Quality Assurance Project Plan

Lower Fox River Pre-Design Characterization Study
Lower Fox River, Wisconsin

Volume 2: Appendices

Prepared for:

Wisconsin Department of Natural Resources

and

United States Environmental Protection Agency
Region V Superfund

Prepared by:

The RETEC Group, Inc.
MAKuehl Company
En Chem, Inc.
Natural Resource Technology, Inc.

November 2003

Appendix A

En Chem and AXYS QA Plans, Certificates

The State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Hereby grants

Wisconsin Certification under NR 149

under the provisions of ch. NR 149, Wisconsin Administrative Code to:

En Chem, Inc. (Green Bay)
1795 Industrial Drive
Green Bay, WI 54302

Laboratory ID Number: **405132750**

Issued Date: **April 29, 2003**

Expiration Date: **August 31, 2003**

for the following test categories:

* Oxygen Utilization
  - Biochemical Oxygen Demand
  - Carbonaceous BOD
* Nitrogen
  - Nitrite as N
  - Nitrate as N
  - Nitrate + Nitrite as N
* Physical
  - Oil and Grease (HEM)
  - Total Dissolved Solids
  - Total Solids
  - Total Suspended Solids
  - Total Vol. Suspend Solids
  - Total Volatile Solids
* General I
  - Color
  - Hardness
* General II
  - Chloride
  - Chemical Oxygen Demand
  - Fluoride
  - Sulfate
* General III
  - Corrosivity
  - Waste Fingerprinting
  - Ignitability
  - SPLP
  - TCLP
* Metals I
  - Silver
* Metals I
  - Aluminum
  - Arsenic
  - Boron
  - Barium
  - Beryllium
  - Calcium
  - Cadmium
  - Cobalt
  - Chromium (Total)
  - Copper
  - Iron
  - Chromium (Hexavalent)
  - Mercury
  - Potassium
  - Magnesium
  - Manganese
  - Molybdenum
  - Sodium
  - Nickel
  - Lead
  - Antimony
  - Selenium
  - Strontium
  - Thallium
  - Vanadium
  - Zinc
* Metals II
  - Titanium
* Organics; Purgeable
  - Purgeable Aromatics
* Organics; Purgeable
  - Purgeable Halocarbons
  - Volatile Organics (VOCs)
* Semivolatiles by GC/MS
  - Base/Neutral/Acid Extract
* Petroleum Hydrocarbons
  - Diesel Range Organics
  - Gasoline Range Organics
  - Petroleum VOCs
* Organics; Organochlorine
  - PCBs

David Webb

Chief, Environmental Science Service

P. Scott Hassett

Secretary

Certification or registration by the State of Wisconsin is not an endorsemet or guartantee of the validity of data generated by this laboratory. This certificate is valid unless revoked or suspended and supersedes all previous certificates.

The State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Hereby grants

Wisconsin Certification under NR 149

under the provisions of ch. NR 149, Wisconsin Administrative Code to:

En Chem, Inc. (Kimberly)
1090 Kennedy Avenue
Kimberly, WI 54136

Laboratory ID Number: **445134030**

Issued Date: **January 21, 2003**

Expiration Date: **August 31, 2003**

for the following test categories:

* Oxygen Utilization
  - Biochemical Oxygen Demand
* Nitrogen
  - Ammonia as N
  - Nitrite as N
  - Nitrate as N
  - Total Kjeldahl Nitrogen
* Phosphorus
  - Orthophosphate
  - Total Phosphorus
* Physical
  - Oil and Grease (HEM)
  - Oil and Grease (Freon)
  - Total Dissolved Solids
  - Total Solids
  - Total Suspended Solids
  - Total Volatile Solids
* General I
  - Alkalinity/Acidity
  - Bromide
  - Color
  - Hardness
  - Silica
  - Sulfite
* General II
  - Chloride
  - Cyanide
  - Chemical Oxygen Demand
  - Fluoride
  - Total Phenolic Compounds
  - Sulfide
* General II
  - Sulfate
* General III
  - EP Toxicity
  - Ignitability
  - Total Releasable Cyanide
  - Reactivity
  - Total Releasable Sulfide
  - SPLP
  - TCLP
  - Total Organic Carbon
  - Total Organic Halides
* Metals I
  - Silver
  - Aluminum
  - Arsenic
  - Boron
  - Barium
  - Beryllium
  - Calcium
  - Cadmium
  - Cobalt
  - Chromium (Total)
  - Copper
  - Iron
  - Chromium (Hexavalent)
  - Mercury
  - Potassium
  - Magnesium
  - Manganese
  - Molybdenum
* Metals I
  - Sodium
  - Nickel
  - Lead
  - Antimony
  - Selenium
  - Tin
  - Thallium
  - Vanadium
  - Zinc
* Organics; Purgeable
  - Purgeable Aromatics
  - Purgeable Halocarbons
  - Volatile Organics (VOCs)
* Semivolatiles by GC/MS
  - Base/Neutral/Acid Extract
* Liquid Chromatography
  - Explosives by LC
  - PAHs by LC
* Pesticides
  - Acid Herbicides
* Organics; Organochlorine
  - PCBs
  - Organochlorine Pesticides
* Safe Drinking Water
  - Arsenic
  - Barium
  - Beryllium
  - Cadmium
  - Chromium
* Safe Drinking Water
  - Copper
  - Mercury
  - Nitrate + Nitrite
  - Sodium
  - Nickel
  - Nitrite
  - Nitrate
  - PAHs by HPLC
  - Lead
  - Antimony
  - Selenium
  - Thallium
  - Total Trihalomethanes
  - Volatile Organics

David Webb

Chief, Environmental Science Services

P. Scott Hassett

Secretary

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QUALITY MANUAL
FOR
ENCHEM, INC. - KIMBERLY, WI

REVISION 4

Prepared by:
EnChem, Inc.
1090 Kennedy Avenue, Kimberly, WI 54136
Ph: (920)-469-2436, Fax: (920)-469-8827
www.enchem.com

EFFECTIVE DATE:
April 23, 2003

Glen A. Coder, Chief Operating Officer — Date: 4/23/2003

Julie A. Trivedi, Quality Assurance Officer — Date: 4/23/2003

Andi Wolf, Inorganic Manager — Date: 4/24/2003

Steve Heraly, Organic Manager — Date: 4/23/03

Art Lautenbach, Quality Assurance Coordinator — Date: 4/23/2003

COPY NUMBER_____

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1.0 POLICY STATEMENT

This Quality Manual summarizes the policies and procedures associated with EnChem, Inc. (EnChem) laboratory, located in Kimberly, WI. Specific protocols for sample handling and storage, chain-of-custody, laboratory analyses, data reduction, corrective action, and reporting are described. Adherence to procedures listed in this manual shall be the responsibility of all EnChem employees of the Kimberly laboratory. Laboratory management shall be responsible for seeing that procedures and practices described in this manual, and all referenced Standard Operating Procedures (SOPs), are fully implemented. In the event that a signatory leaves the company, for any reason, the documents shall remain in effect, to allow for revision, for a maximum period of one year or until the document is archived. Other signatories, as well as the replacement for the vacated position, shall be responsible for implementation of the practices and procedures described in the laboratory documents.

The EnChem Kimberly Laboratory performs chemical analyses for inorganic and organic constituents in water, soil, and biological matrices.

The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. This includes a review of facilities and instrumentation, staffing, and any special QC or reporting requirements. All measurements are made using published reference methods or methods developed by EnChem, Inc. All methods are validated according to the procedure described in Appendix B prior to use.

Any unusual requests, such as lower detection limits or additional QC, that are specified on the work order or project QAPP, will take precedence over this QA Manual if they conflict.

This Quality Manual shall be reviewed at least annually and updated as required.

1.1 Mission Statement

EnChem exists to provide innovative ideas, services, and tools to foster the revitalization of the environment.

1.2 National Environmental Laboratory Accreditation Conference (NELAC) Compliance

All policies and procedures have been structured in accordance with the NELAC standards adopted in May 2001 and applicable EPA requirements, regulations, guidance, and technical standards. This manual has been prepared in accordance with the guidance documents listed in Section 15 of this manual. Further details on these policies and procedures are contained in SOPs and related documents.

A Certification statement that addresses continual compliance with NELAC standards is included in Appendix A of this manual.

1.3 Staff Freedom From Undue Pressures

EnChem laboratory staff shall not be subject to any commercial, financial, or other undue pressures which might adversely affect the quality of their work. Any member of the staff who feels the quality of their work is potentially compromised by these, or any other influence, should bring their concerns to the attention of the QA Officer and/or the President of EnChem.

1.4 Legal identification

The Federal Taxpayer ID for EnChem is: 39-1695955. The US-EPA Laboratory ID for the Kimberly facility is: WI-00051.

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 Organization Chart

A corporate organizational chart for EnChem is shown in Appendix C. This chart includes all EnChem Laboratories and Service Offices. The street addresses and phone numbers for each laboratory location are listed below.

EnChem-Green Bay
1241 Bellevue Street
Green Bay, WI 54302
(920) 469-2436

EnChem-Kimberly
1090 Kennedy Avenue
Kimberly, WI 54136
(920) 469-2436

A listing of credentials for all EnChem-Kimberly laboratory staff is presented in Appendix D.

2.2 Laboratory Management Director

The Laboratory Director is responsible for:

- Defining the minimal level of experience and skills necessary for all positions in the laboratory. In addition to education and/or experience, basic laboratory skills are considered.
- Ensuring that all technical laboratory staff have demonstrated initial and ongoing proficiency in the activities for which they are responsible.
- Ensuring that the training of personnel is kept up-to-date.
- Documenting all analytical and operational activities.
- Supervising all personnel.
- Ensuring that all sample acceptance criteria, as defined in SOP GEN-30, are verified and that samples are logged into the sample tracking system and properly labeled and stored.
- Performing an annual Management System Review.
- Documenting the quality of analytical results reported by the laboratory.

- Ensuring that the laboratory has the appropriate resources and facilities to perform requested work.
- Ensuring that corrective actions relating to findings from the internal audit are completed.
- Nominating deputies when a Technical Director or the Quality Assurance (QA) Officer is absent.
- Responsible for overall operation of the organization including fiscal resources and personnel. Examples of these duties include business development, approval of capital investments, coordination of branch offices and long range planning.

2.3 Quality Assurance Officer

The QA Officer is independent of production involvement and day-to-day operations. The QA Officer reports directly the Laboratory Director to resolve any dispute involving data quality. An organization chart is included in Appendix C. The QA Officer establishes policies to insure data quality objectives are achieved and is responsible for the implementation of the Quality System. The QA Officer is authorized to stop work as deemed necessary in the event of serious QA/Quality Control (QC) issues. Specific functions and duties include:

- Performing QA audits on various phases of laboratory operations.
- Reviewing and approving QA plans and procedures.
- Providing QA technical assistance to project staff.
- Reporting on the adequacy, status, and effectiveness of the Quality System regularly to the Technical Director and Laboratory Director.
- Overseeing laboratory QA and QC.
- Overseeing QA/QC documentation.
- Overseeing implementation, and monitoring of, laboratory corrective actions.
- Overseeing preparation and maintenance of SOPs.
- Approval of SOPs and QA Procedures.
- Approval of any/all Quality Assurance Project Plan (QAPP).
- Serving as the focal point for QA/QC and being responsible for the oversight and/or review of quality control data.
- Having documented training and/or experience in QA/QC procedures and being knowledgeable in the quality system as defined under NELAP.
- Having a general knowledge of the analytical test methods for which data review is performed.
- Conducting internal audits on the entire technical operation annually.

- Notifying laboratory management of deficiencies in the quality system and monitoring corrective action.

2.4 Technical Directors for Chemical Analyses

The Technical Director for Chemical Analyses reports to the Laboratory Operations Manager and is responsible for:

- Coordinating laboratory analyses.
- Supervising in-house sample management.
- Scheduling sample analyses.
- Overseeing data review.
- Overseeing preparation and approval of final labortaory reports.
- Participating in the annual Management System Review.
- Certifying that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited.
- Approval of the purchase of consumables and supplies used in the laboratory.

2.5 Support Systems Supervisors

2.5.1 The Sample Receiving Group Leader shall be responsible for the following:

- Supervision and training of sample receiving staff.
- Overseeing the processing of daily sample receipts.
- Coordination of sample tracking and disposal within the laboratory.
- Communication of nonconformances in the receipt of samples to the project manager.

2.5.2 The Information Systems Group Leader shall be responsible for the following:

- Supervision and training of laboratory IS staff.
- Administration and maintainence of the laboratory information management system (LIMS) and the laboratory network.
- Troubleshooting and resolution of computer related problems.
- Planning and implementation of policy and changes to the laboratory information systems.

2.5.3 The Client Services Group Leader shall be responsible for the following:

- Supervision and training of the laboratory Project Managers and Project Coordinators
- Management of projects within the laboratory.

2.6 Technical Staff

Technical staff are responsible for sample analysis and identification of corrective actions. All personnel are responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function. As documented in the employee records, each technical staff member has the experience and education to adequately demonstrate knowledge of their particular function and a general knowledge of laboratory operations, analytical test methods, quality assurance/quality control procedures and records management. A listing of all staff, positions, educational background and experience is included in Appendix D.

2.7 Training

The technical supervisor of each department is responsible for initial training of new employees on safety requirements and procedures and for assuring safety awareness in the laboratory prior to the new employee beginning work in the laboratory area. Courses are held on an "as needed" basis when new employees are hired. Proper reporting of accidents, what to do in case of fire, proper disposal of hazardous waste, and awareness of safety are also included in the training sessions. Training files for each employee are maintained by the QA Department. Employess are instructed to update their training files to reflect training and reading. All employees are encouraged to report potential safety hazards to the Chemical Hygiene Officer and management.

All employees are required to read, understand, and use the latest version of each laboratory SOP, which relates to their job responsibilities. The procedures in SOP GEN-8 document the use of current SOPs. Analysts and Technicians demonstrate continued proficiency by repeating the Initial Demonstration or, acceptable performance of a blind QC Check Sample (single blind to the analyst) at least once per year. Documentation of proficiency is maintained in laboratory training files by the QA Officer.

2.8 Laboratory Capabilities

The EnChem Kimberly laboratory performs analyses on water, soil, and biological matrices for environmental contaminants. Analyses performed are listed in Appendix E, along with the analytical technique, literature references, and the corresponding EnChem SOP.

3.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objectives of the EnChem Kimberly laboratory are to develop and implement SOPs for chain-of-custody, laboratory analysis, and results reporting which will provide results of known and documented quality. The procedures provide a comprehensive and effective quality control program to measure and validate laboratory performance. The system provides for the maintenance of records relating to sample submittal and the production of accurate, precise, and complete laboratory data, using approved or proven methods. In addition, the system identifies factors, which may adversely affect quality and provides for corrective action when necessary.

Several indicators are used as qualitative and quantitative descriptors in interpreting the degree of acceptability or utility of data. The principal indicators are precision, bias (accuracy), representativeness, comparability, completeness, and detection limits. These indicators, defined below in detail, provide goals for the quality of data generated in the analytical measurement process.

3.1 Precision

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

Precision is assessed through the calculation of Relative Percent Difference (RPD) between a sample matrix spike (MS) and matrix spike duplicate (MSD). The RPD is compared to acceptance limits derived from historical laboratory data or from control limits presented in a project specific QAPP. In cases where an insufficient quantity of sample is available for matrix spikes the precision will be evaluated by calculation of the RPD between a Laboratory Control Sample (LCS) and a LCS Duplicate (LCSD).

The RPD is also determined through the assay of field or laboratory duplicates.

For replicate results D_1 and D_2, the RPD shall be calculated:

$$\text{RPD} = \frac{[D_1 - D_2]}{\left[\frac{(D_1 + D_2)}{2}\right]} \times 100$$

3.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. Accuracy is expressed in terms of percent recovery (%R).

$$\%R = \frac{O_i - O_s}{T_i} \times 100$$

Where:

%R	=	Percent Recovery
0_i	=	Concentration of analyte observed in the spiked sample.
0_s	=	Concentration of analyte observed in the unspiked sample.
T_i	=	Concentration of the Spike

Accuracy is assessed through the analysis of MS/MSD, quality control check samples, laboratory control samples, and surrogate compound spikes. The % Recovery obtained is compared to control limits derived from historical laboratory data or from control limits presented in a project specific QAPP.

3.3 Representativeness

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

Representativeness is ensured by using the proper analytical procedures, appropriate methods and meeting sample holding times.

3.4 Completeness

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

Laboratory completeness is a determination of the amount of valid measurements obtained compared to all the measurements taken in the project. The laboratory completeness objective is to generate valid data for all samples at a rate greater than 95 percent of all samples analyzed.

3.5 Comparability

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

Comparability is achieved by following Standard Operating Procedure, analysis within holding times, the use of approved analytical methods, use of consistent detection levels, and consistent rules for reporting data (including reporting results in common units).

3.6 Data Reporting Limits

3.6.1 Method Detection Limits

Method Detection Limits (MDLs) shall be determined for each analyte and matrix as specified in laboratory SOP LAB-14. The laboratory SOP is based on EPA guidance given in Title 40, Code of Federal Regulations, Part 136, Appendix B. Laboratory MDL determinations shall be performed during initial validation of a method, whenever there is a significant change to the test method or instrument type. MDLS's shall be performed as necessary but no less than once per year on each instrument. The highest valid MDL from all of the instruments used for a particular analysis is used for reporting purposes in LIMS. See SOP LAB-14 for more specific guidance.

3.6.2 Limit of Quantitation

The Limit of Quantitation (LOQ) is nominally 3.18 times the MDL. This value is used for reporting to the State of Wisconsin.

3.6.3 Estimated Quantitation Limit

The Estimated Quantitation Limit (EQL) is a nominally chosen reporting limit, which is greater than the MDL. The EQL is the minimum concentration of an analyte that can be identified and quantified within specified limits of precision and bias during routine analytical operating conditions. EQLs may be adjusted to meet specific client project reporting limits. When this occurs, the value is referred to as a Project Specific Reporting Limit (PSRL).

3.7 Holding Times

The holding times specified in each particular method are utilized for all aqueous and soil/sediment samples. The holding time for biological samples begins at the time the samples are removed from the freezer to thaw for biological preparation and homogenization. In the event sample results are obtained beyond the recommended holding time, these results are qualified on the final report.

4.0 SAMPLING PROCEDURES

The EnChem-Kimberly laboratory does not provide field-sampling services.

4.1 Ice Chests and Shipping Containers

Shipping containers are washed and inspected prior to and following use. Containers are rinsed with tap water and air dried before storage. If a container becomes severely contaminated or damaged, it is cleaned as thoroughly as possible, rendered unusable, and properly disposed.

4.2 Sample Containers

The laboratory provides sample containers. All sample containers are purchased from commercial sources and are pre-cleaned and, certified by the vendor. The containers meet or exceed the requirements of "EPA Publication #9240.0-05A" Specifications and Guidance for Contaminant-Free Containers. The sample containers used for a specific project are traceable by lot number to certification statements provided by the manufacturer. These certificates are maintained on file in the laboratory.

4.3 Sample Preservation

Sample preservatives are added to sample containers in the laboratory prior to shipment to the field. Sample preservation requirements are detailed in SOP REC-3. The preparation of preservatives is documented and is traceable to the lot numbers of reagents used to prepare the preservative. The documentation procedure for laboratory reagents and solutions is detailed in SOP G1-LAB-29 Traceability of Laboratory Reagents.

Proper preservation is the ultimate responsibility of the sampling team. The laboratory may provide additional preservatives for any site with a history indicating that non-routine preservation is required. This information should be communicated to the project manager during project start-up. The laboratory verifies proper sample preservation at the time of sample receipt. The adequacy of sample preservation shall be verified and recorded at the time of sample receipt. The preservation of samples for volatile organics is not checked until the analysis is completed.

Specific project requirements, such as notification prior to pH adjustment, shall take precedent over the laboratory SOP if these requirements have been communicated to the laboratory prior to sample receipt.

4.4 Notification of Receipt of Potentially Hazardous Samples

Communication between EnChem project managers and our clients concerning the receipt of potentially hazardous samples is essential. Copies of Material Safety Data Sheets or the results of any field screening may be assessed to determine whether additional safety precautions are required when handling with the samples.

EnChem does not accept radioactive samples for analysis.

5.0 SAMPLE CONTROL AND PROCESSING

Prior to analysis, sample collection, preservation, and storage must be performed properly to maintain sample integrity. EnChem's laboratories are access-controlled facilities. Upon receipt, all samples shall be inspected for leakage or breakage, and inventoried against the Chain of Custody document. The sample log-in procedure includes assignment of unique sample identification numbers, to ensure samples can be tracked, data can be stored, and quality control samples can be identified for all analyses occurring in the laboratory. Documentation of storage and laboratory handling is documented at this time. Specific procedures are summarized below, and detailed in laboratory SOPs. Deviations from the SOPs must be documented in accordance with Section 13: Corrective Action, of this manual.

5.1 Bottle Request and Chain-Of-Custody Forms

A Bottle Request Form is generated by the laboratory project manager to ensure that the proper bottle types and preservatives are made available to the project sampling team. The bottle request form is submitted to the laboratory Sample Receiving group before the sampling event. Field personnel must properly complete the sample Chain-of-Custody (COC) Form and return it to the laboratory with the samples. The COC indicates the work requested for each sample point. Work requests can also be pre-arranged with the EnChem project manager. Example Bottle Request and COC forms can be found in Appendix I.

5.2 Chain-Of-Custody Procedures

Sample custody documentation includes records necessary to trace a sample from point of origin through final report. Sample custody documentation requires the recording of each event or procedure to which the sample is subjected. This includes but is not limited to: field activities such as sample collection and preservation, as well as laboratory activities such as sample receipt and sample login. The COC remains with the samples during transport, and serves as a written record of sample possession and transference. A sample is considered to be in custody if it is in one's possession, is locked or sealed during shipment, or is placed in a secure area limited to authorized personnel. The COC must be signed and dated by everyone who takes possession of the samples. Samples and documents shipped by commercial carrier must be sealed in

watertight containers. Shipping containers must be sealed before delivery to commercial carriers. The waybill of the carrier shall serve as an extension of the COC between the field and the laboratory. Upon arrival at the laboratory, the shipping containers are opened in the sample log-in area. Shipping containers suspected to contain potentially hazardous samples are opened in the fume hood present in the sample log-in area. The contents are checked against the COC and any discrepancies are noted. Additions or changes to the COC are signed and dated at the time that they are made. If the discrepancies cannot be resolved, project personnel shall be notified and the samples will be held until the problem is resolved. The laboratory will not be responsible for meeting holding times on these types of problem samples. Actions taken to resolve problems with incoming samples are documented (see Section 13, Corrective Action).

Sample custody at the laboratory is documented on the Laboratory Tracking Sheet, which is completed by the Sample Receiving Group for each batch of samples received. The use of this laboratory form is discussed in SOP REC-7.

5.3 Sample Receipt

All samples are received at the EnChem-Green Bay laboratory facility. The laboratory has a specifically designated area for sample receipt. Samples are received during normal business hours, on Saturday mornings and at other times by special arrangements. Sample receiving procedures are defined in SOPs. These procedures include completion of a cooler receipt log and sample log-in SOP G1-REC-7. Personal safety items such as lab coats, gloves, fume hoods and eye protection are provided to the sample receiving staff for their protection. Refer to the specific laboratory SOP for further detail.

5.3.1 Sample Acceptance Policy

EnChem's written sample acceptance policy, SOP GEN-30, requires the following:

- Proper, full, and complete documentation, including the sample identification, the location, date, and time of collection, collector's name, preservation type, sample type and any special remarks concerning the sample;
- Unique identification of samples using durable labels completed in indelible ink;
- Use of appropriate sample containers.;

- Receipt within holding times;
- Adequate sample volume; and
- Procedures to be used when samples show signs of damage or contamination.

Samples, which do not meet the acceptance criteria, must be documented on a Sample Entry Nonconformance Memo (SOP G1-Rec-5). These memos are routed to the EnChem Project Manager of the project for resolution with client project staff. Analytical results from non-acceptable samples shall be qualified or otherwise explained in the laboratory report.

5.3.2 Sample Transfer to EnChem Kimberly

Upon acceptance of the samples, the samples are transferred to the EnChem Kimberly laboratory via an EnChem courier using a sample transfer COC. Appendix I contains an example sample transfer COC. (SOP G1-Rec-10)

Upon receipt at the Kimberly laboratory, the sample custodian verifies the temperature of the samples upon receipt, documents the temperature on the transfer COC, and verifies the contents of the cooler against the sample transfer COC to confirm receipt of all samples. Any discrepancies are documented using a non-conformance memo. In addition, the appropriate project manager and the sample receiving department at the EnChem Green Bay facility are notified so the discrepancy may be resolved.

5.4 Sample Storage

The primary considerations for sample storage are proper temperature as specified by method requirements and the completion of extraction and analysis within the specified holding times. Sample receiving personnel are responsible for ensuring that samples are initially properly stored.

Samples stored in a particular refrigerator, freezer, or other storage area shall be recorded in a logbook for that storage area. Documentation of sample storage is provided on the Laboratory Tracking Sheet (See Appendix I), which must be completed for each sample batch.

To minimize the possibility of contamination, all samples for volatile organics are segregated in a refrigerator specifically designated for these samples. A second

volatiles refrigerator is used to segregate known high level samples or those with a noticeable odor at the time of receipt.

All samples, sample fractions, extracts, leachates, or other sample preparations shall be stored according to the conditions listed in the authoritative test method. These conditions are detailed in the specific method SOP's.

5.5 Sample Disposal

Samples may be completely consumed during analysis, returned to the client or sampling location, or stored under appropriate environmental conditions if re-analysis is anticipated. Ambient storage is used if re-analysis is not likely. Samples and extracts are disposed of not earlier than thirty days after issuance of the final report unless otherwise specified. Samples are placed into long-term storage following analysis, or returned to the client if required by the project.

Sample containers are emptied and disposed in accordance with the State of Wisconsin Chapters NR 500-522 and NR 610. Containers will be crushed and labels will be removed or defaced at the request of our clients.

The EnChem Kimberly facility is classified as a small quantity waste generator by the USEPA. Disposal of all samples, hazardous and non-hazardous, is performed in accordance with all applicable local, state, and federal environmental regulations. Some non-hazardous wastes may be disposed of in a sanitary sewer as permitted by 40 CFR 261.3 (a),(2),(iv). Hazardous wastes as defined under 40 CFR 261 are stored in designated locations in the laboratory according to EPA standards.

EnChem has an agreement with a licensed hazardous waste shipper to pack, test, and ship the hazardous waste approximately every four weeks. Hazardous wastes are shipped to licensed waste disposal facilities for disposal. EnChem receives a Certificate of Disposal for all disposed material. All documents related to waste management are maintained on file in the laboratory.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments and equipment used to generate data shall be calibrated with sufficient frequency, and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. Calibration may be of two types: operational calibration which occurs before instrument, or periodic calibration which occurs at prescribed intervals. This section describes procedures for maintaining the accuracy of all instruments and measuring equipment that are used for conducting laboratory analyses.

6.1 Traceability of Calibration

The calibration of analytical equipment and instruments shall be traceable to the National Institute of Standards and Technology (NIST).

6.2 NIST Traceable Reference Standards

Physical standards used to verify laboratory equipment in used in the labs shall be traceable to nationally recognized standards such as the NIST. The reference standards shall be administered by the Quality Assurance officer. Reference standards must be re-certified according to the expiration dates on the certificate for each standard. If no expiration date is specified a time period of three years shall be used.

Chemical reference standards that are purchased from commercial vendors shall be traceable to the NIST. Calibration certificates that accompany standard materials when received in the laboratory are maintained on file in the laboratory.

6.3 General Requirements

Each operational calibration shall be supported by documentation indicating calibration date, method, instrument, analyst, analysis date, analyte, concentration and response (or response factor). Sufficient information must be recorded to permit reconstruction of the calibration. Acceptance criteria for calibrations comply with method references or

QAPP requirements. This documentation is referenced in, or kept with, data files or analytical log books.

NOTE: Separate records are kept for periodic calibration. These items shall be filed and archived by the laboratory QA Officer.

6.4 Analytical Support Equipment

Analytical support equipment includes: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices and volumetric dispensing devices. If quantitative results are dependent on their accuracy, as in standard preparation and dispensing or diluting procedures, then all such support equipment is maintained in proper working order. The records of all maintenance including service calls shall be recorded in the equipment maintenance log or filed with the QA Officer.

Calibration is verified at least annually, using NIST traceable references when available, over the entire range of use. The results of such calibration must be within the specifications required of the application for which is equipment is used. Noncompliant equipment is removed from service until repaired.

Any equipment which is not calibrated at least annually must be clearly labeled as 'Not Calibrated', such as an oven which is only used to dry glassware. Equipment which is not in use shall be clearly labelled as such.

6.4.1 Temperature Monitoring

Each working day, the temperatures of ovens, refrigerators, freezers, and water baths are checked with calibrated thermometers which are traceable to NIST references. The temperatures of these units are recorded in the logbook which contains the acceptance limits for that unit. SOP's LAB-12 and LAB-13 describe these procedures and corrective action for noncompliance.

All therometers used in the laboratory shall be verified with a NIST traceable thermometer, in the range of use, prior to being used in the laboratory and once annually thereafter. Each thermometer shall contain a calibration tag which identifies the thermometer with a unique number and shows the date which reverification is due. The procedure for calibration verification is available in SOP LAB-10.

6.4.2 Balances

Laboratory balances shall be checked with Class 'S' weights traceable to NIST standards, which bracket the range of use, each day prior to use. The calibration check shall be recorded in the logbook which contains the acceptance limits for that unit. SOP LAB-26 describes this procedure and corrective action.

All balances are serviced and calibrated two times each year by an external service provider. A calibration sticker is attached to each balance which identifies the service contractor, and contains the serial number of the balance, the calibration date, and the date that recalibration is due. Records of this balance calibration shall be maintained by the QA Officer.

6.4.3 Volumetric Dispensing Devices

Mechanical volumetric dispensing devices are checked for accuracy monthly as described in laboratory SOP LAB-1.

6.5 Instrument Calibration

Analytical instrument calibration consists of measuring a standard response or preparing a standard calibration curve.

Detailed initial and continuing calibration procedures for specific laboratory instruments are documented in specific instrument SOPs. The SOP for each method performed in the laboratory describes the calibration procedures, their frequency, acceptance criteria, and the conditions that require recalibration. The analyst is required to perform and document the calibration procedure prior to sample analysis.

In all cases, the initial calibration shall be verified using an independently prepared calibration verification solution. Calibration records are documented on the raw data or in the logbook for each instrument. At a minimum the following information shall be recorded or referenced in the logbook: instrument identification, calibration date, analyst, calibration solutions/concentrations analyzed.

6.5.1 Limited Calibration Procedures

The use of a limited calibration procedure is allowed on a project specific basis for unusual, non-routine compound analysis. In this case, the laboratory may run one or two standards in order to establish a retention time, determine instrument response, and establish a reporting limit. The use of limited calibration must be discussed with the client by the Project Manager prior to initiation of the project. The approval to proceed with a limited calibration for a project shall be documented in the project file by the Project Manager. The use of such procedures shall be included in the final report or accompanying case narrative.

7.0 TEST METHODS AND STANDARD OPERATING PROCEDURES

EnChem maintains Standard Operating Procedures (SOPs) that accurately reflect all test methods, assessment of data integrity, corrective actions, and handling customer complaints. The primary purpose of a Standard Operating Procedure (SOP) is to provide a "How to" document which laboratory personnel can use to perform various routine laboratory operations. SOPs are prepared and used to minimize the introduction of random and systematic errors by ensuring that all personnel use the same procedure when performing a specific operation. SOPs also act as a training guide for new personnel.

Each SOP indicates the effective date, the revision number, and the appropriate signature(s).

7.1 SOP Preparation and Organization

Laboratory SOP GEN -1, Preparation of Standard Operating Procedures, defines the format, identification, and control of SOPs. All SOP's shall be reviewed annually for any needed revisions.

7.2 SOP Control and Distribution

SOPs, which are located throughout the laboratory, are printed on paper with a red header signifying that the copy is a controlled document. The controlled copies shall be issued and distributed by the QA Officer or a designee. Each laboratory area has copies of the appropriate SOPs pertaining to that work area. The SOPs shall be accessible to all personnel in their immediate work areas.

Uncontrolled copies of SOPs may be sent to clients for inclusion in workplans, etc. These uncontrolled copies are photocopies of the controlled SOPs that do not have the red header, and are therefore easily identified as uncontrolled copies.

7.3 SOP Archival

When an SOP is revised, the original of the previous revision shall be archived by the

QA Officer. These archived SOPs shall be retained indefinitely for future reference. The archive is maintained in a locked file cabinet for future reference.

7.4 SOP Formats for Test Methods

Procedures describing how analyses are actually performed in the laboratory are specified in method SOPs. SOPs for sample preparation, cleanup, and analysis are based on literature references published by the USEPA, ASTM, and other organizations and on internally developed methods validated according to EPA's Performance-Based Measurement System. Examples of items included or referenced in a Method SOP include:

1) Identification of the test method.
2) Applicable matrix or matrices.
3) Method detection limit.
4) Scope and application, including components to be analyzed.
5) Summary of the method.
6) Definitions.
7) Interferences.
8) Safety.
9) Equipment and supplies.
10) Reagents and standards.
11) Sample collection, preservation, shipment and storage.
12) Quality control.
13) Calibration and standardization.
14) Procedure.
15) Calculations.
16) Method performance.
17) Pollution prevention.
18) Data assessment and acceptance criteria for quality control measures.
19) Corrective actions for out-of-control data.
20) Contingencies for handling out-of-control or unacceptable data.
21) Waste management.
22) References.
23) Any tables, diagrams, flowcharts and validation data.

7.5 Laboratory SOP Listing

A complete listing of EnChem Kimberly SOPs is located in Appendix J.

7.6 Deviations From Laboratory SOP

Deviations from laboratory SOP may occur as part of a planned process such as a project work plan which specifies added or altered procedures to improve method performance in samples from that site. In this case the deviations shall be included in the case narrative for that project. Unplanned deviations from SOP's, such as an oversight by staff, shall be documented on a nonconformance memo. See Section 13, and EnChem SOP GEN –15 for additional information. These deviations shall be included in the final report or accompanying case narrative.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 Laboratory Quality Control Samples

The data acquired from QC procedures are used to estimate the quality of analytical data, to determine the need for corrective action in response to identified deficiencies, and to interpret results after corrective action procedures are implemented. Each method SOP includes a QC section which addresses the minimum QC requirements for the procedure. The internal QC checks may differ slightly for each individual procedure but in general are described below. The acceptance limits and corrective actions for these QC checks are described in Section 12 and 13 of this manual.

8.1.1 Blanks

a) Method Blank

A method blank is a blank of appropriate analyte-free matrix that is processed (digested, extracted, etc.) and analyzed with a specified sample set. The purpose of the method blank is to verify that interferences caused by contaminants in the solvents, reagents, glassware, etc. are known and minimized. Method blanks are performed at a frequency of one per batch of 20 samples or less, per matrix type, per sample preparation whichever is more frequent. The method blank is processed through all clean-ups, etc., which were performed on the samples in the batch. Method Blank results are used to determine batch acceptance. Acceptance criteria are presented in Section 12.4.

b) Trip Blank - Volatile Organics

Trip Blanks are routinely supplied and analyzed for volatile organics. Trip blanks are necessary because volatile organics samples are susceptible to contamination by diffusion of organic contaminants through the Teflon-faced silicon rubber septum of the sample vial. Trip Blanks are prepared by filling two 40-mL VOA vials with organic free water. These vials are then shipped with the field kit, and follow the sample bottles through the field collection and return shipment to the laboratory. Trip blanks are analyzed and reported in the same manner as samples.

c) Other Blanks

Other types of field quality control blanks, such as field and rinsate blanks are analyzed and reported in the same manner as samples.

8.1.2 Spiked Laboratory Control Samples

a) Laboratory Control Samples (LCS)

A laboratory control sample consists of a control matrix which has been spiked with the analytes(s) of interest or compounds representative of those analytes. Laboratory Control Samples are analyzed at a minimum of 1 per batch of 20 or fewer samples per matrix type per sample extraction or preparation method. Results of the LCS are expressed in terms of percent recovery, and are used to determine batch acceptance. Acceptance limits are established based on in-house data. Table1 of Section 12 provides interim default limits for use prior to calculation of in-house limits. Once sufficient data points (a minimum of 20) are available in-house limits are generated for methods that do not have control criteria specified in the method reference.

Tests for which no spiking solutions are available, or spiking is not applicable, a purchased Quality Control Sample will be used in place of the LCS described above. In these cases the acceptance limits provided by the manufacturer will be used. Some examples of these tests include, total suspended solids, total dissolved solids, and total volatile solids.

b) Laboratory Control Sample Duplicates (LCSD)

A second LCS which is used to evaluate laboratory precision when adequate sample is not supplied by the client to perform a Matrix Spike/ Matrix Spike Duplicate. The Relative Percent Difference (RPD) will be calculated between the LCS and LCSD and the value evaluated against in-house control limits. The LCSD must also meet the accuracy criteria for the LCS.

8.1.3 Spiked Samples

a) Matrix Spikes (MS)

Matrix spikes are performed to evaluate the effect of the sample matrix upon analytical methodology. A separate aliquot of sample is spiked with the analyte of interest and analyzed with the sample. Matrix spikes are performed at a minimum frequency of one in 20 samples (5%) per matrix type per sample extraction or preparation method for SW 846 methods. The frequency for EPA 300 series and 600 series methods is 10%. Matrix spike recoveries are evaluated against in-house control limits. Specific corrective actions for samples recoveries outside of established control limits are provided in the method SOPs. Poor performance in a matrix spike generally indicates a problem with the sample composition, and not the laboratory analysis, and results are used to assist in data assessment.

For analytes which spiking solutions are not available, such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, conductivity, or turbidity, a matrix spike is not performed. In these cases a duplicate analysis is perfromed.

b) Matrix Spike Duplicates (MSDs)

A separate sample aliquot is spiked with the analyte(s) of interest and analyzed with the associated sample and sample matrix spike. Matrix spike duplicates are performed along with matrix spikes at the same frequency. Matrix spike duplicates are evaluated for accuracy in the same manner as matrix spikes. In addition, the Relative Percent Difference (RPD) will be calculated between the MS and MSD. If the RPD is outside of the established control limits, the sample data shall be qualified and all QC data will be carefully evaluated to determine if remedial action is required.

c) Surrogate Spiking (SS)

Surrogate compounds are added to all samples, standards, and blanks for all organic chromatography test methods except when the matrix precludes its use or when a surrogate is not available. Surrogate recoveries are evaluated against in-house control limits. Specific corrective actions for samples with surrogates outside of established control limits are provided in the method SOPs. Poor surrogate recovery generally indicates a problem with the sample composition and is reported to assist in data assessment. Data shall be qualified for surrogates that do not meet established control limits.

8.1.4 Other QC Samples

a) Duplicate Analysis

Duplicate analysis may be used to calculate the precision (relative percent difference) of an analysis in cases where the levels of analyte is sufficiently above the EQL, or a spike of the analyte is not possible, i.e. TSS. Frequency of duplicate analyses may be either one sample per similar matrix group of 10 or one sample per group of 20, depending on choice of methodology. If the RPD is outside of the established control limits, the sample data shall be qualified and all QC data will be carefully evaluated to determine if remedial action is required.

b) Serial Dilution

For ICP metals analysis, a serial dilution is performed on each batch of 20 samples or

less. The parent sample is diluted by a factor of 5, and the result must agree within 10% of the original sample concentration. Any results that are greater than 10% will require a flag on the sample result indicating an estimated concentration due to a chemical or physical interference.

c) Recovery Test

For the recovery test, one sample is spiked with a known amount of the analyte of interest and analyzed. The percent recovery must be within the range of 85-115%. If the recoveries are outside of that range, subsequent dilutions are performed. If recoveries remain outside of the acceptable range then all samples in the digestion group are diluted and qualified.

8.1.5 Spike Components for Organic Analysis

In general, all reportable components are in the spike mixes. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components (such as Method 8270) or components are incompatible, a subset of the listed components are used.

8.1.6 Standard Reference Material Analysis

Standard reference materials, such as those available from the National Institute of Standards and Technology, are analyzed on a project specific basis and used in association with laboratory control spike data to evaluate the method performance .

8.2 Method Detection Limits

Method detection limits (MDL) are determined by 40 CFR Part 136, Appendix B. Method Detection Limits are updated as deemed necessary by the Group Leader or QA Officer, but no less than once per year.

An MDL study is not performed for any component for which spiking solutions are not available such as pH. For these types of analytes, the detection limit is based on a signal to noise ratio from a the analysis of QC check samples or calibration standards. The detection limit for gravimetric tests is based on the analysis of seven replicates of a purchased QC sample. Alternatively, the detection limit may be based on the lowest reading of the balance used to perform the analysis.

b) The method detection limit is initially determined for the compounds of interest by

each method in reagent water and/or Ottawa sand. For the biological matrix, canned tuna fish is used.

c) EnChem has adopted standard Estimated Quantitation Limits (EQLs). For organic and inorganic analyses using a calibration curve with five or more points, the EQL is equivalent to the lowest calibration standard in the calibration curve. In a few cases the EQL is set at the second lowest standard in the calibration curve if the curve contains six or more points. For inorganic analyses using a blank and 1 standard for calibration, like the ICP, the EQL is set at a point where acceptable precision can be obtained. Reporting Limits are a function of project planning and may be modified for a specific project. Deviations from standard reporting limits must be approved by laboratory management and communicated to laboratory staff prior to project start-up.

8.3 Selectivity (Organics analysis)

a) Absolute and relative retention times aid in the identification of components in chromatographic analyses and help evaluate the effectiveness of a column to separate constituents. Acceptance criteria for retention time windows are documented in each method SOP.

b) A confirmation on a column of dissimmilar phase is performed to verify a compound identification when positive results are detected for GC analysis. Such confirmations are performed on organic tests except when the analysis involves the use of a mass spectrometer.

8.4 Demonstration of Method Capability

Prior to acceptance and use of any method, satisfactory initial demonstration of method performance is required. It is the responsibility of the supervisor of the section in which the method is performed to see that this activity is completed. This initial demonstration of method performance shall be performed each time there is a significant change in instrument type, personnel or test method. Upon completion of the initial validation a certification statement is completed for each analyst documenting that this activity has been performed. The procedure used and the certification statement is found in Appendix B.

8.5 Solvent, Reagent, and Adsorbent Check Analysis

Method blanks are extracted/prepared and analyzed with each sample batch for all

methods in order to validate the purity of all reagents and solvents used in the procedure.

Each lot of Florisil is validated and the results are retained on file. A lot of Florisil cartridges is acceptable if all pesticide recoveries are 75-125%, if the trichlorophenol recovery is less than 5%, and if no peaks interfering with target analytes are detected. If this clean-up procedure is used, all sample extracts in the batch, including the method blank and laboratory control samples, are subjected to the cleanup procedure.

The GPC is calibrated weekly to obtain a UV trace showing a discrete peak for each component. The peaks should be symmetrical for all compounds in the calibration solution. The corn oil and phthalate peaks must exhibit greater than 85% resolution. The phthalate and methoxychlor peaks must exhibit greater than 85% resolution. The methoxychlor and perylene peaks must exhibit greater than 85% resolution. The perylene and sulfur peaks must not be saturated and must exhibit greater than 90% baseline resolution. If this clean-up procedure is used, all sample extracts in the batch, including the method blank and laboratory control samples, are subjected to the cleanup procedure.

9.0 DATA REDUCTION, REVIEW, REPORTING AND RECORDS

9.1 Data Reduction and Review

Data resulting from the analyses of samples is reduced according to protocols described in the laboratory SOPs. All information used in the calculations (e.g., raw data, calibration files, tuning records, results of standard additions, interference check results, sample response, and blank or background-correction protocols) are recorded in order to enable reconstruction of the final result at a later date. Information on the preparation of the sample (e.g., weight or volume of sample used, percent dry weight for solids, extract volume, dilution factor used) is maintained in bound logbooks in order to enable reconstruction of the final result at a later date.

All data are reviewed by a second analyst or supervisor according to laboratory procedures to ensure that calculations are correct and to detect transcription errors. The results of all quality control sample analyses are reviewed, and evaluated before data are approved for reporting. Laboratory SOP GEN-6 documents procedures for data reduction, review, validation, and reporting. Errors detected in the review process are referred to the analyst(s) for corrective action.

Spot checks are performed on computer calculations to verify program validity. Computer programs used for data reduction are validated before use and verified regularly.

9.2 Report Format and Contents

The results of each test, or series of tests, are reported in a Certificate of Analysis and include all the information necessary for the interpretation of the results.

Each report includes:
1) the title "Certificate of Analysis".
2) name and address of laboratory, and phone number with name of contact person.
3) a unique identification number and the total number of pages, with all pages sequentially numbered.
4) name of client.
5) description and unambiguous identification of the sample(s) including the client

identification code.
6) identification of results for any sample that did not meet sample acceptance requirements.
7) identification of the test method used.
8) any deviations from, additions to or exclusions from SOPs, and any conditions that may have affected the quality of results, and including the use and definitions of data qualifiers.
9) measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; identification of whether data are calculated on a dry weight or wet weight basis; identification of the reporting units such as ug/L or mg/kg.
10)clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.
11) clear identification of numerical results with values below the Reporting Limit.

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

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

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

Whenever, the NELAP standards are applicable, test results are certified to meet all requirements of the NELAP standards or reasons/justification are provided if the results do not meet the NELAP standards.

9.2.1 Data Deliverable Levels

The results of quality control samples, instrument raw data, etc. may be reported if requested on a project specific basis. The content of these reports may range from a summary of quality control sample results to a fully validated stand alone document containing all raw data and supporting documentation. These requirements should be discussed with the EnChem Project Manager. The level of QC deliverables is determined by project requirements and must be specified at the time that the samples are submitted to the laboratory. Deliverable formats are presented in SOP GEN-21.

9.3 Records

Laboratory records provide the direct evidence and support for the necessary technical interpretations, judgments, and discussions concerning laboratory results. All records shall be recorded in ink, be legible, identifiable, and retrievable, and protected against damage, deterioration, or loss. All laboratory records from time of sample receipt through data reporting and sample disposal shall be available if requested by clients or an authorized regulatory agency or court. All records referenced in this section are retained for a minimum of ten years. The hardware and software necessary to access any data stored electronically shall also be maintained. Storage for longer periods is available and should be discussed with the EnChem project manager prior to initiation of the project. Laboratory policies for record creation and archival are included in EnChem SOP's GEN-4 and GEN-25.

Laboratory records are stored long-term off-site under contract with an insured document and media storage provider. The off-site storage facility offers security, temperature and humidity control of all records that are placed in their control.

9.3.1 General Laboratory Operations Records

The following records shall be maintained:

- Master Sample Log - A chronological paper or computerized record of samples is maintained. This documentation is completed by the Sample Receiving Group.

- Calibration Records & Traceability of Standards/Reagents -- The frequency, conditions, standards, and records reflecting the calibration history of a measurement system are recorded.

- Instrument Maintenance Logs - A separate log is maintained for each instrument listing all maintenance and calibration performed in-house or by outside groups. These logs are maintained during the instrument lifetime and then archived.

- Proficiency Testing Records - Copies of all PT results and any associated corrective actions are maintained by the QA Officer.

- Certification Program Records - Records are maintained of all correspondence, analytical data, agency results and certification of performance from all certification programs.

- Purchased Material Certificates - Information which verifies that purchased materials meet the requirements of the laboratory are maintained in the laboratory.

- Audit Records - Audit reports and responses for both internal and external audits are maintained by the QA Officer.

- Computer Software Verification - Separate records of the data used to verify each software package are maintained in the laboratory.

- Periodic Calibration Records - Information on periodic calibration, i.e., thermometer and weight set calibration, are maintained by the QA Officer.

- Nonconformance Records - A copy of all nonconformance reports are maintained. The QA Officer maintains completed nonconformance memos.

- Instrument Run Log - A list of samples run on each instrument is maintained in the logbooks designated for that purpose.

- Standard Operating Procedures - A file of current and historical laboratory SOPs with issue dates is maintained.

- Administrative Records -- The following are maintained:
  a) Personnel qualifications, experience and training records;
  b) Initial and continuing demonstration of proficiency for each analyst; and
  c) A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

9.3.2 Sample Specific Records

- Sample Management -- A record of all procedures to which a sample is subjected while in the possession of the laboratory is maintained. These include records pertaining to:
  a) Sample identification, receipt, acceptance or rejection and log-in;
  b) Sample preservation including appropriateness of sample container and compliance with holding time requirement;

c) Sample storage and tracking including shipping receipts, transmittal forms, and internal routing and assignment records;
d) Disposal of hazardous samples including the date of sample or subsample disposal and name of the responsible person;

- Original Data -- The raw data and calculated results for all samples is maintained in laboratory notebooks, logs, benchsheets, files or other sample tracking or data entry forms. Instrument output is stored in a computer file or a hard copy report. These records include:
  a) Laboratory sample ID code.
  b) Date of analysis.
  c) Instrumentation identification and instrument operating conditions/parameters;
  d) Analysis type and sample preparation information, including sample aliquots processed, cleanup, and separation protocols.
  e) All manual, automated, or statistical calculations.
  f) Confirmatory analysis data, when required to be performed.
  g) Review history of sample data.
  f) Analyst's or operator's initials/signature.

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

- Correspondence -- Correspondence pertinent to a project is maintained in the project files.

- Deviations -- Records of all deviations from SOPs. Deviations are reviewed and approved by the QA Officer or Technical Director through the use of a nonconformance memo.

- Final Report -- A copy of any report issued and any supporting documentation.

9.4 Document Control System

A document control system, under the direction of the QA Officer, is used to ensure that

all staff have access to current policies and procedures at all times. Documents which are managed by this system include this Quality Manual and all SOPs. The policy for laboratory document control, distribution, receipt, return, and accessibility is maintained in SOP GEN-2.

All quality documents (this Manual, SOPs, policies, etc.) are reviewed and approved by the QA Officer, the Technical Directors and the Laboratory Director. A system for SOP and QAM review, revision and approval is documented in SOP GEN-8. Such documents are revised whenever the activity described changes significantly. All documents are reviewed at least every 3 years.

9.5 Confidentiality

All information related to a project, such as laboratory results, associated raw data, product information, processes, designs or strategies are kept in confidence to the customer who requested the analyses. This policy is documented in SOP GEN-23. Access to laboratory records and LIMs data is limited to laboratory personnel except with the permission of the QA Officer or Laboratory Director. NELAP-related records are made available to authorized accrediting authority personnel.

Where clients require transmission of test results by telephone, facsimile or other electronic means, staff will ensure confidentiality is preserved. Copies of all information related to specific samples that is sent to, or received from, clients shall be maintained in the project file for that batch number.

10.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

10.1 Internal Laboratory Audits

Annual internal audits are performed by the Quality Assurance Department to verify that laboratory operations continue to comply with the requirements of the quality system. Where the audit findings cast doubt on the correctness or validity of the laboratory's results, an immediate corrective action is initiated and any client whose work may have been affected is notified.

The internal system audits include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc. Internal audits are conducted according to the procedures and schedule included in SOP QAU-1.

10.2 Performance Audits

Blind proficiency test samples are analyzed at least two times per year from a NIST-approved PT provider for all analytes, methods, and matrices, as applicable. The rounds of proficiency test samples are spread throughout the year in an attempt to analyze 1 round each quarter. Additional samples, such as make-up samples to demonstrate corrective action, may be ordered from another approved PT provider at the discretion of the QA Officer.

In addition, the laboratory performs the following QC practices to monitor the quality of the laboratories analytical activities:

a) Use of a round robin study from a Canadian source to monitor the Method 1631 results in the ng/L concentration range. The round robin is utilized in addition to PT studies because a PT study is not currently available with mercury present at ng/L concentrations.

b) Use of certified reference materials where applicable.

10.3 Managerial Review

At least once per year, laboratory management conducts a review of the quality system to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements in the quality system and laboratory operations. The review takes account of reports from managerial and supervisory personnel, the outcome of recent internal audits, assessments by external bodies, the results of proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, corrective actions and other relevant factors. Documentation of the Management Review Meeting is maintained on file by the QA Officer.

11.0 FACILITIES, EQUIPMENT, REAGENTS, AND PREVENTATIVE MAINTENANCE

11.1 Equipment and Reference Materials

A listing of laboratory instrumentation is provided in Appendix F.

Records are maintained for all major equipment and all reference materials significant to the tests performed. These records include documentation on all routine and non-routine maintenance activities and reference material verifications.

The records include:
1) the name of the equipment;
2) the manufacturer's name, model identification, and serial number or other unique identification;
3) date received and date placed in service (if available);
4) current location, where appropriate;
5) if available, condition when received (e.g. new, used, reconditioned);
6) copy of the manufacturer's instructions, where available;
7) dates and results of calibrations;
8) details of maintenance carried out to date and planned for the future; and
9) history of any damage, malfunction, modification or repair.

11.1.1 Glassware Cleaning

Glassware is cleaned to meet the sensitivity of the method. Laboratory SOPs are available for cleaning glassware for each type of analysis performed in the laboratory, i.e. metals, semivolatile organics, volatile organics, wet chemistry. The SOP for each type of glassware must be posted in the immediate area in which the glassware is cleaned.

11.2 Documentation and Labeling of Standards and Reagents

Records shall be kept for all standards, including the manufacturer/vendor, the manufacturer's Certificate of Analysis or purity (if supplied), the date of receipt, recommended storage conditions, and an expiration date. Standards, which have aged beyond the stated expiration date, must be clearly labeled as expired and cannot be used for reportable analyses. Bound logbooks are maintained to document reagent and

standard preparation. These records indicate traceability to purchased stocks or neat compounds, a description of reference to the method of preparation, date of preparation, expiration date and preparer's initials. This requirement is documented in SOP LAB-22.

Original containers provided by the vendor are labeled with an expiration date if one does not exist.

All containers of prepared reagents and standards shall bear a unique identifier and expiration date and are linked to the documentation requirements above.

1) Reagents - In methods where the purity of reagents is not specified, analytical reagent grade shall be used. Reagents must meet the minimum purity requirements specified by the method. For items that are not routinely ordered, the labels on the containers are checked to verify that the purity of the reagents meets the requirements of the particular method. Manufacturer lot numbers of all solvents and reagents are recorded in preparation logbooks

2) Water - The quality of reagent water sources is monitored and documented to meet method specified requirements. The specific tests performed to verify reagent water acceptability are documented in laboratory SOP LAB-15.

11.3 Computers and Electronic Data Related Requirements

Where computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of test data:

- Computer software is documented to be adequate for use.
- Procedures are established and implemented for protecting the integrity of data.
- Computer and automated equipment are maintained to ensure proper functioning.
- Appropriate procedures are used for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records. This includes the use of passwords and security levels for all staff. The security of the computer systems is the responsibility of the system administrator.

11.4 Preventative Maintenance

Preventive maintenance is performed to ensure proper instrument and equipment performance and to minimize the occurrence of instrument and equipment failure during use. Factors considered when scheduling or performing preventive maintenance include: instrument type, equipment and parts that are subject to wear, deterioration or other changes in operational characteristics, spare parts that should be available to minimize downtime, and the frequency that maintenance is required. Maintenance must be performed when instrument performance begins to deteriorate as made evident by calibration failure, loss of sensitivity, or failure to meet quality control criteria.

Major equipment in the laboratory may either be covered under manufacturer service contacts or serviced by trained EnChem staff. Manufacturer service technicians or EnChem staff performs periodic preventive maintenance. The analyst responsible for the instrument performs daily or routine preventive maintenance. Group leaders and section supervisors will monitor this activity. An adequate supply of consumable parts and hardware will be maintained to ensure continued instrument operation.

11.4.1 Documentation of Preventative Maintenance

Each instrument will have a maintenance log that is kept by the instrument. All maintenance must be documented. This includes maintenance performed by instrument manufacturer, and service technicians, as well as routine maintenance performed by the analyst. The analyst shall be responsible for maintaining documentation. The record of maintenance will note any parts replaced as well as observations made.

11.5 Inspection/Acceptance Requirements for Supplies and Consumables

Labels indicating the following information on receipt and testing shall be used for critical supplies and consumables.

- Unique identification number (if not clearly shown).
- Date received.
- Date opened.
- Expiration date.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO EVALUATE DATA QUALITY

Quality control acceptance criteria are used to determine the validity of the data based on the analysis of internal quality control check (QC) samples (see Section 8.0). The specific QC samples and acceptance criteria are found in the laboratory Quality Control literature. Typically, acceptance criteria are based on published EPA methods for analysis where there is insufficient data to generate limits. In cases where specific control criteria are required by a method, these control limits are used in leu of generating in-house control limits.

Acceptance criteria for bias are based on the historical mean recovery plus or minus three standard deviation units, and acceptance criteria for precision range from zero (no difference between duplicate control samples) to the historical mean relative percent difference plus three standard deviation units.

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

Many published EPA methods do not contain recommended acceptance criteria for QC sample results. Where no criteria exist, the laboratory uses acceptance criteria established by management policy. In these situations, EnChem uses the following as interim acceptance criteria for recoveries of spiked analytes until in-house limits are developed :

Analysis	LCS/LCSD Targets % Recovery	LCS/LCSD Targets %RPD	MS/MSD Targets % Recovery	MS/MSD Targets %RPD
Metals	80-120	20	75-125 [1]	20 [1]
Wet Chemistry	80-120	20	75-125	20
Volatile Organics	70-130	40	70-130	40
Volatile Gases	50-150	50	50-150	50
Base/neutrals	50-130	40	50-150	40
Acids	20-140	40	20-120	40
Organochlorine Pesticides/PCBs	50-140	40	50-140	40

The above limits apply to all matricies.
1 Also used for Biota LCS.

A listing of control limits currently in use by the laboratory is available upon request.

12.1 Laboratory Control Samples

A laboratory control sample (LCS) is analyzed with each batch of samples to verify that the accuracy of the analytical process is within the expected performance of the method. The results of the laboratory control sample are compared to acceptance criteria to determine usability of the data. Data generated with LCS samples that fall outside the established acceptance criteria are judged to be out-of-control. These data are considered suspect and the corresponding samples are reanalyzed or reported with qualifiers.

12.2 Matrix Spikes/Matrix Spike Duplicates

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

12.3 Surrogate Recoveries

Surrogates are exclusively used in organic analyses. Surrogate recovery data from individual samples are compared to surrogate recovery acceptance criteria in the laboratory's Quality Control literature. Samples which fall outside of established control limits are reextracted/reanalyzed, if sample is available, to verify the failure is matrix related. If a matrix effect is confirmed, or reextraction/reanalysis was not possible, the sample results will be qualified.

For sample extracts which are diluted, the surrogate will not be evaluated if the dilution causes the surrogate concentration in the extract to be below the lowest point in the initial calibration. In these cases, the percent recovery will be qualified with a 'D' qualifier and no corrective action required.

12.4 Method Blanks

For a method blank to be acceptable, the concentration shall not be higher than the highest of the following:

- The method detection limit, or
- Five percent of the regulatory limit of concern for that analyte, or
- Five percent of the measured concentraion in a particular sample of interest.

Each sample in the affected batch is assessed against the above criteria to determine if the sample results are acceptable. Any sample associated with an unacceptable blank is reprocessed for analysis or, if reprocessing is not an alternative, the results are reported with appropriate data qualifying codes.

13.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable performance or out of control QC results that can affect data quality. All out-of-control situations or deviations from SOP must be documented on a nonconformance memo. All EnChem employees are responsible for initiating a nonconformance memo for any situation that deviates from laboratory practice or SOP. Laboratory SOP GEN-15 explains documentation, responsibilities and filing of nonconformance memos.

Nonconformances that may occur during sample receiving review include the following:

- Incomplete/missing sample documentation.
- Unacceptable sample condition.
- Samples received after expiration of sample holding times.
- Improper sample storage.
- Any other situation that might affect data quality.

Nonconformances that may occur during laboratory analysis include the following:

- Instrument failures/problems.
- Incomplete/missing sample documentation.
- Exceeding sample holding times.
- Incorrect sample preparation.
- Wrong analysis method/procedure.
- QC data (blank, spike, duplicate, surrogates, etc.) outside acceptance limits.
- Calibration requirements not met.
- Data recording, transcription or validation errors.
- Any other situation that might affect data quality.

The QA Officer or the Technical Director is responsible for approval of the corrective action on the nonconformance memo. The QA Officer will ensure implementation and documentation of the corrective action.

Corrective actions are performed prior to release of the data from the laboratory. If necessary, a narrative will be provided in the final laboratory report.

13.1 Resolution of Client Complaints

Where a complaint, or any other circumstance, raises doubt concerning the laboratory's compliance with the laboratory's policies or procedures, or with the quality of the laboratory's tests, the laboratory shall ensure that those areas of activity and responsibility involved are promptly audited. Records of the complaint and subsequent actions are maintained in the project file. The laboratory procedure for resolution of client complaints is documented in SOP Gen-29.

14.0 SUBCONTRACTING AND SUPPORT SERVICES AND SUPPLIES

14.1 Subcontracting Laboratory Services

EnChem clients shall be advised prior to any analyses being subcontracted to another laboratory. Any subcontracted work is placed with another properly accredited laboratory, where required, for the tests to be performed. Procedures for subcontracting analyses are documented in laboratory SOP G1-REC-4. The following records of all subcontracted analyses are maintained:

- a copy of the subcontracted laboratory's scope or statement of accreditation;
- a copy of the report from the subcontracted laboratory; and
- the notice to the client.

14.2 Outside Support Services and Supplies

EnChem, Inc. uses only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests. Records of suppliers for support services or supplies required for tests are maintained.

15.0 REFERENCES

NELAC Standards, Approved May 2001 Effective July 2003

Example NELAC Quality Manual, Catalyst Information Resources, L.L.C., Evergreen, CO

Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, US EPA, Washington, DC 20460.

RCRA QAPP Instructions, US EPA Region 5, Revision: April 1998

ASTM D-5283-92. Generation of Environmental Data Related to Waste Management Activities: Quality assurance and Quality Control Planning and Implementation.

"American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)", 1994

EPA 2185 - Good Automated Laboratory Practices, 1995

ISO/IEC Guide 25: 1990. General requirements for the competence of calibration and testing laboratories.

QA/R-2: EPA Requirements for Quality Management Plans, August, 1994

QA/G-4: Guidance for the Data Quality Objectives Process, EPA/600/R-96/055, September, 1994

QA/R-5: EPA Requirements for Quality Assurance Project Plans, Draft - November 1997

QA/G-5: Guidance on Quality Assurance Project Plans, EPA/600/R-98/018, February, 1998

QA/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations, EPA/600/R-96/027, November, 1995

QA/G-9: Guidance for the Data Quality Assessment: Practical Methods for Data Analysis, EPA/600/R-96/084 , January, 1998

Manual for the Certification of Laboratories Analyzing Drinking Water, EPA/570/9-90/008

APPENDIX A

NELAC CERTIFICATION STATEMENT

APPENDIX A: CERTIFICATION STATEMENT

NELAC CERTIFICATION STATEMENT

The applicant understands and acknowledges that En Chem, Inc, is required to be continually in compliance with the National Environmental Laboratory Accreditation Conference (NELAC) standards and shall be subject to the penalty provisions provided therein.

I hereby certify that I am authorized as an approved signatory for applications, SOPs, reports, and the Quality Manual on behalf of the applicant/owner and that there are no intentional misrepresentations.

En Chem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

_____	Glen Coder	_____
Signature	Laboratory Director	Date
_____	Julie A. Trivedi	_____
Signature	Quality Assurance Officer	Date
_____	Steve Heraly	_____
Signature	Technical Director	Date
_____	Andi Wolf	_____
Signature	Technical Director	Date
_____	Art Lautenbach	_____
Signature	Technical Director	Date

APPENDIX B

INITIAL DEMONSTRATION OF CAPABILITY/ CERTIFICATION STATEMENT

APPENDIX B: INITIAL DEMONSTRATION OF CAPABILITY

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

All demonstrations are documented using the form in this appendix.

A demonstration of capability consists of one or more of the following:

1. successful performance of 4 spiked replicates as outlined below in steps a-f;
2. successful performance of a PT sample;
3. successful analysis of duplicate samples: or
4. hands-on training to the satisfaction of a supervisor or other trained employee.

To perform 4 spiked replicates, the following steps are performed:

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

b) The analyte(s) are diluted in, or spiked into, a volume of clean matrix sufficient to prepare four aliquots at a concentration approximately 10 times the method detection limit.

c) The four aliquots are prepared and analyzed according to the test method either concurrently or over a period of days.

d) Using the four results, the mean recovery x and the sample standard deviation (s) of the set (n-1) is calculated for each parameter of interest.

e) For each parameter, s and x are compared to the corresponding acceptance criteria for precision and accuracy in the method (if applicable) or laboratory-generated acceptance criteria (if there is no criteria listed in the method). If all parameters meet the acceptance criteria, the analysis of actual samples may begin. If any one of the parameters exceeds the acceptance range, the performance is unacceptable for that parameter.

f) When one or more of the tested parameters fail at least one of the acceptance criteria, the laboratory repeats the test for all parameters that failed to meet criteria. If repeated failure occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with c).

Demonstration of Capability
Certification Statement

Date:
Laboratory Name: **EnChem, Inc.**
Laboratory Address: **1090 Kennedy Avenue, Kimberly, WI 54136**

Analyst Name:
Matrix: Reagent Water **x** Ottowa Sand ___ Biota ___
Method/Parameter:

We, the undersigned, CERTIFY that:

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

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

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

4. The data associated with the demonstration of capability are true, accurate, complete and self-explanatory. (1)

5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors.

Technical Director	Signature	Date
Julie A Trivedi Quality Assurance Officer	Signature	Date

(1) True: Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices.
Complete: Includes the results of all supporting performance testing.

Self-Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanation.

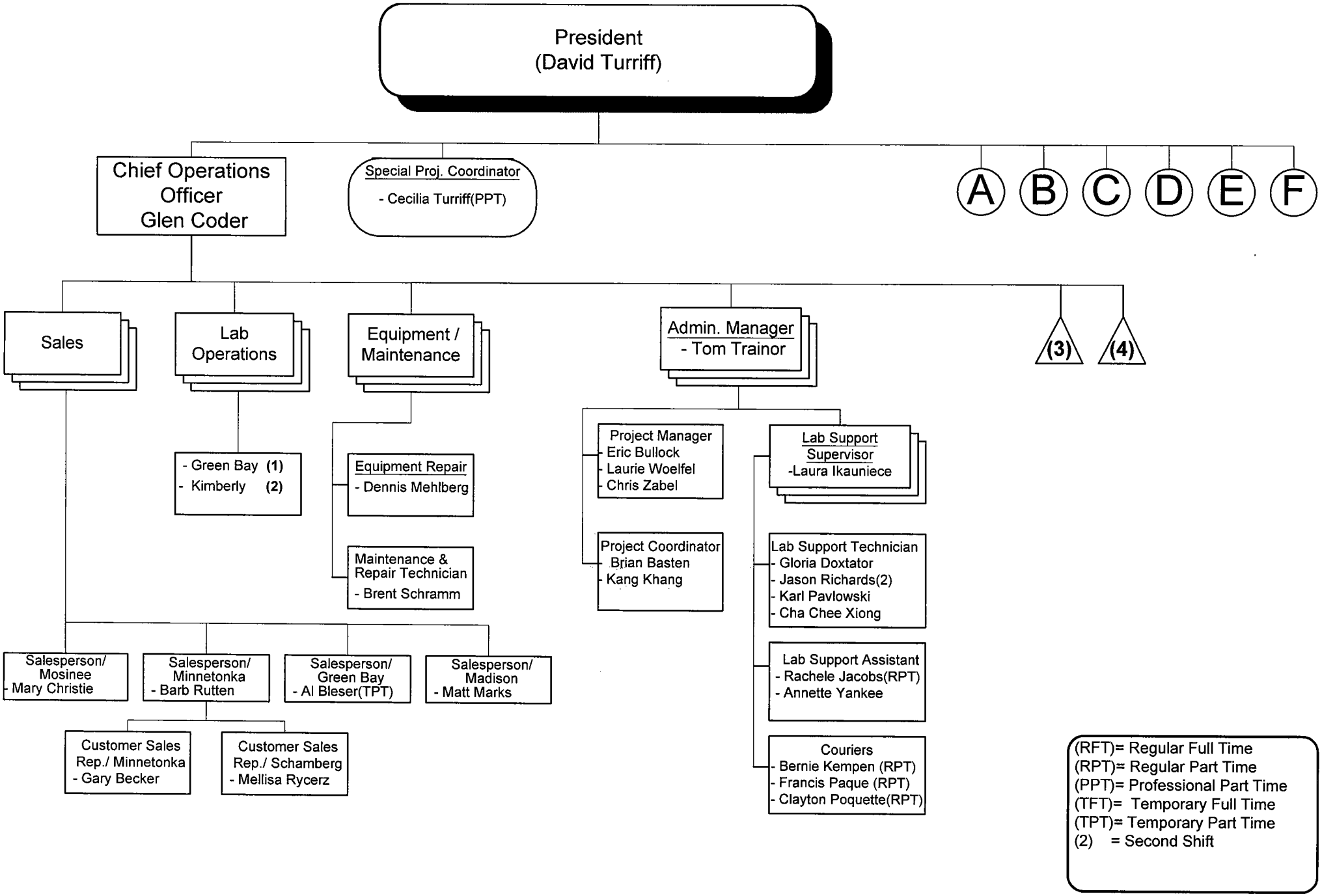
APPENDIX C

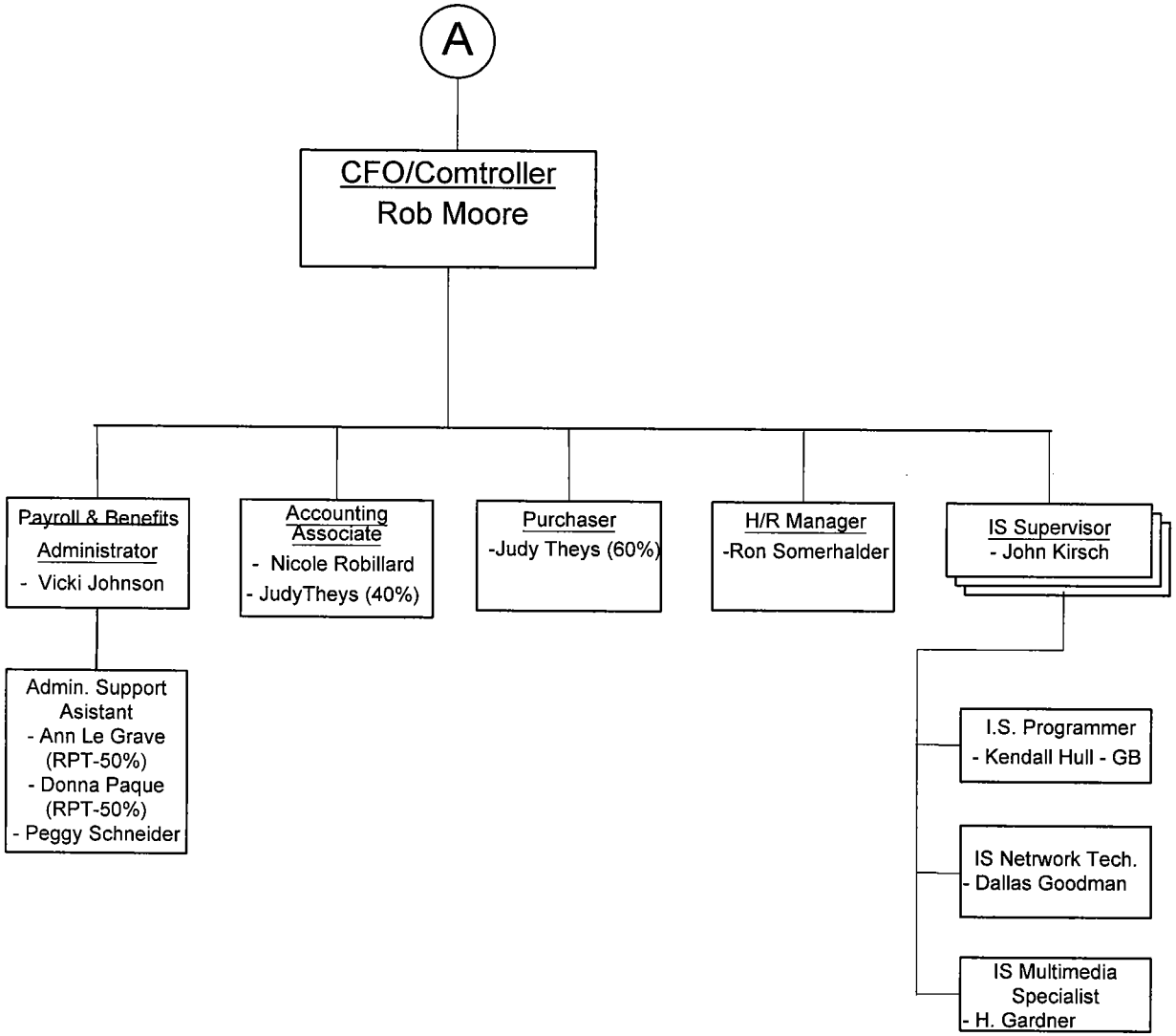
ORGANIZATIONAL CHARTS

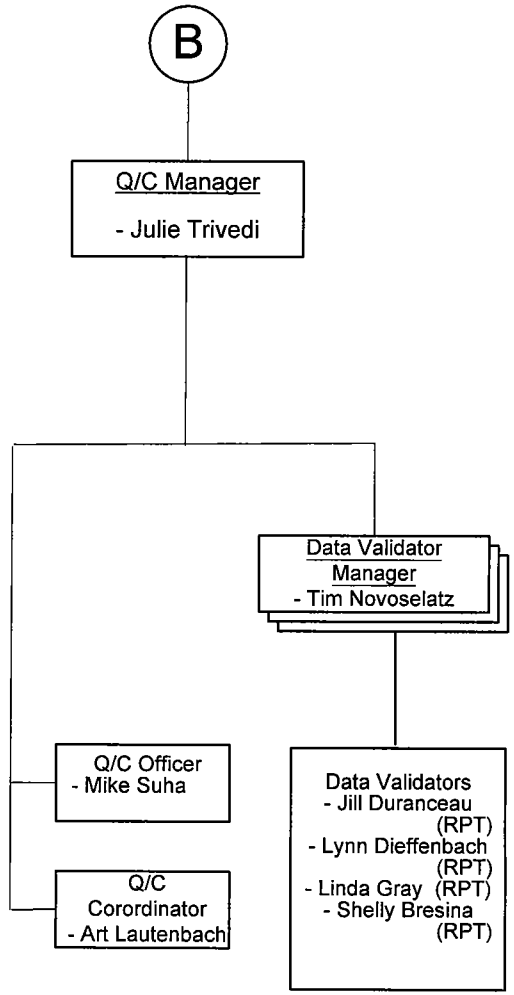
En Chem Organizational Reporting Structure

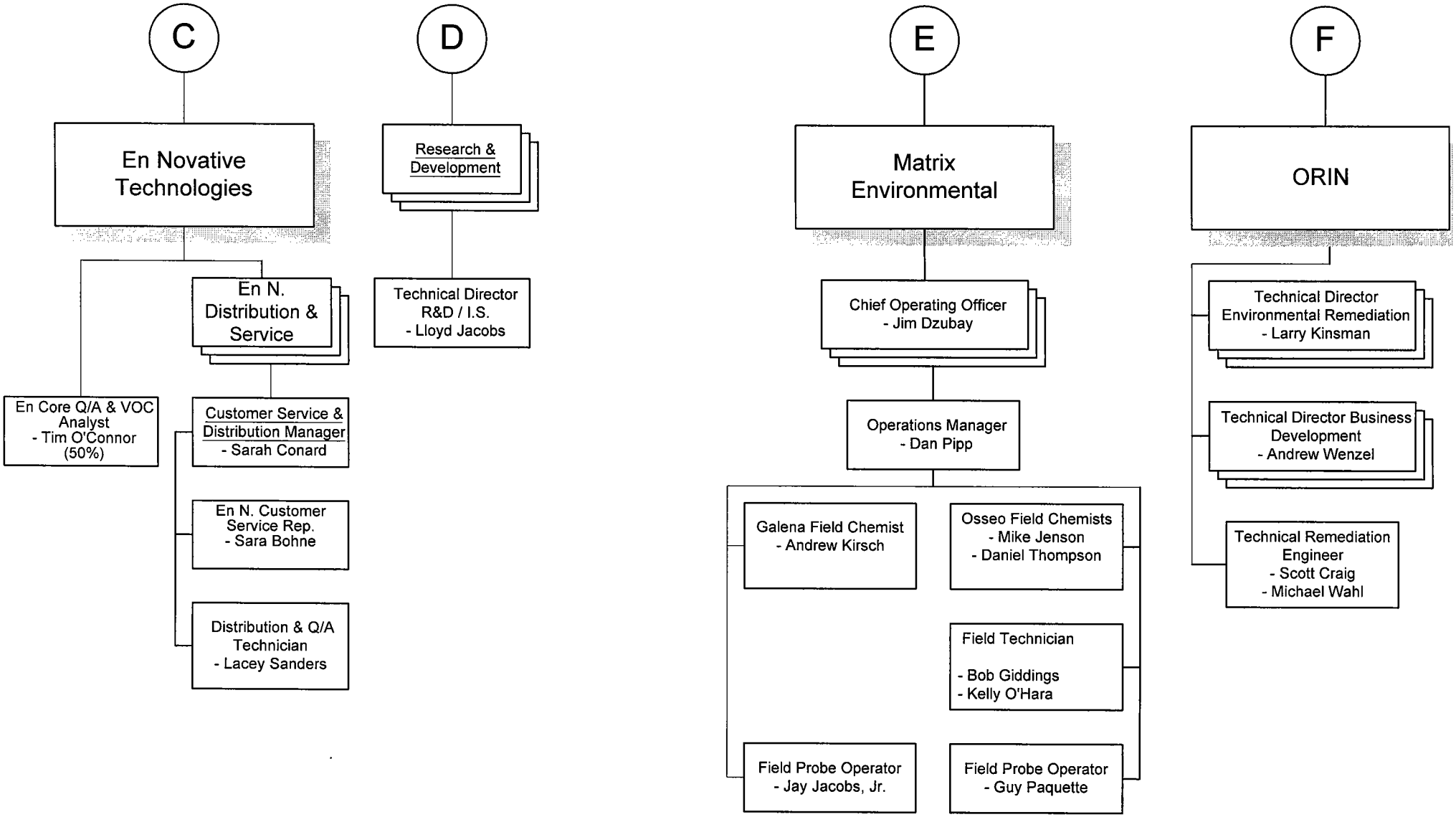
Work Units / Titles / Employees

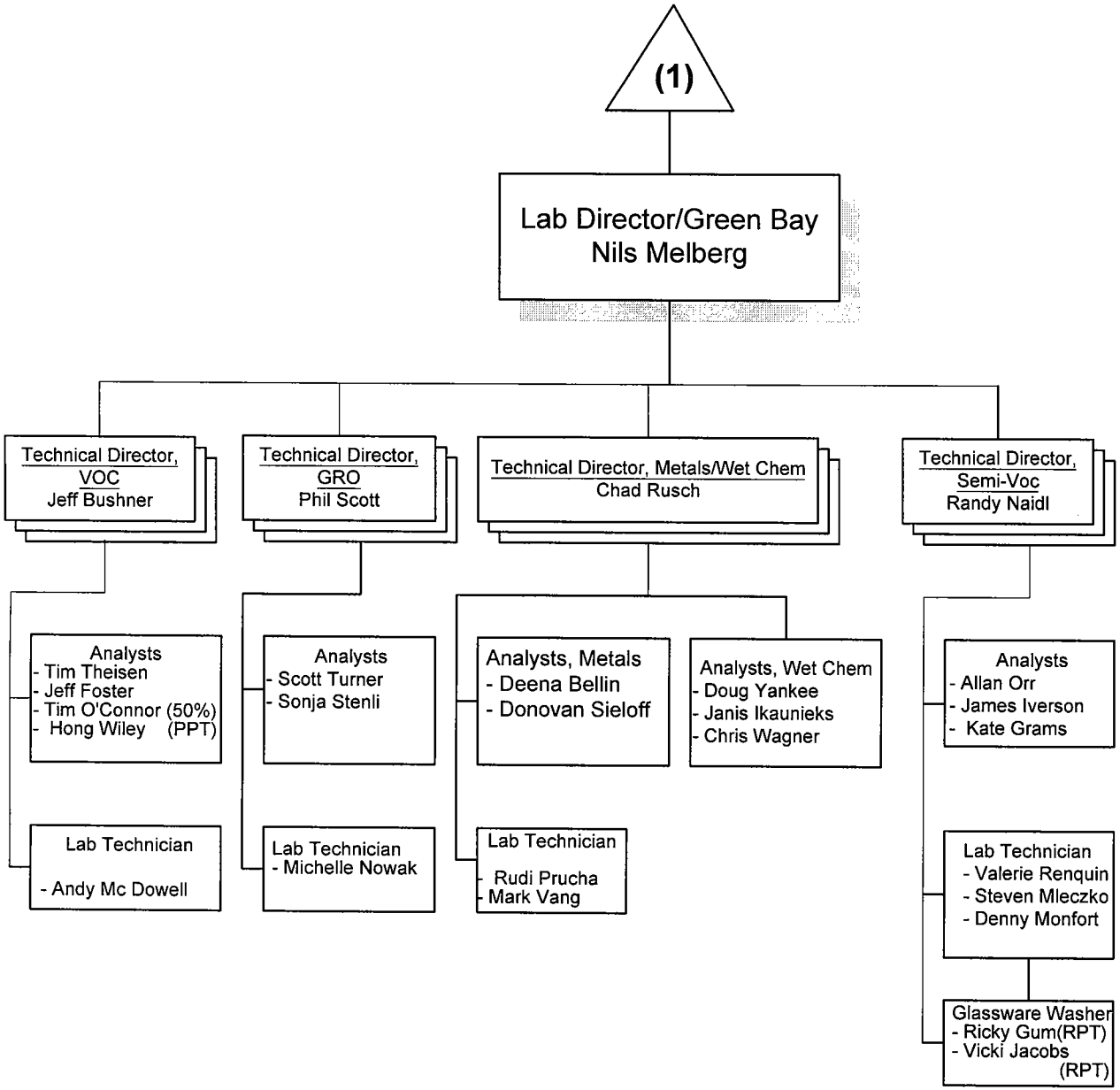
April 01, 2003

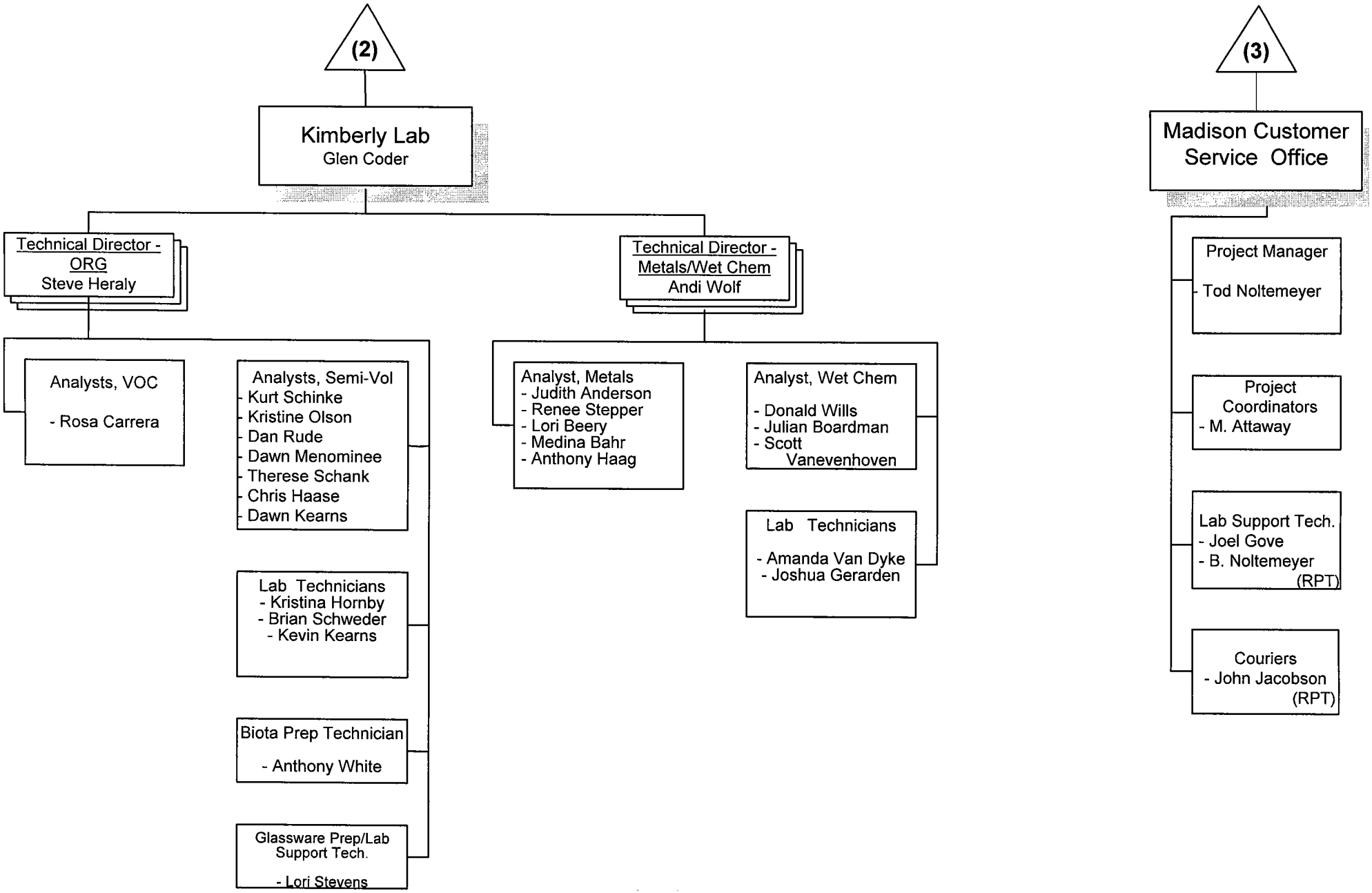


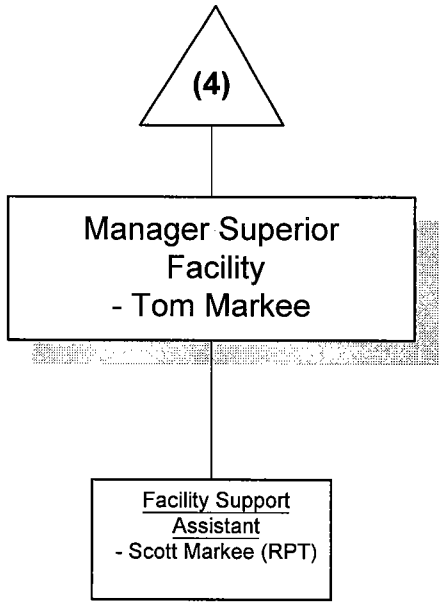

A
CFO/Comtroller
Rob Moore
Payroll & Benefits Administrator
- Vicki Johnson
Admin. Support Asistant
- Ann Le Grave (RPT-50%)
- Donna Paque (RPT-50%)
- Peggy Schneider
Accounting Associate
- Nicole Robillard
- JudyTheys (40%)
Purchaser
-Judy Theys (60%)
H/R Manager
-Ron Somerhalder
IS Supervisor
- John Kirsch
I.S. Programmer
- Kendall Hull - GB
IS Network Tech.
- Dallas Goodman
IS Multimedia Specialist
- H. Gardner


B
Q/C Manager
- Julie Trivedi
Q/C Officer
- Mike Suha
Q/C Corordinator
- Art Lautenbach
Data Validator Manager
- Tim Novoselatz
Data Validators
- Jill Duranceau (RPT)
- Lynn Dieffenbach (RPT)
- Linda Gray (RPT)
- Shelly Bresina (RPT)


C
En Novative Technologies
En N. Distribution & Service
En Core Q/A & VOC Analyst - Tim O'Connor (50%)
Customer Service & Distribution Manager - Sarah Conard
En N. Customer Service Rep. - Sara Bohne
Distribution & Q/A Technician - Lacey Sanders
D
Research & Development
Technical Director R&D / I.S. - Lloyd Jacobs
E
Matrix Environmental
Chief Operating Officer - Jim Dzubay
Operations Manager - Dan Pipp
Galena Field Chemist - Andrew Kirsch
Osseo Field Chemists - Mike Jenson - Daniel Thompson
Field Technician - Bob Giddings - Kelly O'Hara
Field Probe Operator - Jay Jacobs, Jr.
Field Probe Operator - Guy Paquette
F
ORIN
Technical Director Environmental Remediation - Larry Kinsman
Technical Director Business Development - Andrew Wenzel
Technical Remediation Engineer - Scott Craig - Michael Wahl


(1)
Lab Director/Green Bay
Nils Melberg
Technical Director, VOC
Jeff Bushner
Technical Director, GRO
Phil Scott
Technical Director, Metals/Wet Chem
Chad Rusch
Technical Director, Semi-Voc
Randy Naidl
Analysts
- Tim Theisen
- Jeff Foster
- Tim O'Connor (50%)
- Hong Wiley (PPT)
Lab Technician
- Andy Mc Dowell
Analysts
- Scott Turner
- Sonja Stenli
Lab Technician
- Michelle Nowak
Analysts, Metals
- Deena Bellin
- Donovan Sieloff
Analysts, Wet Chem
- Doug Yankee
- Janis Ikaunieks
- Chris Wagner
Lab Technician
- Rudi Prucha
- Mark Vang
Analysts
- Allan Orr
- James Iverson
- Kate Grams
Lab Technician
- Valerie Renquin
- Steven Mleczko
- Denny Monfort
Glassware Washer
- Ricky Gum(RPT)
- Vicki Jacobs (RPT)


(2)
Kimberly Lab
Glen Coder
Technical Director - ORG
Steve Heraly
Analysts, VOC
- Rosa Carrera
Analysts, Semi-Vol
- Kurt Schinke
- Kristine Olson
- Dan Rude
- Dawn Menominee
- Therese Schank
- Chris Haase
- Dawn Kearns
Lab Technicians
- Kristina Hornby
- Brian Schweder
- Kevin Kearns
Biota Prep Technician
- Anthony White
Glassware Prep/Lab Support Tech.
- Lori Stevens
Technical Director - Metals/Wet Chem
Andi Wolf
Analyst, Metals
- Judith Anderson
- Renee Stepper
- Lori Beery
- Medina Bahr
- Anthony Haag
Analyst, Wet Chem
- Donald Wills
- Julian Boardman
- Scott Vanevenhoven
Lab Technicians
- Amanda Van Dyke
- Joshua Gerarden
(3)
Madison Customer Service Office
Project Manager
- Tod Noltemeyer
Project Coordinators
- M. Attaway
Lab Support Tech.
- Joel Gove
- B. Noltemeyer (RPT)
Couriers
- John Jacobson (RPT)


(4)
Manager Superior Facility
- Tom Markee
Facility Support Assistant
- Scott Markee (RPT)

APPENDIX D

PERSONNEL SUMMARY

ADMINISTRATION

Name	Title	Degree	Years Experience	Location
Michelle Attaway	Project Coordinator	HS	3	Green Bay
Brian Basten	Project Coordinator	HS+	6	Green Bay
Eric Bullock	Project Manager	BS Environmental Science	4	Green Bay
Glen Coder	Lab Manager	BA Communication	14	Kimberly
Kang Khang	Project Coordinator	HS	<1	Green Bay
Tod Noltemeyer	Project Manager	BS Biology	16	Madison
Tom Trainor	Lead Project Manager	BS Chemical Engineering	14	Green Bay
Laurie Woelfel	Project Manager	HS+	14	Green Bay
Christopher Zabel	Project Manager	BS Environmental Policy	7	Green Bay

QUALITY ASSURANCE

Name	Title	Degree	Years Experience	Location
Shelly Bresina	QA Auditor	BS Biology	6	Madison
Lynn Dieffenbach	QA Auditor	BS Zoology	13	Madison
Jill Duranceau	QA Auditor	BS Forestry	14	Green Bay
Linda Gray	QA Auditor	BS Biology	13	Chicago
Tim Novoselatz	Data Validation Manager	BS Environmental Science	8	Green Bay
Julie Trivedi	QA Officer	BS Biochemistry	13	Kimberly

INSTRUMENTATION SERVICE

Name	Title	Degree	Years Experience	Location
Dennis Mehlberg	Instrument Technician	BS Chemistry	12	Green Bay
Brent Schramm	Instrument Technician	HS+	1	Green Bay

SALES

Name	Title	Degree	Years Experience	Location
Mary Christie	Sales Agent	BS Chemistry	20	Mosinee
Matt Marks	Sales Agent	BS Chemistry	32	Madison
Barb Rutten	Sales Agent	HS+	24	Minneapolis
Melissa Rycerz	Sales Agent	BS Environmental Biology	1	Chicago

INFORMATION SYSTEMS

Name	Title	Degree	Years Experience	Location
Heather Gardner	IS Multimedia Specialist	BA Journalism	6	Madison
Dallas Goodman	IS Network Technician	BS Computer Information Systems	4	Green Bay
Kendall Hull	IS Programmer	MS Paper Science	3	Green Bay
Lloyd Jacobs	MIS Technician	HS+	28	Green Bay
John Kirsch	IS Manager	CIS Network Specialist	4	Green Bay

SAMPLE RECEIVING

Name	Title	Degree	Years Experience	Location
Gloria Doxtator	Custodian	HS	13	Green Bay
Joel Gove	Custodian	BA Anthropology	3	Madison
Laura Ikauniece	Senior Custodian	BS Chemistry Technology	4	Green Bay
Jason Richards	Custodian	BA Biology	1	Green Bay
Lori Stevens	Custodian	BS Environmental Sciences	<1	Kimberly

ORGANICS

Steve Heraly	Supervisor	BS Chemistry	15	Kimberly

SEMIVOLATILES

Name	Title	Degree	Years Experience	Location
Christopher Haase	Laboratory Analyst	BS Water Resources	5	Kimberly
Kris Hornby	Laboratory Analyst	AS Environmental Chemistry	4	Kimberly
Dawn Kearns	Laboratory Analyst	BS Environmental Sciences	4	Kimberly

Name	Title	Degree	Years Experience	Location
Kevin Kearns	Laboratory Analyst	HS+	<1	Kimberly
Dawn Menominee	Laboratory Analyst	BS Chemistry	14	Kimberly
Kristen Olson	Laboratory Analyst	BS Cell Biology	8	Kimberly
Dan Rude	Laboratory Analyst	BS Chemistry	18	Kimberly
Therese Schank	Laboratory Analyst	BS Zoology	13	Kimberly
Kurt Schinke	Laboratory Analyst	HS+	12	Kimberly
Brian Schweder	Laboratory Analyst	BS Water Resources	1	Kimberly
Anthony White	Laboratory Technician	HS+	1	Kimberly
VOLATILES				
Name	**Title**	**Degree**	**Years Experience**	**Location**
Rosa Carrera	Laboratory Analyst	MS Bacteriology	4	Kimberly
INORGANICS				
Andi Wolf	Supervisor	BS Biology	4	Kimberly
WET CHEMISTRY				
Name	**Title**	**Degree**	**Years Experience**	**Location**
Julian Boardman	Laboratory Analyst	BA Chemistry	4	Kimberly
Josh Gerarden	Laboratory Analyst	HS	<1	Kimberly
Anthony Haag	Laboratory Analyst	BS Chemistry	3	Kimberly
Amanda Van Dyke	Laboratory Analyst	BS Biology	1	Kimberly
Scott VanEvenhoven	Laboratory Technician	BS Environmental Sciences	4	Kimberly
Donald Wills	Laboratory Analyst	AS Water Chemistry	13	Kimberly
METALS				
Name	**Title**	**Degree**	**Years Experience**	**Location**
Judith Anderson	Laboratory Analyst	BA Chemistry	10	Kimberly
Medina Bahr	Laboratory Analyst	BS Biology	9	Kimberly
Lori Berry	Laboratory Analyst	BS Chemistry	10	Kimberly
Renee Stepper	Laboratory Analyst	BS Chemistry	5	Kimberly

APPENDIX E

LABORATORY CAPABILITIES

APPENDIX E
LABORATORY CAPABILITIES

ANALYTE/PARAMETER TECHNIQUE METHOD REFERENCE ENCHEM SOP

Wet Chemistry

		EPA-600	SW-846		Matrix
Acid Volatile Sulfides + SEM		Draft EPA 1629		WCM-63	S
Acidity as $CaCO_3$	Titrimetric	305.1	-----	WCM-16	W
Acidity (Free) as $CaCO_3$	Titrimetric	305.1M	-----	WCM-57	W
Alkalinity as $CaCO_3$	LACHAT	310.2	-----	WCM-28	W
Alkalinity, bicarb/carb as $CaCO_3$	Titrimetric	SM 2320B	-----	WCM-13	W
Ash, total	Gravimetric	160.4	-----	WCM-10	W,S
Bromide	I.C.	300.0	9056	WCM-50	W
Cation/Anion Balance					
Chloride	LACHAT	325.2	9251	WCM-19	W,S
Chloride	I.C.	300.0	9056	WCM-60	W
COD (mid)	Colorimetric	410.4	-----	WCM-40	W
Conductance, specific		120.1	9050A	WCM-17	W
Cyanide, amenable		335.1/335.4	9010B	WCM-35	W,S
Cyanide, reactive	LACHAT	-----	7.3.3.2	WCM-23	W,S
Cyanide, total	LACHAT	335.4	9012A	WCM-23	W,S
Cyanide, weak and dissociable		SM 4500CN	-----	WCM-34	W,S
Fluoride	I.C.	300.0	9056	WCM-60	W
Fraction Organic Carbon	Gravimetric	ASTM 2974-87	ASTM2974-87		W,S
Nitrogen, ammonia	LACHAT	350.1	-----	WCM-58	W,S
Nitrogen, nitrate	Calculated	353.2	-----	WCM-33	W,S
Nitrogen, nitrate	I.C.	300.0	9056	WCM-60	W
Nitrogen, nitrate + nitrite	LACHAT	353.2	-----	WCM-33	W,S
Nitrogen, nitrite	I.C.	300.0	9056	WCM-60	W
Nitrogen, nitrite	LACHAT	353.2	-----		W,S
Nitrogen, organic	Calculated	350.1/351.2	-----	WCM-64	W,S
Nitrogen, Total	Calculated	351.2/353.2			
Nitrogen, total Kjeldahl	LACHAT	351.2	-----	WCM-64	W,S
Oil and Grease	Gravimetric	1664	-----	WCM-4	W
PH	pH Probe	150.1	9040B/9045C	WCM-54	W,S
Phenolics, total recoverable	LACHAT	420.4	9065	WCM-8	W,S
Phosphorus, total		365.4	-----	WCM-44	W,S
Solids, total	Gravimetric	160.3	-----	WCM-10	S
Solids, total dissolved	Gravimetric	160.1	-----	WCM-11	W
Solids, total suspended	Gravimetric	160.2	-----	WCM-1	W
Solids, total volatile	Gravimetric	160.4	-----	WCM-1	W

EPA-600	EPA-600/4-79-020
MSA	Method of Soil Analysis
SM	Standard Methods for the Examination of Water and Wastewater, 18th Ed.
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Ed.
I.C.	Ion Chromatography
I.S.E.	Ion Selective Electrode

APPENDIX E
LABORATORY CAPABILITIES

ANALYTE/PARAMETER TECHNIQUE METHOD REFERENCE ENCHEM SOP

Wet Chemistry

		EPA-600	SW-846		Matrix
Specific gravity		SM 2710F	-----	WCM-47	W,S
Sulfate	I.C.	300.0	9056	WCM-60	W,S
Sulfide	Titrimetric	376.1	9030B	WCM-21	W
Total organic carbon		-----	9060 M	WCM-9	S
Total organic carbon		415.2/415.1	9060 M	WCM-2	W
Total organic carbon			9060		S
Turbidity		180.1	-----	WCM-24	W

Total Organic Carbon as NPOC for aqueous reporting

Metals Prep

AQUEOUS

	EPA-600	SW-846	
Microwave Digestion	-----	3015 / 7470A	MET-45
Acid Digestion - ICP - Total Metals	200.7	3010A	MET-3
Acid Digestion - ICP or ICPMS - Dissolved or Total Recov. Metals	-----	3005A	MET-2
Acid Digestion - Total Metals [1]	-----	3020A/7761(Ag)	MET-4
Acid Digestion - GFAA - As and Se	-----	7060A/7740	MET-5
Hg Digestion - CVAA	245.1	7470A	MET-30

1: Analysis by GFAA or ICPMS

COMPOSITIONAL

	EPA-600	SW-846	
Microwave Digestion	-----	3051	MET-46
Acid Digestion - ICP, ICPMS or GFAA	-----	3050B	MET-6
Acid Digestion - ICP, ICPMS or GFAA - BIOTA Samples	-----	3050-Modified	MET-59
Acid Digestion - ICP, ICPMS -Ag, Sb	-----	3050B [2]	MET-7
Hg Digestion - CVAA	-----	7471A	MET-31

2: Includes use of option 7.5 of the method.

EPA-600	EPA-600/4-79-020
SM	Standard Methods for the Examination of Water and Wastewater, 18th Ed.
SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd Ed.
I.C.	Ion Chromatography

APPENDIX E
LABORATORY CAPABILITIES

METHOD REFERENCE ENCHEM SOP

Metals Analysis

	EPA-600	SW-846	
ICP - Trace	-----	6010	MET-42
ICP - AES	-----	6010B	MET-27
ICP - MS	200.8	6020	MET-58
GFAA - 5100Z Including: Antimony	-----	7041	MET-15
Arsenic	-----	7060A	MET-21
Cadmium	-----	7131A	MET-20
Chromium	-----	7191	MET-22
Copper	-----	7211	MET-23
Lead	-----	7421	MET-13
Selenium	-----	7740	MET-14
Silver	-----	7761	MET-18
Thallium	-----	7841	MET-16
Dissolved Berrylium	-----	7091	
GFAA – Dissolved As, Be, Cd, Cr, Cu, Pb, Sb, Se, Tl	200.9		
FIMS – Mercury	-----	7470A, 7471A	MET-57
Mercury, Low concentration	1631		
Simultaneously Extracted Metals	EPA Draft 1629		

Metals Analysis - Instrument Operating Procedures

	EPA-600	SW-846	
ICP - AES	200.7	6010B	MET-27
ICP - MS		6020	MET-58
GFAA - 5100Z	-----	7000	MET-10
FIMS - Hg	-----	7470A, 7471A	MET-57

Volatiles Analysis

	EPA-600	SW-846	
Volatile GC/MS Analysis Low Level GC/MS Analysis	-----	524.2	VOA-6
Volatile GC/MS Analysis Waters and Methanol Extracted Solids	USEPA 40 CFR 624	8260B 5035	VOA-5
Volatile GC/MS Analysis Solid matrices	----- -----	8260B 5030B	VOA-9

APPENDIX E
LABORATORY CAPABILITIES

METHOD REFERENCE ENCHEM SOP

SemiVolatile Extractions

AQUEOUS

	EPA-600	SW-846	
Base/ Neutral/ Acids - Water	USEPA 40CFR 625	3510C	SVO-1
Base/ Neutral/ Acids - Continuous Liquid-Liquid Extraction	-----	3520C	SVO-3
Base/ Neutral/ Acids - TCLP	USEPA 57CFR 227	3510C	SVO-2
Organochlorine Pesticides, PCBs, Toxaphene	-----	3510C	SVO-6
Organochlorine Pesticides - TCLP	-----	3510C	SVO-7
Organochlorine Pesticides/PCBs - CLP	-----	USEPA SOW*	SVO-8
Polynuclear Aromatic Hydrocarbons by Selective Ion Monitoring	-----		
Polynuclear Aromatic Hydrocarbons by HPLC	-----	3510B, 3630B	SVO-40

*USEPA Statement of Work for Organics Analysis, Document # OLM03.1
CFR : USEPA Code of Federal Regulations

COMPOSITIONAL

	EPA-600	SW-846	
Base/ Neutral/ Acids - Soil	-----	3550B	SVO-4
Base/ Neutral/ Acids - CLP	-----	USEPA SOW^	SVO-5
Organochlorine Pesticides, PCBs, Toxaphene	-----	3550B	SVO-10
Organochlorine Pesticides/PCBs - CLP	-----	USEPA SOW*	SVO-11
Base/ Neutral/ Acids - Medium Level	-----	3550A	SVO-19
Base/ Neutral/ Acids - Medium Level - CLP	-----	USEPA SOW*	SVO-20
Toxaphene and PCBs - Medium Level	-----	3550A	SVO-21
Polynuclear Aromatic Hydrocarbons by HPLC	-----	3550B	SVO-39
PCB Wipe Samples	-----	3550A	SVO-45
Organochlorine Pesticides, PCBs, Toxaphene - Biological	-----	3540C	SVO-60
Polynuclear Aromatic Hydrocarbons - Biological samples	-----	3540C	SVO-61

^USEPA Statement of Work for Organics Analysis, Document # OLM01.8
*USEPA Statement of Work for Organics Analysis, Document # OLM03.1

APPENDIX E
LABORATORY CAPABILITIES

METHOD REFERENCE ENCHEM SOP

SemiVolatile Analysis

	EPA-600	SW-846	SOP
Toxaphene	-----	8000B, 8081A	SVO-33
Organochlorine Pesticides/PCBs - CLP	-----	USEPA SOW^	SVO-36
Base/ Neutral/ Acids - GC/MS	USEPA 57CFR 625	8000B, 8270C	SVO-37
Base/ Neutral/ Acids - GC/MS - CLP	-----	USEPA SOW^	SVO-38
Polynuclear Aromatic Hydrocarbons by HPLC	-----	8000B, 8310	SVO-41
Polynuclear Aromatic Hydrocarbons by HPLC	USEPA 40CFR 610	-----	SVO-49
Polynuclear Aromatic Hydrocarbons by SIM		8000B, 8270C	
Organochlorine Pesticides - GC	-----	8000B, 8081A	SVO-51
Polychlorinated Biphenyls - GC	-----	8000B, 8082	SVO-52
Lipids Determination - Tissues, Plants, Fats	(Env.Tox.& Chem.*)	(SM5520)	SVO-59
Toxaphene		8000B, 8081A	

^USEPA Statement of Work for Organics Analysis, Document # OLM01.8
CFR : USEPA Code of Federal Regulations
*Evaluation of Selected Lipid Methods for Normalizing Pollutant Bioaccumulation, Environmental Toxicology and Chemistry, Vol 10, 1992
SM: Standard Methods for the Evaluation of Water and Wastewater, 1992

Other Capabilities

CLEANUP

	EPA-600	SW-846	
Florisil Cleanup	-----	USEPA SOW^	SVO-25
Sulfur Cleanup	-----	3660A	SVO-27
Sulfuric Acid Cleanup	-----	3665A	SVO-28
Florisil Cleanup - PCBs	-----	3620B	SVO-57
Silica Gel Cleanup and Separation - Organochlorine Pesticides & PCBs	-----	3630C	SVO-58

^USEPA Statement of Work for Organics Analysis, Document # OLM01.8

APPENDIX F

LABORATORY INSTRUMENT INVENTORY

LABORATORY INSTRUMENTATION

Quantity	Equipment	Manufacturer	Model	Date of Purchase
	BIOTA PREPARATION			
1	Blender	Waring	34BL22	NA
1	Muffle Furnace	American Scientific	FP-41	1988
1	Muffle Furnace	Thermolyne	F6010	NA
1	Oven	VWR	1350FM	NA
1	Meat Grinder	Berkel	E-222	NA
1	Balance	Mettler	PE3600	NA
1	Balance	Mettler	AJ100	NA
	EXTRACTIONS			
1	Recirculating Chiller	Neslab	M150	Jan-03
1	Vacuum Pump	GE	0522	NA
1	Water Bath	Lab-Line	18202	2000
2	Automated Separatory Fun	Lab-Line		Jun-99
1	Water Bath	Precision	183	2000
1	GPC	ABC	1002B	Jan-90
2	GPC	O.I. Analytical	Autoprep 1000	Oct-98
1	Sonicator	Branson	1200	Mar-88
1	Sonicator with horn	Fisher	550	Mar-88
2	Sonicator with horn	Heart Systems		Mar-88
1	Evaporator/Concentrator	Zymark	TurboVap II	Jul-98
	SEMI-VOLATILES			
1	Recirculator	VWR	1136	NA
2	GC	Hewlitt Packard	5890	May-92
1	Mass Selective Detector	Hewlitt Packard	5972	Apr-96
1	Mass Selective Detector	Hewlitt Packard	5972	Jun-96
1	Mass Selective Detector	Hewlitt Packard	5973	Jun-99
1	HPLC	Hewlitt Packard	1046A Detector	Jul-93
1	HPLC	Hewlitt Packard	1090 Series II	Jul-93
1	HPLC Interface	Hewlitt Packard	35900C	Jul-93
6	GC	Hewlitt Packard	5890 Series II	Jun-94
2	GC	Hewlitt Packard	6890	Jan-00
2	GC	Hewlitt Packard	6890	Aug-00
3	Auto-injector Controller	Hewlitt Packard	7673 Controller	May-92
1	Auto-injector Controller	Hewlitt Packard	7673 Controller	Apr-96
4	Auto-injector	Hewlitt Packard	7673 Injector	May-92
4	Auto-injector Tray	Hewlitt Packard	7673 Tray	May-92
3	Auto-injector Controller	Hewlitt Packard	7673A Controller	Jun-96
3	Auto-injector	Hewlitt Packard	7673A Injector	Jun-96
3	Auto-injector Tray	Hewlitt Packard	7673A Tray	Jun-96
2	Auto-injector	Hewlitt Packard	7683 Injector	Jan-00
3	Auto-injector	Hewlitt Packard	7683 Injector	Aug-00
2	Auto-injector Tray	Hewlitt Packard	7683 Tray	Jan-00
3	Auto-injector Tray	Hewlitt Packard	7683 Tray	Aug-00
1	Balance	Sartorius	B310P	NA
1	Sonicator	Fisher	FS20	NA
1	Mixer	Thermolyne	M37615	NA

	Equipment	Manufacturer	Model	Date of Purchase
	VOLATILES			
2	MS Pump	Edwards	E2M2	Jun-96
2	Purge and Trap	Tekmar	3000	1996
1	Autosampler	DynaTech	PTA-30	Jun-93
1	Mass Selective Detector	Hewlitt Packard	5971	Jun-93
1	pH Meter	Corning	320	NA
1	Milli-Q Water System	Millipore		NA
1	Balance	Mettler	PM480	NA
2	GC	Hewlitt Packard	5890 Series II	Jun-96
1	Mass Selective Detector	Hewlitt Packard	5972	Jun-96
1	Ultrasonic Cleaner	Mettler		NA
1	Autosampler	Varian	Archon	Jun-96
	METALS			
	Microwave Digestor	CEM	MARS 5	May-99
	AA-Furnace	Perkin Elmer	4100ZL	May-93
	Autosampler	Perkin Elmer	AS-70	May-93
	EDL Generator	Perkin Elmer	System 2	May-93
	EDL Generator	Perkin Elmer	System 2	May-93
	EDL Generator	Perkin Elmer	System 2	May-93
	EDL Generator	Perkin Elmer	System 2	May-93
1	Balance	Fisher	XL-500	NA
1	ICP	TJA	Trace	Mar-00
1	Autosampler	TJA	AS300	Mar-00
1	Coolflow	NESLAB	CFT-33	NA
2	ICPMS	Hewlitt Packard	G1820	Jan-99, Mar-00
2	Autosampler	Cetac	ASX-500	Jan-99, Mar-00
2	Coolflow	NESLAB	CFT-100	Jan-99, Mar-00
1	ISIS	Hewlitt Packard	G3138A	Jan-99
1	CVAA	Perkin Elmer	FIMS-100	Aug-98
1	AA-Furnace	Perkin Elmer	5100PC	Sep-92
1	Zeeman	Perkin Elmer	Z5100	Sep-92
1	Power supply	Perkin Elmer	HGA600	Sep-92
1	Autosampler	Perkin Elmer	AS-60	Sep-92
1	Coolflow	NESLAB	CFT-33	Sep-92
1	EDLPowerSupply	Perkin Elmer	System 2	Sep-92
1	Control Unit	CPI		NA
2	MOD Block			NA
2	Hot Block	Enviro. Express	SC100	1999
1	Sonicator	Lab-Line	R9333	NA
	WET CHEMISTRY			
1	Balance	A&D	HR-200	NA
1	Balance	Mettler	PM480	NA
1	Balance	Mettler	AJ100	NA
1	Spectrophotometer	Milton Roy	Genesis 5	NA
1	COD Reactor	HACH	45600	NA
1	Cimarec Stirring Hot Plates	Barnstead/Thermolyne		NA
2	Micro Dist	Lachat		Aug-99
1	Vortex Genie 2	VWR	G-560	NA
1	AutoAnalyzer	Lachat	2300-000	May-91

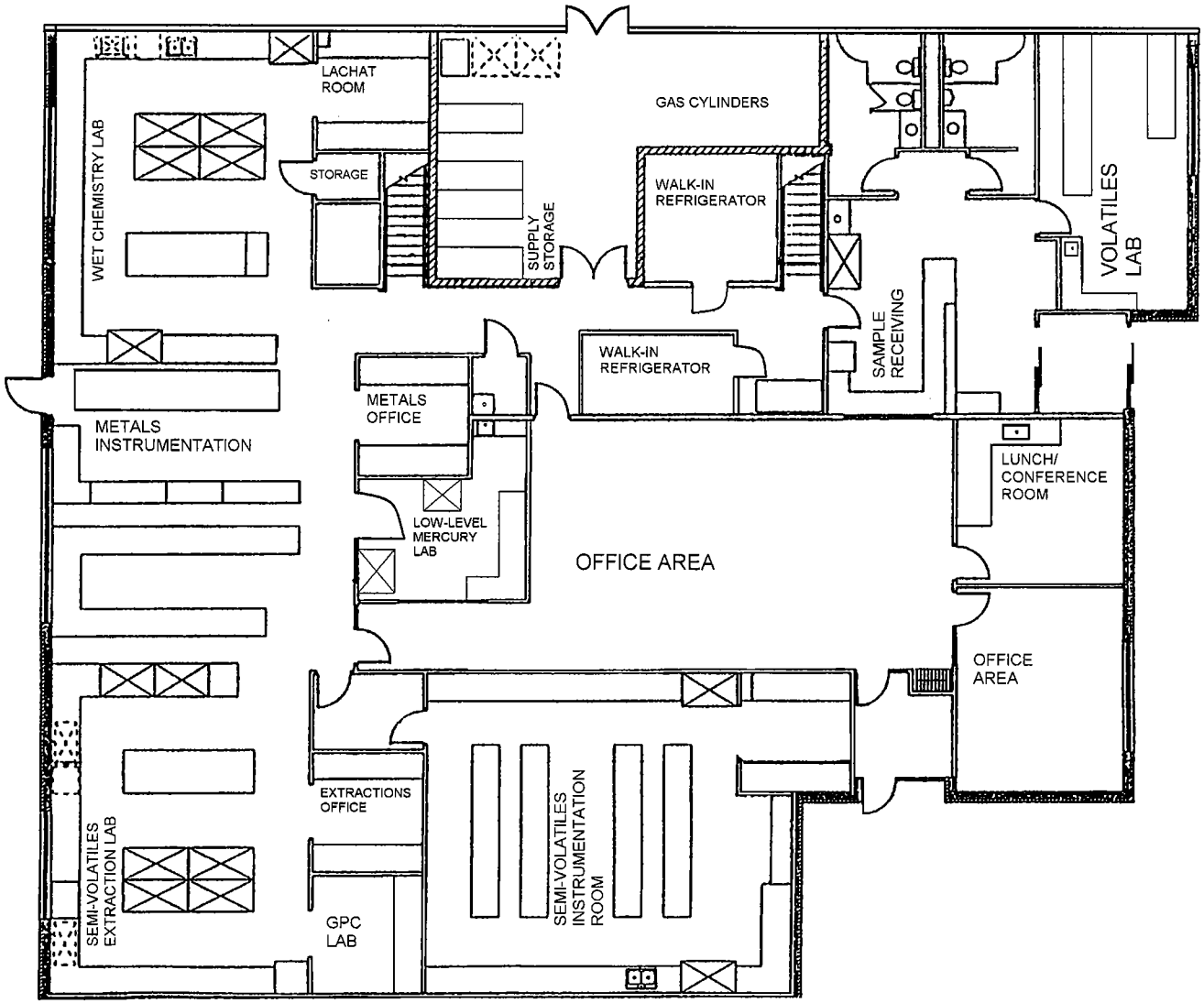
	Equipment	Manufacturer	Model	Date of Purchase
1	Autosampler	Lachat	2100-000	May-91
1	AutoAnalyzer	Lachat		Aug-95
1	Autosampler	Lachat		Aug-95
1	Digestion Block	Westco	40/20	NA
1	Digestion Block	Bran & Lubbe	BD-40	NA
1	pH Meter	Fisher	AB15	NA
1	IC	DIONEX	DX-120	Aug-98
1	Autosampler	DIONEX	AS40	Aug-98
1	Soil TOC Oven	Dohrmann	183 S/SS	NA
1	Carbon Analyzer	Dohrmann	DC-80	NA
1	TOC Detector	Horiba		Sep-88
1	TOC Boatsampler	Rosemount/Dohrmann	832-386	Sep-88
1	Autosampler	Loamer	STS-800	Aug-99
1	Carbon Analyzer	Tekmar/Dohrmann	Apollo9000	Aug-99

NA=Not Available

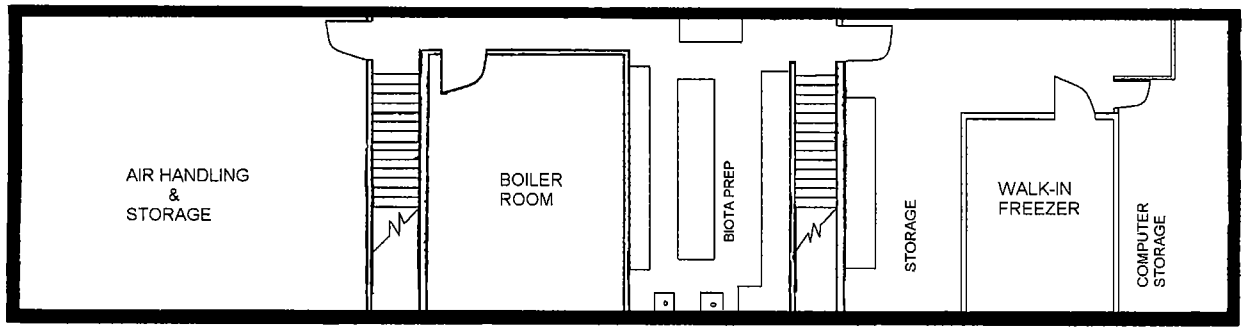
APPENDIX G

LABORATORY FLOORPLAN

FLOOR PLAN
MAIN FLOOR
ENCHEM KIMBERLY FACILITY



FLOOR PLAN
LOWER LEVEL
ENCHEM KIMBERLY FACILITY



APPENDIX H

LABORATORY CERTIFICATIONS/APPROVALS

State of Florida
Department of Health, Bureau of Laboratories
This is to certify that

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

has complied with Florida Administrative Code 64E-1, for the examination of Environmental samples in the following categories:

CWA - General Chemistry,Metals,Volatile Organics
RCRA/CERCLA - Extractable Organics,General Chemistry,Metals,Pesticides-Herbicides-PCB's,Volatile Organics

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

EFFECTIVE JANUARY 15, 2003 **THROUGH JUNE 30, 2003**

Ming S. Chan, Ph.D.
Bureau Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 3/98

NON-TRANSFERABLE N6172E87855

Jeb Bush
Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

March 13, 2003
I. D. # E87855

Dear Laboratory Director:

Based on the authority mandated by sections 381.00591, 403.0625 and 403.863 Florida Statutes and chapter 64E-1 Florida Administrative Code (FAC), I hereby declare that

EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

is granted certification to perform analyses in the following categories on environmental samples:

CWA – Metals, General Chemistry,
Volatile Organics; RCRA\CERCLA – Metals, General Chemistry,
Extractable Organics, Volatile Organics, Pesticides-Herbicides-PCB's

Certification in this case specifies that the above named laboratory has met the minimum requirements for a certified laboratory as set forth in section 64E-1.102 FAC.

This certification is effective as of January 15, 2003 and shall be in effect until June 30, 2003 or until revoked by the Florida Department of Health.

If I can be of any further assistance, feel free to call me at (904) 791-158, or SunCom 866-158.

Sincerely,

Stephen A. Arms
Administrator
Environmental Laboratory Certification Program

By:
Environmental Laboratory Certification Program

SAA*\rm

Laboratory Scope of Accreditation

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87855 **EPA Lab Code: WI00051** **(920) 469-2436**

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program CWA

Analyte	Method	Category	Certification Type	Effective Date
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	1/15/2003
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	1/15/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	1/15/2003
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	1/15/2003
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	1/15/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	1/15/2003
Acidity, as CaCO3	EPA 305.1	General Chemistry	NELAP	1/15/2003
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	1/15/2003
Acrylonitrile	EPA 624	Volatile Organics	NELAP	1/15/2003
Alkalinity as CaCO3	EPA 310.2	General Chemistry	NELAP	1/15/2003
Aluminum	EPA 200.7	Metals	NELAP	1/15/2003
Aluminum	EPA 200.8	Metals	NELAP	1/15/2003
Amenable cyanide	EPA 335.1	General Chemistry	NELAP	1/15/2003
Ammonia as N	EPA 350.1	General Chemistry	NELAP	1/15/2003
Antimony	EPA 200.7	Metals	NELAP	1/15/2003
Antimony	EPA 200.8	Metals	NELAP	1/15/2003
Arsenic	EPA 200.7	Metals	NELAP	1/15/2003
Arsenic	EPA 200.8	Metals	NELAP	1/15/2003
Arsenic	EPA 6010	Metals	NELAP	1/15/2003
Arsenic	EPA 6020	Metals	NELAP	1/15/2003
Barium	EPA 200.7	Metals	NELAP	1/15/2003
Barium	EPA 200.8	Metals	NELAP	1/15/2003
Benzene	EPA 624	Volatile Organics	NELAP	1/15/2003
Beryllium	EPA 200.7	Metals	NELAP	1/15/2003
Beryllium	EPA 200.8	Metals	NELAP	1/15/2003
Boron	EPA 200.7	Metals	NELAP	1/15/2003
Bromide	EPA 300.0	General Chemistry	NELAP	1/15/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	1/15/2003
Bromoform	EPA 624	Volatile Organics	NELAP	1/15/2003

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87855 **EPA Lab Code: WI00051** **(920) 469-2436**

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program CWA

Analyte	Method	Category	Certification Type	Effective Date
Cadmium	EPA 200.7	Metals	NELAP	1/15/2003
Cadmium	EPA 200.8	Metals	NELAP	1/15/2003
Cadmium	EPA 6010	Metals	NELAP	1/15/2003
Cadmium	EPA 6020	Metals	NELAP	1/15/2003
Calcium	EPA 200.7	Metals	NELAP	1/15/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	1/15/2003
Chloride	EPA 300.0	General Chemistry	NELAP	1/15/2003
Chlorobenzene	EPA 624	Volatile Organics	NELAP	1/15/2003
Chloroethane	EPA 624	Volatile Organics	NELAP	1/15/2003
Chloroform	EPA 624	Volatile Organics	NELAP	1/15/2003
Chromium	EPA 200.7	Metals	NELAP	1/15/2003
Chromium	EPA 200.8	Metals	NELAP	1/15/2003
Chromium	EPA 6010	Metals	NELAP	1/15/2003
Chromium	EPA 6020	Metals	NELAP	1/15/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	1/15/2003
Cobalt	EPA 200.7	Metals	NELAP	1/15/2003
Cobalt	EPA 200.8	Metals	NELAP	1/15/2003
Copper	EPA 200.7	Metals	NELAP	1/15/2003
Copper	EPA 200.8	Metals	NELAP	1/15/2003
Copper	EPA 6010	Metals	NELAP	1/15/2003
Copper	EPA 6020	Metals	NELAP	1/15/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	1/15/2003
Ethylbenzene	EPA 624	Volatile Organics	NELAP	1/15/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	1/15/2003
Iron	EPA 200.7	Metals	NELAP	1/15/2003
Kjeldahl nitrogen - total	EPA 351.1	General Chemistry	NELAP	1/15/2003
Lead	EPA 200.7	Metals	NELAP	1/15/2003
Lead	EPA 200.8	Metals	NELAP	1/15/2003
Lead	EPA 6010	Metals	NELAP	1/15/2003
Lead	EPA 6020	Metals	NELAP	1/15/2003
Magnesium	EPA 200.7	Metals	NELAP	1/15/2003
Manganese	EPA 200.7	Metals	NELAP	1/15/2003
Manganese	EPA 200.8	Metals	NELAP	1/15/2003
Mercury	EPA 1631	Metals	NELAP	1/15/2003

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State Laboratory ID: E87855 **EPA Lab Code: WI00051** **(920) 469-2436**

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program CWA

Analyte	Method	Category	Certification Type	Effective Date
Mercury	EPA 200.8	Metals	NELAP	1/15/2003
Mercury	EPA 245.1	Metals	NELAP	1/15/2003
Mercury	EPA 7470	Metals	NELAP	1/15/2003
Mercury	EPA 7471	Metals	NELAP	1/15/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	1/15/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	1/15/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	1/15/2003
Molybdenum	EPA 200.7	Metals	NELAP	1/15/2003
Molybdenum	EPA 200.8	Metals	NELAP	1/15/2003
Molybdenum	EPA 6010	Metals	NELAP	1/15/2003
Molybdenum	EPA 6020	Metals	NELAP	1/15/2003
Nickel	EPA 200.7	Metals	NELAP	1/15/2003
Nickel	EPA 200.8	Metals	NELAP	1/15/2003
Nickel	EPA 6010	Metals	NELAP	1/15/2003
Nickel	EPA 6020	Metals	NELAP	1/15/2003
Nitrate as N	EPA 300.0	General Chemistry	NELAP	1/15/2003
Nitrate as N	EPA 353.2	General Chemistry	NELAP	1/15/2003
Nitrite as N	EPA 300.0	General Chemistry	NELAP	1/15/2003
Organic nitrogen	TKN minus AMMONIA	General Chemistry	NELAP	1/15/2003
pH	EPA 150.1	General Chemistry	NELAP	1/15/2003
Phosphorus, total	EPA 365.4	General Chemistry	NELAP	1/15/2003
Potassium	EPA 200.7	Metals	NELAP	1/15/2003
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	1/15/2003
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	1/15/2003
Residue-total	EPA 160.3	General Chemistry	NELAP	1/15/2003
Residue-volatile	EPA 160.4	General Chemistry	NELAP	1/15/2003
Selenium	EPA 200.7	Metals	NELAP	1/15/2003
Selenium	EPA 200.8	Metals	NELAP	1/15/2003
Selenium	EPA 6010	Metals	NELAP	1/15/2003
Selenium	EPA 6020	Metals	NELAP	1/15/2003
Silver	EPA 200.7	Metals	NELAP	1/15/2003
Silver	EPA 200.8	Metals	NELAP	1/15/2003
Sodium	EPA 200.7	Metals	NELAP	1/15/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	1/15/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87855 **EPA Lab Code:** WI00051 **(920) 469-2436**

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EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program CWA

Analyte	Method	Category	Certification Type	Effective Date
Sulfide	EPA 376.1	General Chemistry	NELAP	1/15/2003
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	1/15/2003
Thallium	EPA 200.7	Metals	NELAP	1/15/2003
Thallium	EPA 200.8	Metals	NELAP	1/15/2003
Tin	EPA 200.7	Metals	NELAP	1/15/2003
Titanium	EPA 200.7	Metals	NELAP	1/15/2003
Toluene	EPA 624	Volatile Organics	NELAP	1/15/2003
Total cyanide	EPA 335.4	General Chemistry	NELAP	1/15/2003
Total nitrate-nitrite	EPA 300.0	General Chemistry	NELAP	1/15/2003
Total nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	1/15/2003
Total organic carbon	EPA 415.1	General Chemistry	NELAP	1/15/2003
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	1/15/2003
trans-1,3-Dichloropropylene	EPA 624	Volatile Organics	NELAP	1/15/2003
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	1/15/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	1/15/2003
Turbidity	EPA 180.1	General Chemistry	NELAP	1/15/2003
Vanadium	EPA 200.7	Metals	NELAP	1/15/2003
Vanadium	EPA 200.8	Metals	NELAP	1/15/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	1/15/2003
Xylene (total)	EPA 624	Volatile Organics	NELAP	1/15/2003
Zinc	EPA 200.7	Metals	NELAP	1/15/2003
Zinc	EPA 200.8	Metals	NELAP	1/15/2003
Zinc	EPA 6010	Metals	NELAP	1/15/2003
Zinc	EPA 6020	Metals	NELAP	1/15/2003

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Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,2-Dinitrobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,4-Dinitrobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	1/15/2003
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	1/15/2003
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
1-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	1/15/2003

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Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	1/15/2003
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	1/15/2003
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	1/15/2003
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	1/15/2003
2-Cyclohexyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	1/15/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	1/15/2003
2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270	Extractable Organics	NELAP	1/15/2003
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	1/15/2003
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	1/15/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/15/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	1/15/2003

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Analyte	Method	Category	Certification Type	Effective Date
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	1/15/2003
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	1/15/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	1/15/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	1/15/2003
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Acetone	EPA 8260	Volatile Organics	NELAP	1/15/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	1/15/2003
Acetophenone	EPA 8270	Extractable Organics	NELAP	1/15/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	1/15/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	1/15/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aluminum	EPA 6010	Metals	NELAP	1/15/2003
Aluminum	EPA 6020	Metals	NELAP	1/15/2003
Amenable cyanide	EPA 9010/9012	General Chemistry	NELAP	1/15/2003
Aniline	EPA 8270	Extractable Organics	NELAP	1/15/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Antimony	EPA 6010	Metals	NELAP	1/15/2003
Antimony	EPA 6020	Metals	NELAP	1/15/2003

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Analyte	Method	Category	Certification Type	Effective Date
Aramite	EPA 8270	Extractable Organics	NELAP	1/15/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Arsenic	EPA 6010	Metals	NELAP	1/15/2003
Arsenic	EPA 6020	Metals	NELAP	1/15/2003
Barium	EPA 6010	Metals	NELAP	1/15/2003
Barium	EPA 6020	Metals	NELAP	1/15/2003
Benzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Benzidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	1/15/2003
Benzyl chloride	EPA 8260	Volatile Organics	NELAP	1/15/2003
Beryllium	EPA 6010	Metals	NELAP	1/15/2003
Beryllium	EPA 6020	Metals	NELAP	1/15/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
beta-Naphthylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	1/15/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	1/15/2003
bis(2-Chloroisopropyl) ether	EPA 8270	Extractable Organics	NELAP	1/15/2003

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Analyte	Method	Category	Certification Type	Effective Date
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	1/15/2003
Boron	EPA 6010	Metals	NELAP	1/15/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Bromoform	EPA 8260	Volatile Organics	NELAP	1/15/2003
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Cadmium	EPA 6010	Metals	NELAP	1/15/2003
Cadmium	EPA 6020	Metals	NELAP	1/15/2003
Calcium	EPA 6010	Metals	NELAP	1/15/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	1/15/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	1/15/2003
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	1/15/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Chloride	EPA 9056	General Chemistry	NELAP	1/15/2003
Chloride	EPA 9250	General Chemistry	NELAP	1/15/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Chloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Chloroform	EPA 8260	Volatile Organics	NELAP	1/15/2003
Chloroprene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Chromium	EPA 6010	Metals	NELAP	1/15/2003
Chromium	EPA 6020	Metals	NELAP	1/15/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	1/15/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/15/2003
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	1/15/2003
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Cobalt	EPA 6010	Metals	NELAP	1/15/2003
Cobalt	EPA 6020	Metals	NELAP	1/15/2003
Copper	EPA 6010	Metals	NELAP	1/15/2003
Copper	EPA 6020	Metals	NELAP	1/15/2003
Crotonaldehyde	EPA 8260	Volatile Organics	NELAP	1/15/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003

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Analyte	Method	Category	Certification Type	Effective Date
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Dibenz(a, j) acridine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	1/15/2003
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Dibromofluoromethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Diethyl ether	EPA 8260	Volatile Organics	NELAP	1/15/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Diphenylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	1/15/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	1/15/2003
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Ethylene oxide	EPA 8260	Volatile Organics	NELAP	1/15/2003
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Fluoride	EPA 9056	General Chemistry	NELAP	1/15/2003

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87855 **EPA Lab Code: WI00051** **(920) 469-2436**

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Hexachlorobenzene	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Hexachloroethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	1/15/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Iron	EPA 6010	Metals	NELAP	1/15/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	1/15/2003
Isopropyl alcohol (2-Propanol)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	1/15/2003
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Lead	EPA 6010	Metals	NELAP	1/15/2003
Lead	EPA 6020	Metals	NELAP	1/15/2003
Magnesium	EPA 6010	Metals	NELAP	1/15/2003
Manganese	EPA 6010	Metals	NELAP	1/15/2003
Manganese	EPA 6020	Metals	NELAP	1/15/2003
Mercury	EPA 7470	Metals	NELAP	1/15/2003
Mercury	EPA 7471	Metals	NELAP	1/15/2003
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	1/15/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	1/15/2003

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E87855
EnChem, Inc.
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Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	1/15/2003
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	1/15/2003
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Methylene chloride	EPA 8260	Volatile Organics	NELAP	1/15/2003
Mirex	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Molybdenum	EPA 6010	Metals	NELAP	1/15/2003
Naphthalene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	1/15/2003
n-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	1/15/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Nickel	EPA 6010	Metals	NELAP	1/15/2003
Nickel	EPA 6020	Metals	NELAP	1/15/2003
Nitrate	EPA 9056	General Chemistry	NELAP	1/15/2003
Nitrite	EPA 9056	General Chemistry	NELAP	1/15/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
n-Propanol	EPA 8260	Volatile Organics	NELAP	1/15/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
o-Toluidine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003

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E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
Pentachloronitrobenzene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
pH	EPA 9040	General Chemistry	NELAP	1/15/2003
pH	EPA 9045	General Chemistry	NELAP	1/15/2003
Phenacetin	EPA 8270	Extractable Organics	NELAP	1/15/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Phenol	EPA 8270	Extractable Organics	NELAP	1/15/2003
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Potassium	EPA 6010	Metals	NELAP	1/15/2003
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	1/15/2003
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	1/15/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	1/15/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	1/15/2003
Safrole	EPA 8270	Extractable Organics	NELAP	1/15/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Selenium	EPA 6010	Metals	NELAP	1/15/2003
Silver	EPA 6010	Metals	NELAP	1/15/2003
Silver	EPA 6020	Metals	NELAP	1/15/2003
Sodium	EPA 6010	Metals	NELAP	1/15/2003
Strontium	EPA 6010	Metals	NELAP	1/15/2003
Styrene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Sulfate	EPA 9036	General Chemistry	NELAP	1/15/2003
Sulfate	EPA 9056	General Chemistry	NELAP	1/15/2003
Sulfotepp	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Thallium	EPA 6010	Metals	NELAP	1/15/2003
Thallium	EPA 6020	Metals	NELAP	1/15/2003
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
Tin	EPA 6010	Metals	NELAP	1/15/2003
Titanium	EPA 6010	Metals	NELAP	1/15/2003
Toluene	EPA 8260	Volatile Organics	NELAP	1/15/2003

"STATE" indicates certification for the analyte by the method specified. "NELAP" further indicates certification compliant with the NELAC Standards.

Print Date 3/13/2003 2:08:06 PM

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State Laboratory ID: E87855 **EPA Lab Code: WI00051** **(920) 469-2436**

E87855
EnChem, Inc.
1090 Kennedy Avenue
Kimberly, WI 54136

Program RCRA/CERCLA

Analyte	Method	Category	Certification Type	Effective Date
Total cyanide	EPA 9010/9012	General Chemistry	NELAP	1/15/2003
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	1/15/2003
Total organic carbon	EPA 9060	General Chemistry	NELAP	1/15/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
trans Nanochlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	1/15/2003
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	1/15/2003
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	1/15/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	1/15/2003
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	1/15/2003
Vanadium	EPA 6010	Metals	NELAP	1/15/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	1/15/2003
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	1/15/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	1/15/2003
Zinc	EPA 6010	Metals	NELAP	1/15/2003
Zinc	EPA 6020	Metals	NELAP	1/15/2003

The State of Washington
Department of Ecology

This is to certify that

En Chem, Inc.
Kimberly, WI

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective April 3, 2003, and shall expire April 2, 2004.

Witnessed under my hand on April 1, 2003.

Perry F. Brake, Chemist
Lab Accreditation Section Manager

Lab Accreditation Number
C310

Scope of Accreditation

En Chem, Inc.

Kimberly, WI

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation may apply to any of the following matrix types: non-potable water, drinking water, solid and chemical materials, and air and emissions. Accreditation for all parameters is final unless indicated otherwise in a note. Accreditation is for the latest version of a method unless otherwise specified in a note. EPA refers to the U.S. Environmental Protection Agency. SM refers to American Public Health Association's publication, Standard Methods for the Examination of Water and Wastewater, 18th, 19th or 20th Edition, unless otherwise noted. ASTM stands for the American Society for Testing and Materials. PSEP stands for Puget Sound Estuary Program. Other references are detailed in the notes section.

Matrix Type/Parameter Name	Reference	Method Number	Notes
Non-potable Water			
Mercury	EPA	1631	

4/1/2003

Authentication Signature

Perry Brake -- Section Manager, Washington State Department of Ecology -- Lab Accreditation Section

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Wadsworth Center The Governor Nelson A. Rockefeller Empire State Plaza P.O. Box 509 Albany, New York 12201-0509

Antonia C. Novello, M.D., M.P.H., Dr.P.H.
Commissioner

Dennis P. Whalen
Executive Deputy Commissioner

February 18, 2003

Dear Lead Technical Director:

Please note that although your ELAP Certificate(s) of Approval is/are scheduled to expire at 12:01 AM April 1, 2003, it/they will remain valid until June 16, 2003. This extension is being granted in advance due to the possibility that the New York State budget may not be approved by April 1, 2003. The only exceptions to this extension are laboratories who are notified in writing that their certification has been revoked for just cause.

If there are any questions, please feel free to contact me at 518-485-5570 or by email to jej02@health.state.ny.us.

Verification of your laboratory's approved ELAP status is available to you or your clients by calling the Program Office at (518) 485-5570 between 8:30 a.m. and 4:45 p.m. Monday through Friday.

Sincerely,

Joyce Reilly
Administrative Assistant
Environmental Laboratory Approval Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
Antonia C. Novello, M.D., M.P.H., Dr.P.H. Commissioner

Expires 12:01 AM April 01, 2003
Issued July 05, 2002
Revised January 06, 2003

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. STEVE HERALY
EN CHEM INC
525 SCIENCE DRIVE
MADISON WI 53711 United States

NY Lab Id No: 11436
EPA Lab Code: WI00051

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER All approved analytes are listed below:

Acrolein and Acrylonitrile	
Acrolein	EPA 624
Acrylonitrile	EPA 624
Benzidines	
3,3 -dichlorobenzidine	EPA 625
Benzidine	EPA 625
Chlorinated Hydrocarbon Pesticides	
4,4 -DDE	EPA 608
4,4 -DDT	EPA 608
4,4-DDD	EPA 608
Aldrin	EPA 608
alpha-BHC	EPA 608
beta-BHC	EPA 608
Chlordane Total	EPA 608
delta-BHC	EPA 608
Dieldrin	EPA 608
Endosulfan I	EPA 608
Endosulfan II	EPA 608
Endosulfan sulfate	EPA 608
Endrin	EPA 608
Endrin aldehyde	EPA 608
Heptachlor	EPA 608
Chlorinated Hydrocarbon Pesticides	
Heptachlor epoxide	EPA 608
Lindane	EPA 608
Methoxychlor	EPA 608
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA 625
2-Chloronaphthalene	EPA 625
Hexachlorobenzene	EPA 625
Hexachlorobutadiene	EPA 625
Hexachlorocyclopentadiene	EPA 625
Hexachloroethane	EPA 625
Chlorophenoxy Acid Pesticides	
2,4,5-T	SM 18-20 6640B
2,4,5-TP (Silvex)	SM 18-20 6640B
2,4-D	SM 18-20 6640B
Haloethers	
4-Bromophenylphenyl ether	EPA 625
4-Chlorophenylphenyl ether	EPA 625
Bis (2-chloroisopropyl) ether	EPA 625
Bis(2-chloroethoxy)methane	EPA 625
Bis(2-chloroethyl)ether	EPA 625

Serial No.: 17886

Property of the New York State Department of Health. Valid only at the address shown. Must be conspicuously posted. Valid certificates have a raised seal and may be verified by calling (518) 485-5570.

DOH-3317 (3/97)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
Antonia C. Novello, M.D., M.P.H., Dr.P.H. Commissioner

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Mineral	
Acidity	EPA 305.1
Alkalinity	EPA 310.2
	SM 18-20 2320-B
Calcium Hardness	EPA 200.7
Chloride	EPA 300.0
	EPA 325.1
Fluoride, Total	EPA 300.0
	SM 18-20 4500-F-C
Hardness, Total	EPA 200.7
Sulfate (as SO4)	EPA 300.0
	EPA 375.1
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 625
2,6-Dinitrotoluene	EPA 625
Isophorone	EPA 625
Nitrobenzene	EPA 625
Nitrosoamines	
N-Nitrosodimethylamine	EPA 625
N-Nitrosodi-n-propylamine	EPA 625
N-Nitrosodiphenylamine	EPA 625

Nutrient	
Ammonia (as N)	EPA 350.1
Nitrate (as N)	EPA 300.0
	EPA 353.2
Nitrite (as N)	EPA 300.0
	EPA 354.1
Orthophosphate (as P)	EPA 300.0
Phosphorus, Total	EPA 365.1
Phthalate Esters	
Benzyl butyl phthalate	EPA 625
Bis(2-ethylhexyl) phthalate	EPA 625
Diethyl phthalate	EPA 625
Dimethyl phthalate	EPA 625
Di-n-butyl phthalate	EPA 625
Di-n-octyl phthalate	EPA 625
Polychlorinated Biphenyls	
PCB-1016	EPA 608
PCB-1221	EPA 608
PCB-1232	EPA 608
PCB-1242	EPA 608
PCB-1248	EPA 608
PCB-1254	EPA 608

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Polychlorinated Biphenyls	
PCB-1260	EPA 608
Polynuclear Aromatics	
Acenaphthene	EPA 610
	EPA 625
Acenaphthylene	EPA 610
	EPA 625
Anthracene	EPA 610
	EPA 625
Benzo(a)anthracene	EPA 610
	EPA 625
Benzo(a)pyrene	EPA 610
	EPA 625
Benzo(b)fluoranthene	EPA 610
	EPA 625
Benzo(ghi)perylene	EPA 610
	EPA 625
Benzo(k)fluoranthene	EPA 610
	EPA 625
Chrysene	EPA 610
	EPA 625
Dibenzo(a,h)anthracene	EPA 610
Polynuclear Aromatics	
Dibenzo(a,h)anthracene	EPA 625
Fluoranthene	EPA 610
	EPA 625
Fluorene	EPA 610
	EPA 625
Indeno(1,2,3-cd)pyrene	EPA 610
	EPA 625
Naphthalene	EPA 610
	EPA 625
Phenanthrene	EPA 610
	EPA 625
Pyrene	EPA 610
	EPA 625
Priority Pollutant Phenols	
2,4,5-Trichlorophenol	EPA 625
2,4,6-Trichlorophenol	EPA 625
2,4-Dichlorophenol	EPA 625
2,4-Dimethylphenol	EPA 625
2,4-Dinitrophenol	EPA 625
2-Chlorophenol	EPA 625
2-Methyl-4,6-dinitrophenol	EPA 625

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Priority Pollutant Phenols

2-Nitrophenol	EPA 625
4-Chloro-3-methylphenol	EPA 625
4-Nitrophenol	EPA 625
Pentachlorophenol	EPA 625
Phenol	EPA 625

Purgeable Aromatics

1,2-Dichlorobenzene	EPA 624
	EPA 625
1,3-Dichlorobenzene	EPA 624
	EPA 625
1,4-Dichlorobenzene	EPA 624
	EPA 625
Benzene	EPA 624
Chlorobenzene	EPA 624
Ethyl benzene	EPA 624
Toluene	EPA 624
Total Xylenes	EPA 624

Purgeable Halocarbons

1,1,1-Trichloroethane	EPA 624
1,1,2,2-Tetrachloroethane	EPA 624
1,1,2-Trichloroethane	EPA 624

Purgeable Halocarbons

1,1-Dichloroethane	EPA 624
1,1-Dichloroethene	EPA 624
1,2-Dichloroethane	EPA 624
1,2-Dichloropropane	EPA 624
2-Chloroethylvinyl ether	EPA 624
Bromodichloromethane	EPA 624
Bromoform	EPA 624
Bromomethane	EPA 624
Carbon tetrachloride	EPA 624
Chloroethane	EPA 624
Chloroform	EPA 624
Chloromethane	EPA 624
cis-1,3-Dichloropropene	EPA 624
Dibromochloromethane	EPA 624
Dichlorodifluoromethane	EPA 624
Methylene chloride	EPA 624
Tetrachloroethene	EPA 624
trans-1,2-Dichloroethene	EPA 624
trans-1,3-Dichloropropene	EPA 624
Trichloroethene	EPA 624
Trichlorofluoromethane	EPA 624

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All approved analytes are listed below:

Purgeable Halocarbons	
Vinyl chloride	EPA 624
Residue	
Solids, Total	EPA 160.3
Solids, Total Dissolved	EPA 160.1
Solids, Total Suspended	EPA 160.2
TCLP Additional Compounds	
Cresol	SW-846 8270C
Methylethyl ketone (2-butanone)	SW-846 8260B
Pyridine	SW-846 8270C
Wastewater Metals I	
Barium, Total	EPA 200.7
	EPA 200.8
Cadmium, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 213.2
Calcium, Total	EPA 200.7
Chromium, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 218.2
Wastewater Metals I	
Copper, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 220.2
Iron, Total	EPA 200.7
Lead, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 239.2
Magnesium, Total	EPA 200.7
Manganese, Total	EPA 200.7
	EPA 200.8
Nickel, Total	EPA 200.7
	EPA 200.8
Potassium, Total	EPA 200.7
Silver, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 272.2
Sodium, Total	EPA 200.7

Serial No.: 17886

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DOH-3317 (3/97)

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
Antonia C. Novello, M.D., M.P.H., Dr.P.H. Commissioner

Expires 12:01 AM April 01, 2003
Issued July 05, 2002
Revised January 06, 2003

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. STEVE HERALY
EN CHEM INC
525 SCIENCE DRIVE
MADISON WI 53711 United States

NY Lab Id No: 11436
EPA Lab Code: WI00051

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER All approved analytes are listed below:

Wastewater Metals II	
Aluminum, Total	EPA 200.7
	EPA 200.8
Antimony, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 204.2
Arsenic, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 206.2
Beryllium, Total	EPA 200.7
	EPA 200.8
Chromium VI	SM 18-19 3500-Cr D
Mercury, Total	EPA 1631E
	EPA 200.8
	EPA 245.1
Selenium, Total	EPA 200.7
	EPA 200.8
	EPA 270.2
Vanadium, Total	EPA 200.7
	EPA 200.8
Wastewater Metals II	
Zinc, Total	EPA 200.7
	EPA 200.8
Wastewater Metals III	
Cobalt, Total	EPA 200.7
	EPA 200.8
Molybdenum, Total	EPA 200.7
Thallium, Total	EPA 200.7
	EPA 200.8
	EPA 200.9
	EPA 279.2
Tin, Total	EPA 200.7
Titanium, Total	EPA 200.7
Wastewater Miscellaneous	
Bromide	EPA 300.0
Color	EPA 110.2
Cyanide, Total	EPA 335.4
Hydrogen Ion (pH)	EPA 150.1
Organic Carbon, Total	EPA 415.1
Phenols	EPA 420.2
Specific Conductance	EPA 120.1
Sulfide (as S)	EPA 376.1

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Toxaphene	EPA 608

Chlorophenoxy Acid Pesticides

Dicamba	Method Not Specified

Serial No.: 17887

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EN CHEM INC
525 SCIENCE DRIVE
MADISON WI 53711 USA

NY Lab Id No: 11436
EPA Lab Code: WI00051

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrolein and Acrylonitrile	
Acrolein	SW-846 8260B
Acrylonitrile	SW-846 8260B
Characteristic Testing	
TCLP	FED REG 1311
Chlorinated Hydrocarbon Pesticides	
4,4 -DDE	SW-846 8081A
4,4 -DDT	SW-846 8081A
4,4-DDD	SW-846 8081A
Aldrin	SW-846 8081A
alpha-BHC	SW-846 8081A
beta-BHC	SW-846 8081A
Chlordane Total	SW-846 8081A
delta-BHC	SW-846 8081A
Dieldrin	SW-846 8081A
Endosulfan I	SW-846 8081A
Endosulfan II	SW-846 8081A
Endosulfan sulfate	SW-846 8081A
Endrin	SW-846 8081A
Endrin aldehyde	SW-846 8081A
Heptachlor	SW-846 8081A
Heptachlor epoxide	SW-846 8081A
Chlorinated Hydrocarbon Pesticides	
Lindane	SW-846 8081A
Methoxychlor	SW-846 8081A
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	SW-846 8270C
2-Chloronaphthalene	SW-846 8270C
Hexachlorobenzene	SW-846 8270C
Hexachlorobutadiene	SW-846 8270C
Hexachlorocyclopentadiene	SW-846 8270C
Hexachloroethane	SW-846 8270C
Chlorophenoxy Acid Pesticides	
2,4,5-T	SW846 8151-A
2,4,5-TP (Silvex)	SW846 8151-A
2,4-D	SW846 8151-A
Dicamba	SW846 8151-A
Haloethers	
Bis (2-chloroisopropyl) ether	SW-846 8270C
Bis(2-chloroethoxy)methane	SW-846 8270C
Metals I	
Barium, Total	SW-846 6010B
	SW-846 6020

Serial No.: 17467

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Metals I	
Cadmium, Total	SW-846 6010B
	SW-846 6020
	SW-846 7131-A
Chromium, Total	SW-846 7191
	SW-846 6010B
	SW-846 6020
Lead, Total	SW-846 6010B
	SW-846 6020
	SW-846 7421
Nickel, Total	SW-846 6010B
	SW-846 6020
Silver, Total	SW846 - 7761
	SW-846 6010B
	SW-846 6020
Metals II	
Antimony, Total	SW-846 6010B
	SW-846 6020
	SW846 7041
Arsenic, Total	SW-846 6010B
	SW-846 6020
	SW846 7060A
Metals II	
Selenium, Total	SW-846 6010B
	SW-846 6020
	SW-846 7740
Miscellaneous	
Cyanide, Total	SW-846 9012A
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	SW-846 8270C
2,6-Dinitrotoluene	SW-846 8270C
Isophorone	SW-846 8270C
Nitrobenzene	SW-846 8270C
Phthalate Esters	
Benzyl butyl phthalate	SW-846 8270C
Bis(2-ethylhexyl) phthalate	SW-846 8270C
Diethyl phthalate	SW-846 8270C
Dimethyl phthalate	SW-846 8270C
Di-n-butyl phthalate	SW-846 8270C
Di-n-octyl phthalate	SW-846 8270C
Polychlorinated Biphenyls	
PCB-1016	SW-846 8082
PCB-1221	SW-846 8082

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Polychlorinated Biphenyls

PCB-1232	SW-846 8082
PCB-1242	SW-846 8082
PCB-1248	SW-846 8082
PCB-1254	SW-846 8082
PCB-1260	SW-846 8082

Polynuclear Aromatic Hydrocarbons

Acenaphthene	SW-846 8270C
	SW-846 8310
Acenaphthylene	SW-846 8270C
	SW-846 8310
Anthracene	SW-846 8270C
	SW-846 8310
Benzo(a)anthracene	SW-846 8270C
	SW-846 8310
Benzo(a)pyrene	SW-846 8270C
	SW-846 8310
Benzo(b)fluoranthene	SW-846 8270C
	SW-846 8310
Benzo(ghi)perylene	SW-846 8270C
	SW-846 8310
Chrysene	SW-846 8270C

Polynuclear Aromatic Hydrocarbons

Chrysene	SW-846 8310
Dibenzo(a,h)anthracene	SW-846 8270C
	SW-846 8310
Fluoranthene	SW-846 8270C
	SW-846 8310
Fluorene	SW-846 8270C
	SW-846 8310
Indeno(1,2,3-cd)pyrene	SW-846 8270C
	SW-846 8310
Naphthalene	SW-846 8270C
	SW-846 8310
Phenanthrene	SW-846 8270C
	SW-846 8310
Pyrene	SW-846 8270C
	SW-846 8310

Priority Pollutant Phenols

2,4,6-Trichlorophenol	SW-846 8270C
2,4-Dichlorophenol	SW-846 8270C
2,4-Dimethylphenol	SW-846 8270C
2,4-Dinitrophenol	SW-846 8270C
2-Chlorophenol	SW-846 8270C

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All approved analytes are listed below:

Priority Pollutant Phenols

2-Methyl-4,6-dinitrophenol	SW-846 8270C
2-Nitrophenol	SW-846 8270C
4-Chloro-3-methylphenol	SW-846 8270C
4-Nitrophenol	SW-846 8270C
Pentachlorophenol	SW-846 8270C
Phenol	SW-846 8270C

Purgeable Aromatics

1,2-Dichlorobenzene	SW-846 8260B
1,3-Dichlorobenzene	SW-846 8260B
1,4-Dichlorobenzene	SW-846 8260B
Benzene	SW-846 8260B
Chlorobenzene	SW-846 8260B
Ethyl benzene	SW-846 8260B
Toluene	SW-846 8260B
Total Xylenes	SW-846 8260B

Purgeable Halocarbons

1,1,1-Trichloroethane	SW-846 8260B
1,1,2,2-Tetrachloroethane	SW-846 8260B
1,1,2-Trichloroethane	SW-846 8260B
1,1-Dichloroethane	SW-846 8260B
1,1-Dichloroethene	SW-846 8260B

Purgeable Halocarbons

1,2-Dichloroethane	SW-846 8260B
1,2-Dichloropropane	SW-846 8260B
2-Chloroethylvinyl ether	SW-846 8260B
Bromodichloromethane	SW-846 8260B
Bromoform	SW-846 8260B
Bromomethane	SW-846 8260B
Carbon tetrachloride	SW-846 8260B
Chloroethane	SW-846 8260B
Chloroform	SW-846 8260B
Chloromethane	SW-846 8260B
cis-1,3-Dichloropropene	SW-846 8260B
Dibromochloromethane	SW-846 8260B
Dichlorodifluoromethane	SW-846 8260B
Methylene chloride	SW-846 8260B
Tetrachloroethene	SW-846 8260B
trans-1,3-Dichloropropene	SW-846 8260B
Trichloroethene	SW-846 8260B
Trichlorofluoromethane	SW-846 8260B
Vinyl chloride	SW-846 8260B

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DOH-3317 (3/97)

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WADSWORTH CENTER
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EN CHEM INC
525 SCIENCE DRIVE
MADISON WI 53711 USA

NY Lab Id No: 11436
EPA Lab Code: WI00051

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Toxaphene	SW-846 8081A

Metals II

Chromium VI	SW-846 7196A
Mercury, Total	SW846 7470A
	SW846 7471A

Serial No.: 17468

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DOH-3317 (3/97)

NEW YORK STATE DEPARTMENT OF HEALTH
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EN CHEM INC
525 SCIENCE DRIVE
MADISON WI 53711 USA

NY Lab Id No: 11436
EPA Lab Code: WI00051

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES ANALYTICAL SERVICES PROTOCOL
All approved subcategories and/or analytes are listed below:

CLP Semi-Volatile Organics

CLP Volatile Organics

CLP Inorganics

CLP PCB/Pesticides

Serial No.: 17469

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DOH-3317 (3/97)

The State of Wisconsin

DEPARTMENT OF NATURAL RESOURCES

Hereby grants

Wisconsin Certification under NR 149

under the provisions of ch. NR 149, Wisconsin Administrative Code to:

En Chem, Inc. (Kimberly)
1090 Kennedy Avenue
Kimberly, WI 54136

Laboratory ID Number: **445134030**

Issued Date: **January 21, 2003**

Expiration Date: **August 31, 2003**

for the following test categories:

- * Oxygen Utilization
  - Biochemical Oxygen Demand
- * Nitrogen
  - Ammonia as N
  - Nitrite as N
  - Nitrate as N
  - Total Kjeldahl Nitrogen
- * Phosphorus
  - Orthophosphate
  - Total Phosphorus
- * Physical
  - Oil and Grease (HEM)
  - Oil and Grease (Freon)
  - Total Dissolved Solids
  - Total Solids
  - Total Suspended Solids
  - Total Volatile Solids
- * General I
  - Alkalinity/Acidity
  - Bromide
  - Color
  - Hardness
  - Silica
  - Sulfite
- * General II
  - Chloride
  - Cyanide
  - Chemical Oxygen Demand
  - Fluoride
  - Total Phenolic Compounds
  - Sulfide
- * General II
  - Sulfate
- * General III
  - EP Toxicity
  - Ignitability
  - Total Releasable Cyanide
  - Reactivity
  - Total Releasable Sulfide
  - SPLP
  - TCLP
  - Total Organic Carbon
  - Total Organic Halides
- * Metals I
  - Silver
  - Aluminum
  - Arsenic
  - Boron
  - Barium
  - Beryllium
  - Calcium
  - Cadmium
  - Cobalt
  - Chromium (Total)
  - Copper
  - Iron
  - Chromium (Hexavalent)
  - Mercury
  - Potassium
  - Magnesium
  - Manganese
  - Molybdenum
- * Metals I
  - Sodium
  - Nickel
  - Lead
  - Antimony
  - Selenium
  - Tin
  - Thallium
  - Vanadium
  - Zinc
- * Organics; Purgeable
  - Purgeable Aromatics
  - Purgeable Halocarbons
  - Volatile Organics (VOCs)
- * Semivolatiles by GC/MS
  - Base/Neutral/Acid Extract
- * Liquid Chromatography
  - Explosives by LC
  - PAHs by LC
- * Pesticides
  - Acid Herbicides
- * Organics; Organochlorine
  - PCBs
  - Organochlorine Pesticides
- * Safe Drinking Water
  - Arsenic
  - Barium
  - Beryllium
  - Cadmium
  - Chromium
- * Safe Drinking Water
  - Copper
  - Mercury
  - Nitrate + Nitrite
  - Sodium
  - Nickel
  - Nitrite
  - Nitrate
  - PAHs by HPLC
  - Lead
  - Antimony
  - Selenium
  - Thallium
  - Total Trihalomethanes
  - Volatile Organics

David Webb

Chief, Environmental Science Services

P. Scott Hassett

Secretary

Certification or registration by the State of Wisconsin is not an endorsement or guartantee of the validity of data generated by this laboratory. This certificate is valid unless revoked or suspended and supersedes all previous certificates.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Scott McCallum, Governor
Darrell Bazzell, Secretary

101 S. Webster St.
Box 7921
Madison, Wisconsin 53707-7921
Telephone 608-266-2621
FAX 608-267-3579
TTY 608-267-6897

November 20, 2002

Ms. Julie Trivedi
En Chem, Inc.
1241 Bellevue Street.
Green Bay, WI 54302

FID: 445134030

Subject: Recognition of Low-Level Mercury Analysis Capability at Kimberly Facility Effective November 20, 2002

Dear Ms. Trivedi:

I am pleased to inform you that effective November 20,2002, the Wisconsin Department of Natural Resources (DNR) recognizes the capabilities of the En Chem laboratory located at 1090 Kennedy Avenue in Kimberly, WI to perform low-level mercury determinations in water matrices. We understand that En Chem transferred the instrumentation and procedures used at the Madison laboratory to Kimberly. The SOP is equivalent to EPA Method 1631 approved in NR 219 Wis. Adm. Code. We will continue to recognize this capability as long as the following conditions are met:

1. En Chem will notify DNR if the method detection limit (MDL) for water or wastewater matrices changes significantly from what was provided in the request for recognition (reagent water = 0.17 ng/L and wastewater = 0.39ng/L.).

2. Mercury contamination in the laboratory and analytical system is effectively controlled so that contamination or carry-over is not introduced into samples or quality control.

3. Recoveries for laboratory control samples (fortified reagent water) at an appropriate concentration fall between 79 and 121%.

4. En Chem - Kimberly continues to meet the criteria established in NR 106.145 (10).
   a. Matrix spike recoveries routinely fall between 75 and 125%. Results outside of this range may be acceptable only on a case-by-case basis.
   b. Method blanks analyzed concurrently with samples are reported with sample results and mercury concentrations in the method blank are not subtracted unless the concentration is less than the MDL, 0.5 ng/L, or 5% of the sample concentration, whichever is greater.
   c. Field blanks associated with samples are reported.
   d. Results for samples and blanks are reported to the laboratory's MDL.

5. Containers provided for samples and blanks are sufficiently free of mercury contamination. To the extent practicable, sampling procedures provided to clients should ensure that contamination incurred during collection will not significantly affect results.

The Department reserves the right to rescind this recognition or to revise the specified performance criteria based on data quality needs. This recognition is not transferable to another facility.

Since the revision to NR 219 Wis. Adm. Code became effective, EPA promulgated Revision E to method 1631. In the October 30, 2002 Federal Register, EPA removed the requirement to refrigerate samples prior to preservation and extended the holding time to 28 days if the sample is oxidized in the same bottle. The holding time for preserved samples remains at 90 days. DNR will defer to the federal regulations for preservation and holding time requirements until NR 219 is revised. Both Revision D and E provide for method flexibility in section 9.1.2. Please note that although NR 219 recognizes a similar degree of flexibility in modifying the method, if the laboratory chooses to eliminate the purge and trap or change detectors, then the method reported should be something other than 1631.

The EnChem, Inc.facility in Kimberly, WI is now listed as a laboratory that is capable of performing low-level mercury determinations. Based on the data your laboratory provided, we will list your reagent water MDL as 0.17 ng/L and the wastewater matrix MDL as 0.39 ng/L. The MDLs included on your listing may be updated by submitting additional MDL studies.

We value your laboratory's efforts to develop method 1631 for mercury in a clean laboratory environment. Your laboratory's detection limits will enable regulated facilities to obtain quantifiable mercury results for most, if not all, wastewater effluents.

Sincerely,

David Webb

David Webb, Chief
Environmental Science Services Section
Bureau of Integrated Science Services

cc: Art Lautenbach, EnChem
Tom Mugan, WT/2
Donalea Dinsmore, SS/BW

c:\data\labcert\Hg-EnChem Go.doc

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Environmental Laboratory Certification Program

In accordance with the provisions of Regulation 61 - 81, entitled "State Environmental Laboratory Certification Regulation,"

EN CHEM INC KIMBERLY
1090 KENNEDY AVE
KIMBERLY, WISCONSIN 54136

is hereby certified to perform analyses as documented on the attached parameter list(s). This certification does not guarantee validity of data generated, but indicates the laboratory's adherence to prescribed methodology, quality control, records keeping, and reporting procedures. This certificate is the property of S.C. DHEC and must be surrendered upon demand. This certificate is non-transferable and is valid only for the parameters and methodology listed on the attached parameter list(s).

Laboratory Director: DAVID TURRIFF PH D
Certifying Authority: WI
Date of Issue: April 17, 2003
Date of Expiration: August 31, 2003
Certificate Number: 83001001

R. Wayne Davis
Director
Office of Environmental Laboratory Certification

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EN CHEM INC KIMBERLY (Laboratory ID 83001)
Laboratory Director: DAVID TURRIFF PH D
Certifying Authority: WI
Certificate Number: 83001001

Date of Issue: April 17, 2003
Expiration Date: August 31, 2003

CLEAN WATER ACT

HERBICIDES

CHLORINATED PHENOXY ACID HERBICIDES	SM 6640B

INORGANIC - MINERAL

ACIDITY	EPA 305.1
CHLORIDE	EPA 300.0
FLUORIDE	EPA 300.0
SULFATE	EPA 300.0

INORGANIC - MISCELLANEOUS

BROMIDE	EPA 300.0
OIL & GREASE	EPA 413.1
SULFIDE	EPA 376.1

INORGANIC - NUTRIENT

NITRATE-NITROGEN	EPA 300.0
NITRATE-NITROGEN	NO3-NO2 MINUS NO2
NITRITE-NITROGEN	EPA 300.0
NITRITE-NITROGEN	EPA 354.1

INORGANIC - RESIDUE

RESIDUE, FILTERABLE (TDS)	EPA 160.1
RESIDUE, NONFILTERABLE (TSS)	EPA 160.2
RESIDUE, TOTAL (TS)	EPA 160.3
RESIDUE, VOLATILE (VS)	EPA 160.4

INORGANIC - TRACE METAL

ALUMINUM	EPA 200.7
ANTIMONY	EPA 200.7
ARSENIC	EPA 200.7
BARIUM	EPA 200.7
BERYLLIUM	EPA 200.7
BORON	EPA 200.7
CADMIUM	EPA 200.7
CALCIUM	EPA 200.7
CHROMIUM	EPA 200.7
CHROMIUM, HEXAVALENT	EPA 218.4
COBALT	EPA 200.7
COPPER	EPA 200.7
IRON	EPA 200.7
LEAD	EPA 200.7
MAGNESIUM	EPA 200.7

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CLEAN WATER ACT

INORGANIC - TRACE METAL

MANGANESE	EPA 200.7
MERCURY	EPA 245.1
MOLYBDENUM	EPA 200.7
NICKEL	EPA 200.7
POTASSIUM	EPA 200.7
SELENIUM	EPA 200.7
SILVER	EPA 200.7
SODIUM	EPA 200.7
THALLIUM	EPA 200.7
TIN	EPA 200.7
VANADIUM	EPA 200.7
ZINC	EPA 200.7

PCBS AND PESTICIDES

ORGANOCHLORINE PESTICIDES & PCBS - GC/ECD	EPA 608

SEMI-VOLATILES

BASE/NEUTRALS AND ACIDS - GC/MS	EPA 625
POLY. AROM. HYDROC. (PAHS)-GC/FID OR HPLC	EPA 610

VOLATILES (VOCS)

PURGEABLES - GC/MS	EPA 624

SOLID & HAZARDOUS WASTES

INORGANIC - DEMAND

TOTAL ORGANIC CARBON (TOC)	EPA 9060

INORGANIC - HAZARDOUS WASTE CHARACTERISTICS

IGNITABILITY (SETAFLASH)	EPA 1020A
REACTIVITY - CYANIDE	S.7.3. - SW846
REACTIVITY - SULFIDE	S.7.3. - SW846
SYNTHETIC PREC. LEACHING PROC.	EPA 1312
TCLP - BOTTLE EXTRACTION	EPA 1311
TCLP - ZERO HEADSPACE	EPA 1311

INORGANIC - MINERAL

CHLORIDE	EPA 9056
CHLORIDE	EPA 9250
FLUORIDE	EPA 9056

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SOLID & HAZARDOUS WASTES

INORGANIC - MINERAL

FLUORIDE	EPA 9214
SULFATE	EPA 9036
SULFATE	EPA 9056

INORGANIC - MISCELLANEOUS

BROMIDE	EPA 9056
CYANIDE	EPA 9012A
CYANIDE AMEN. TO CHLORINATION	EPA 9012A
PHENOLICS, TOTAL RECOVERABLE	EPA 9066
SULFIDE	EPA 9034
SULFIDE DISTILLATION	EPA 9030B

INORGANIC - NUTRIENT

NITRATE-NITROGEN	EPA 9056
NITRITE-NITROGEN	EPA 9056

INORGANIC - TRACE METAL

ALUMINUM	EPA 6010B
ALUMINUM	EPA 6020
ANTIMONY	EPA 6010B
ANTIMONY	EPA 6020
ANTIMONY	EPA 7041
ARSENIC	EPA 6010B
ARSENIC	EPA 6020
ARSENIC	EPA 7060A
BARIUM	EPA 6010B
BARIUM	EPA 6020
BERYLLIUM	EPA 6010B
BERYLLIUM	EPA 6020
CADMIUM	EPA 6010B
CADMIUM	EPA 6020
CADMIUM	EPA 7131A
CALCIUM	EPA 6010B
CHROMIUM	EPA 6010B
CHROMIUM	EPA 6020
CHROMIUM, HEXAVALENT	EPA 7196A
COBALT	EPA 6010B
COBALT	EPA 6020
COPPER	EPA 6010B
COPPER	EPA 6020
IRON	EPA 6010B
LEAD	EPA 6010B
LEAD	EPA 6020

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SOLID & HAZARDOUS WASTES

INORGANIC - TRACE METAL

LEAD	EPA 7421
MAGNESIUM	EPA 6010B
MANGANESE	EPA 6010B
MANGANESE	EPA 6020
MERCURY	EPA 7470A
MERCURY	EPA 7471A
MOLYBDENUM	EPA 6010B
NICKEL	EPA 6010B
NICKEL	EPA 6020
POTASSIUM	EPA 6010B
SELENIUM	EPA 6010B
SELENIUM	EPA 7740
SILVER	EPA 6010B
SILVER	EPA 6020
SODIUM	EPA 6010B
THALLIUM	EPA 6010B
THALLIUM	EPA 6020
THALLIUM	EPA 7841
TIN	EPA 6010B
VANADIUM	EPA 6010B
ZINC	EPA 6010B
ZINC	EPA 6020

PCBS AND PESTICIDES

ORGANOCHLORINE PESTICIDES BY GC: CAP.COL.	EPA 8081A	EPA 3510C
ORGANOCHLORINE PESTICIDES BY GC: CAP.COL.	EPA 8081A	EPA 3550B
POLYCHLORINATED BIPHENYLS BY GC	EPA 8082	EPA 3510C
POLYCHLORINATED BIPHENYLS BY GC	EPA 8082	EPA 3550B

SEMI-VOLATILES

POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC	EPA 8310	EPA 3510C
POLYNUCLEAR AROMATIC HYDROCARBONS BY HPLC	EPA 8310	EPA 3550B
SEMIVOLATILE ORGANICS BY GC/MS:CAP. COL.	EPA 8270C	EPA 3510C
SEMIVOLATILE ORGANICS BY GC/MS:CAP. COL.	EPA 8270C	EPA 3550B

VOLATILES (VOCS)

VOLATILE ORGANICS BY GC/MS: CAPILLARY COL.	EPA 8260B	EPA 5030B
VOLATILE ORGANICS BY GC/MS: CAPILLARY COL.	EPA 8260B	EPA 5035

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CLEAN WATER ACT

----------HERBICIDES----------

SM 6640B

2,4,5-T
2,4,5-TP (SILVEX)
2,4-D

--------PCBS AND PESTICIDES--------

EPA 608

4,4'-DDD
4,4'-DDE
4,4'-DDT
ALDRIN
ALPHA-BHC
BETA-BHC
CHLORDANE
DELTA-BHC
DIELDRIN
ENDOSULFAN I
ENDOSULFAN II
ENDOSULFAN SULFATE
ENDRIN
ENDRIN ALDEHYDE
GAMMA-BHC (LINDANE)
HEPTACHLOR
HEPTACHLOR EPOXIDE
METHOXYCHLOR
PCB-1016 (AROCLOR-1016)
PCB-1221 (AROCLOR-1221)
PCB-1232 (AROCLOR-1232)
PCB-1242 (AROCLOR-1242)
PCB-1248 (AROCLOR-1248)
PCB-1254 (AROCLOR-1254)
PCB-1260 (AROCLOR-1260)
TOXAPHENE

----------SEMI-VOLATILES----------

EPA 610

ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE

EPA 610

CHRYSENE
DIBENZO(A,H)ANTHRACENE
FLUORANTHENE
FLUORENE
INDENO(1,2,3-CD)PYRENE
NAPHTHALENE
PHENANTHRENE
PYRENE

EPA 625

1,2,4-TRICHLOROBENZENE
1,2-DICHLOROBENZENE
1,3-DICHLOROBENZENE
1,4-DICHLOROBENZENE
2,4,6-TRICHLOROPHENOL
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,6-DINITROTOLUENE
2-CHLORONAPHTHALENE
2-CHLOROPHENOL
2-METHYL-4,6-DINITROPHENOL
2-NITROPHENOL
3,3-DICHLOROBENZIDINE
4-BROMOPHENYLPHENYL ETHER
4-CHLORO-3-METHYLPHENOL
4-CHLOROPHENYL PHENYL ETHER
4-NITROPHENOL
ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZIDINE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
BENZYL BUTYL PHTHALATE
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER
BIS(2-CHLOROISOPROPYL)ETHER
BIS(2-ETHYLHEXYL)PHTHALATE
CHRYSENE
DI-N-BUTYL PHTHALATE
DI-N-OCTYL PHTHALATE
DIBENZO(A,H)ANTHRACENE
DIETHYL PHTHALATE

EPA 625

DIMETHYL PHTHALATE
FLUORANTHENE
FLUORENE
HEXACHLOROBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
INDENO(1,2,3-CD)PYRENE
ISOPHORONE
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
NAPHTHALENE
NITROBENZENE
PENTACHLOROPHENOL
PHENANTHRENE
PHENOL
PYRENE

----------VOLATILES (VOCS)---------

EPA 624

1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DICHLOROETHANE
1,1-DICHLOROETHENE
1,2-DICHLOROETHANE
1,2-DICHLOROPROPANE
BENZENE
BROMODICHLOROMETHANE
BROMOFORM
BROMOMETHANE
CARBON TETRACHLORIDE
CHLOROBENZENE
CHLOROETHANE
CHLOROFORM
CHLOROMETHANE
CIS-1,3-DICHLOROPROPENE
DIBROMOCHLOROMETHANE
DICHLORODIFLUOROMETHANE
ETHYLBENZENE
METHYLENE CHLORIDE
NAPHTHALENE
TETRACHLOROETHENE
TOLUENE
TRANS-1,2-DICHLOROETHENE
TRANS-1,3-DICHLOROPROPENE

EPA 624

TRICHLOROETHENE
TRICHLOROFLUOROMETHANE
VINYL CHLORIDE
XYLENE, TOTAL

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SOLID & HAZARDOUS WASTES

--------PCBS AND PESTICIDES--------

EPA 8081A
EPA 3510C

4,4'-DDD
4,4'-DDE
4,4'-DDT
ALDRIN
ALPHA-BHC
ALPHA-CHLORDANE
BETA-BHC
CHLORDANE
DELTA-BHC
DIELDRIN
ENDOSULFAN I
ENDOSULFAN II
ENDOSULFAN SULFATE
ENDRIN
ENDRIN ALDEHYDE
ENDRIN KETONE
GAMMA-BHC (LINDANE)
GAMMA-CHLORDANE
HEPTACHLOR
HEPTACHLOR EPOXIDE
METHOXYCHLOR
TOXAPHENE

EPA 8081A
EPA 3550B

4,4'-DDD
4,4'-DDE
4,4'-DDT
ALDRIN
ALPHA-BHC
ALPHA-CHLORDANE
BETA-BHC
CHLORDANE
DELTA-BHC
DIELDRIN
ENDOSULFAN I
ENDOSULFAN II
ENDOSULFAN SULFATE
ENDRIN
ENDRIN ALDEHYDE
ENDRIN KETONE
GAMMA-BHC (LINDANE)
GAMMA-CHLORDANE
HEPTACHLOR
HEPTACHLOR EPOXIDE

EPA 8081A
EPA 3550B

METHOXYCHLOR
TOXAPHENE

EPA 8082
EPA 3510C

PCB-1016 (AROCLOR-1016)
PCB-1221 (AROCLOR-1221)
PCB-1232 (AROCLOR-1232)
PCB-1242 (AROCLOR-1242)
PCB-1248 (AROCLOR-1248)
PCB-1254 (AROCLOR-1254)
PCB-1260 (AROCLOR-1260)

EPA 8082
EPA 3550B

PCB-1016 (AROCLOR-1016)
PCB-1221 (AROCLOR-1221)
PCB-1232 (AROCLOR-1232)
PCB-1242 (AROCLOR-1242)
PCB-1248 (AROCLOR-1248)
PCB-1254 (AROCLOR-1254)
PCB-1260 (AROCLOR-1260)

----------SEMI-VOLATILES----------

EPA 8270C
EPA 3510C

1,2,4,5-TETRACHLOROBENZENE
1,2,4-TRICHLOROBENZENE
1,2-DICHLOROBENZENE
1,2-DIPHENYLHYDRAZINE
1,3,5-TRINITROBENZENE
1,3-DICHLOROBENZENE
1,3-DINITROBENZENE
1,4-DICHLOROBENZENE
1,4-NAPHTHOQUINONE
1-NAPHTHYLAMINE
2,3,4,6-TETRACHLOROPHENOL
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,6-DICHLOROPHENOL

EPA 8270C
EPA 3510C

2,6-DINITROTOLUENE
2-ACETYLAMINOFLUORENE
2-CHLORONAPHTHALENE
2-CHLOROPHENOL
2-METHYLNAPHTHALENE
2-METHYLPHENOL
2-NAPHTHYLAMINE
2-NITROANILINE
2-NITROPHENOL
2-PICOLINE
3,3-DICHLOROBENZIDINE
3,3-DIMETHYLBENZIDINE
3-METHYLCHOLANTHRENE
3-METHYLPHENOL
3-NITROANILINE
4,6-DINITRO-2-METHYLPHENOL
4-AMINOBIPHENYL
4-BROMOPHENYLPHENYL ETHER
4-CHLORO-3-METHYLPHENOL
4-CHLOROANILINE
4-CHLOROPHENYL PHENYL ETHER
4-METHYLPHENOL
4-NITROANILINE
4-NITROPHENOL
4-NITROQUINOLINE-1-OXIDE
5-NITRO-O-TOLUIDINE
7,12-DIMETHYLBENZ(A)ANTHRACENE
A,A-DIMETHYLPHENETHYLAMINE
ACENAPHTHENE
ACENAPHTHYLENE
ACETOPHENONE
ANILINE
ANTHRACENE
ARAMITE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
BENZOIC ACID
BENZYL ALCOHOL
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER
BIS(2-CHLOROISOPROPYL)ETHER
BIS(2-ETHYLHEXYL)PHTHALATE
BUTYL BENZYL PHTHALATE
CHLOROBENZILATE
CHRYSENE

EPA 8270C
EPA 3510C

DI-N-BUTYL PHTHALATE
DI-N-OCTYL PHTHALATE
DIALLATE
DIBENZ(A,J)ACRIDINE
DIBENZO(A,H)ANTHRACENE
DIBENZOFURAN
DIETHYL PHTHALATE
DIMETHOATE
DIMETHYL PHTHALATE
DIMETHYLAMINOAZOBENZENE
DINOSEB
DIPHENYLAMINE
DISULFOTON
ETHYL METHANESULFONATE
FAMPHUR
FLUORANTHENE
FLUORENE
HEXACHLOROBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
HEXACHLOROPHENE
HEXACHLOROPROPENE
INDENO(1,2,3-CD)PYRENE
ISODRIN
ISOPHORONE
ISOSAFROLE
METHAPYRILENE
METHYL METHANESULFONATE
METHYL PARATHION
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIETHYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
N-NITROSOMETHYLETHYLAMINE
N-NITROSOMORPHOLINE
N-NITROSOPIPERIDINE
N-NITROSOPYRROLIDINE
NAPHTHALENE
NITROBENZENE
O,O,O-TRIETHYLPHOSPHOROTHIOATE
O-TOLUIDINE
PARATHION
PENTACHLOROBENZENE
PENTACHLORONITROBENZENE
PENTACHLOROPHENOL
PHENACETIN
PHENANTHRENE

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SOLID & HAZARDOUS WASTES

----------SEMI-VOLATILES---------

EPA 8270C
EPA 3510C

PHENOL
PHORATE
PRONAMIDE
PYRENE
PYRIDINE
SAFROLE
THIONAZIN

EPA 8270C
EPA 3550B

1,2,4,5-TETRACHLOROBENZENE
1,2,4-TRICHLOROBENZENE
1,2-DICHLOROBENZENE
1,2-DIPHENYLHYDRAZINE
1,3,5-TRINITROBENZENE
1,3-DICHLOROBENZENE
1,3-DINITROBENZENE
1,4-DICHLOROBENZENE
1,4-NAPHTHOQUINONE
1-NAPHTHYLAMINE
2,3,4,6-TETRACHLOROPHENOL
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,6-DICHLOROPHENOL
2,6-DINITROTOLUENE
2-ACETYLAMINOFLUORENE
2-CHLORONAPHTHALENE
2-CHLOROPHENOL
2-METHYLNAPHTHALENE
2-METHYLPHENOL
2-NAPHTHYLAMINE
2-NITROANILINE
2-NITROPHENOL
2-PICOLINE
3,3-DICHLOROBENZIDINE
3,3-DIMETHYLBENZIDINE
3-METHYLCHOLANTHRENE
3-METHYLPHENOL
3-NITROANILINE
4,6-DINITRO-2-METHYLPHENOL
4-AMINOBIPHENYL

EPA 8270C
EPA 3550B

4-BROMOPHENYLPHENYL ETHER
4-CHLORO-3-METHYLPHENOL
4-CHLOROANILINE
4-CHLOROPHENYL PHENYL ETHER
4-METHYLPHENOL
4-NITROANILINE
4-NITROPHENOL
4-NITROQUINOLINE-1-OXIDE
5-NITRO-O-TOLUIDINE
7,12-DIMETHYLBENZ(A)ANTHRACENE
A,A-DIMETHYLPHENETHYLAMINE
ACENAPHTHENE
ACENAPHTHYLENE
ACETOPHENONE
ANILINE
ANTHRACENE
ARAMITE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
BENZOIC ACID
BENZYL ALCOHOL
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL)ETHER
BIS(2-CHLOROISOPROPYL)ETHER
BIS(2-ETHYLHEXYL)PHTHALATE
BUTYL BENZYL PHTHALATE
CHLOROBENZILATE
CHRYSENE
DI-N-BUTYL PHTHALATE
DI-N-OCTYL PHTHALATE
DIALLATE
DIBENZ(A,J)ACRIDINE
DIBENZO(A,H)ANTHRACENE
DIBENZOFURAN
DIETHYL PHTHALATE
DIMETHOATE
DIMETHYL PHTHALATE
DIMETHYLAMINOAZOBENZENE
DINOSEB
DIPHENYLAMINE
DISULFOTON
ETHYL METHANESULFONATE
FAMPHUR
FLUORANTHENE
FLUORENE

EPA 8270C
EPA 3550B

HEXACHLOROBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
HEXACHLOROPHENE
HEXACHLOROPROPENE
INDENO(1,2,3-CD)PYRENE
ISODRIN
ISOPHORONE
ISOSAFROLE
KEPONE
METHAPYRILENE
METHYL METHANESULFONATE
METHYL PARATHION
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIBUTYLAMINE
N-NITROSODIETHYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
N-NITROSOMETHYLETHYLAMINE
N-NITROSOMORPHOLINE
N-NITROSOPIPERIDINE
N-NITROSOPYRROLIDINE
NAPHTHALENE
NITROBENZENE
O,O,O-TRIETHYLPHOSPHOROTHIOATE
O-TOLUIDINE
PARATHION
PENTACHLOROBENZENE
PENTACHLORONITROBENZENE
PENTACHLOROPHENOL
PHENACETIN
PHENANTHRENE
PHENOL
PHORATE
PRONAMIDE
PYRENE
PYRIDINE
SAFROLE
THIONAZIN

EPA 8310
EPA 3510C

ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZO(A)ANTHRACENE

EPA 8310
EPA 3510C

BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
CHRYSENE
DIBENZO(A,H)ANTHRACENE
FLUORANTHENE
FLUORENE
INDENO(1,2,3-CD)PYRENE
NAPHTHALENE
PHENANTHRENE
PYRENE

EPA 8310
EPA 3550B

ACENAPHTHENE
ACENAPHTHYLENE
ANTHRACENE
BENZO(A)ANTHRACENE
BENZO(A)PYRENE
BENZO(B)FLUORANTHENE
BENZO(G,H,I)PERYLENE
BENZO(K)FLUORANTHENE
CHRYSENE
DIBENZO(A,H)ANTHRACENE
FLUORANTHENE
FLUORENE
INDENO(1,2,3-CD)PYRENE
NAPHTHALENE
PHENANTHRENE
PYRENE

----------VOLATILES (VOCS)---------

EPA 8260B
EPA 5030B

1,1,1,2-TETRACHLOROETHANE
1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DICHLOROETHANE
1,1-DICHLOROETHENE
1,1-DICHLOROPROPENE
1,2,3-TRICHLOROBENZENE
1,2,3-TRICHLOROPROPANE
1,2,4-TRICHLOROBENZENE

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SOLID & HAZARDOUS WASTES

----------VOLATILES (VOCS)---------

EPA 8260B
EPA 5030B

1,2,4-TRIMETHYLBENZENE
1,2-DIBROMO-3-CHLOROPROPANE(DBCP)
1,2-DIBROMOETHANE (EDB)
1,2-DICHLOROBENZENE
1,2-DICHLOROETHANE
1,2-DICHLOROPROPANE
1,3,5-TRIMETHYLBENZENE
1,3-DICHLOROBENZENE
1,3-DICHLOROPROPANE
1,4-DICHLOROBENZENE
2,2-DICHLOROPROPANE
2-CHLOROETHYLVINYL ETHER
2-CHLOROTOLUENE
2-HEXANONE
4-CHLOROTOLUENE
4-METHYL-2-PENTANONE
ACETONE
ACETONITRILE
ACROLEIN
ACRYLONITRILE
ALLYL CHLORIDE
BENZENE
BROMOBENZENE
BROMOCHLOROMETHANE
BROMODICHLOROMETHANE
BROMOFORM
BROMOMETHANE
CARBON DISULFIDE
CARBON TETRACHLORIDE
CHLOROBENZENE
CHLOROETHANE
CHLOROFORM
CHLOROMETHANE
CHLOROPRENE
CIS-1,2-DICHLOROETHENE
CIS-1,3-DICHLOROPROPENE
CIS-1,4-DICHLORO-2-BUTENE
DIBROMOCHLOROMETHANE
DIBROMOFLUOROMETHANE
DIBROMOMETHANE
DICHLORODIFLUOROMETHANE
DIETHYL ETHER
ETHYL METHACRYLATE
ETHYLBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROETHANE

EPA 8260B
EPA 5030B

IODOMETHANE
ISOBUTYL ALCOHOL
ISOPROPYLBENZENE
METHACRYLONITRILE
METHYL ETHYL KETONE (MEK)
METHYL METHACRYLATE
METHYL TERT BUTYL ETHER (MTBE)
METHYLENE CHLORIDE
N-BUTYLBENZENE
N-PROPYLBENZENE
NAPHTHALENE
P-ISOPROPYLTOLUENE
PROPIONITRILE
SEC-BUTYLBENZENE
STYRENE
TERT-BUTYLBENZENE
TETRACHLOROETHENE
TOLUENE
TRANS-1,2-DICHLOROETHENE
TRANS-1,3-DICHLOROPROPENE
TRANS-1,4-DICHLORO-2-BUTENE
TRICHLOROETHENE
TRICHLOROFLUOROMETHANE
VINYL ACETATE
VINYL CHLORIDE
XYLENE, TOTAL

EPA 8260B
EPA 5035

1,1,1,2-TETRACHLOROETHANE
1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DICHLOROETHANE
1,1-DICHLOROETHENE
1,1-DICHLOROPROPENE
1,2,3-TRICHLOROBENZENE
1,2,3-TRICHLOROPROPANE
1,2,4-TRICHLOROBENZENE
1,2,4-TRIMETHYLBENZENE
1,2-DIBROMO-3-CHLOROPROPANE(DBCP)
1,2-DIBROMOETHANE (EDB)
1,2-DICHLOROBENZENE
1,2-DICHLOROETHANE
1,2-DICHLOROPROPANE
1,3,5-TRIMETHYLBENZENE
1,3-DICHLOROBENZENE

EPA 8260B
EPA 5035

1,3-DICHLOROPROPANE
1,4-DICHLOROBENZENE
2,2-DICHLOROPROPANE
2-CHLOROETHYLVINYL ETHER
2-CHLOROTOLUENE
2-HEXANONE
4-CHLOROTOLUENE
4-METHYL-2-PENTANONE
ACETONE
ACROLEIN
ACRYLONITRILE
ALLYL CHLORIDE
BENZENE
BROMOBENZENE
BROMOCHLOROMETHANE
BROMODICHLOROMETHANE
BROMOFORM
BROMOMETHANE
CARBON DISULFIDE
CARBON TETRACHLORIDE
CHLOROBENZENE
CHLOROETHANE
CHLOROFORM
CHLOROMETHANE
CHLOROPRENE
CIS-1,2-DICHLOROETHENE
CIS-1,3-DICHLOROPROPENE
CIS-1,4-DICHLORO-2-BUTENE
DIBROMOCHLOROMETHANE
DIBROMOFLUOROMETHANE
DIBROMOMETHANE
DICHLORODIFLUOROMETHANE
DIETHYL ETHER
ETHYL METHACRYLATE
ETHYLBENZENE
HEXACHLOROBUTADIENE
HEXACHLOROETHANE
IODOMETHANE
ISOBUTYL ALCOHOL
ISOPROPYLBENZENE
METHACRYLONITRILE
METHYL ETHYL KETONE (MEK)
METHYL METHACRYLATE
METHYL TERT BUTYL ETHER (MTBE)
METHYLENE CHLORIDE
N-BUTYLBENZENE
N-PROPYLBENZENE
NAPHTHALENE

EPA 8260B
EPA 5035

P-ISOPROPYLTOLUENE
PENTACHLOROETHANE
PROPIONITRILE
SEC-BUTYLBENZENE
STYRENE
TERT-BUTYLBENZENE
TETRACHLOROETHENE
TOLUENE
TRANS-1,2-DICHLOROETHENE
TRANS-1,3-DICHLOROPROPENE
TRANS-1,4-DICHLORO-2-BUTENE
TRICHLOROETHENE
TRICHLOROFLUOROMETHANE
VINYL ACETATE
VINYL CHLORIDE
XYLENE, TOTAL

State of Louisiana

Department of Environmental Quality

M.J. "MIKE" FOSTER, JR.
GOVERNOR

J. DALE GIVENS
SECRETARY

CERTIFIED MAIL #7001 2510 0000 6144 9583
Return Receipt Requested

August 8, 2002

AI #85085 **LELAP Certificate #03091**

Ms. Julie Trivedi
En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

RE: Scope of Accreditation

Dear Ms. Trivedi:

In accordance with Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, the State of Louisiana formally recognizes that this laboratory has successfully completed the accreditation process and is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment. Parameters or analytes that the laboratory has applied for accreditation not included in the scope of accreditation attachment are not certified.

If you have any questions, please contact the Louisiana Environmental Laboratory Accreditation Program at (225) 765-0582.

Sincerely,

Karen S. Vanado for

Louis R. C. Johnson, Accreditation Officer
Louisiana Environmental Laboratory Accreditation Program

LRCJ:KV

Attachment

Louisiana Environmental Laboratory LELAP Accreditation Program

Laboratory Scope of Accreditation

Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

RCRA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10118806	EPA 1311	TOXICITY CHARACTERISTIC LEACHING PROCEDURE	Accredited	STATE	
10155201	EPA 6010	Antimony	Accredited	STATE	
10155201	EPA 6010	Arsenic	Accredited	STATE	
10155201	EPA 6010	Barium	Accredited	STATE	
10155201	EPA 6010	Cadmium	Accredited	STATE	
10155201	EPA 6010	Chromium	Accredited	STATE	
10155201	EPA 6010	Lead	Accredited	STATE	
10155201	EPA 6010	Nickel	Accredited	STATE	
10155201	EPA 6010	Selenium	Accredited	STATE	
10155201	EPA 6010	Silver	Accredited	STATE	
10156000	EPA 6020	Antimony	Accredited	STATE	
10156000	EPA 6020	Arsenic	Accredited	STATE	
10156000	EPA 6020	Barium	Accredited	STATE	
10156000	EPA 6020	Cadmium	Accredited	STATE	
10156000	EPA 6020	Chromium	Accredited	STATE	
10156000	EPA 6020	Lead	Accredited	STATE	
10156000	EPA 6020	Nickel	Accredited	STATE	
10156000	EPA 6020	Selenium	Accredited	STATE	
10156000	EPA 6020	Silver	Accredited	STATE	
10158404	EPA 7041	Antimony	Accredited	STATE	
10158608	EPA 7060	Arsenic	Accredited	STATE	
10161009	EPA 7131	Cadmium	Accredited	STATE	
10161805	EPA 7191	Chromium	Accredited	STATE	
10162206	EPA 7196	Chromium VI	Accredited	STATE	
10164600	EPA 7421	Lead	Accredited	STATE	
10165603	EPA 7470	Mercury	Accredited	STATE	
10166004	EPA 7471	Mercury	Accredited	STATE	
10168602	EPA 7740	Selenium	Accredited	STATE	
10169809	EPA 7761	Silver	Accredited	STATE	
10178402	EPA 8081	4,4'-DDD	Accredited	STATE	
10178402	EPA 8081	4,4'-DDE	Accredited	STATE	
10178402	EPA 8081	4,4'-DDT	Accredited	STATE	
10178402	EPA 8081	Aldrin	Accredited	STATE	
10178402	EPA 8081	alpha-BHC (alpha-Hexachlorocyclohexane)	Accredited	STATE	
10178402	EPA 8081	alpha-Chlordane	Accredited	STATE	
10178402	EPA 8081	beta-BHC (beta-Hexachlorocyclohexane)	Accredited	STATE	
10178402	EPA 8081	delta-BHC	Accredited	STATE	
10178402	EPA 8081	Dieldrin	Accredited	STATE	
10178402	EPA 8081	Endosulfan I	Accredited	STATE	
10178402	EPA 8081	Endosulfan II	Accredited	STATE	
10178402	EPA 8081	Endosulfan sulfate	Accredited	STATE	

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Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

RCRA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10178402	EPA 8081	Endrin	Accredited	STATE	
10178402	EPA 8081	Endrin aldehyde	Accredited	STATE	
10178402	EPA 8081	Endrin ketone	Accredited	STATE	
10178402	EPA 8081	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	Accredited	STATE	
10178402	EPA 8081	gamma-Chlordane	Accredited	STATE	
10178402	EPA 8081	Heptachlor	Accredited	STATE	
10178402	EPA 8081	Heptachlor epoxide	Accredited	STATE	
10178402	EPA 8081	Methoxychlor	Accredited	STATE	
10178402	EPA 8081	Toxaphene (Chlorinated camphene)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1016 (PCB-1016)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1221 (PCB-1221)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1232 (PCB-1232)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1242 (PCB-1242)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1248 (PCB-1248)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1254 (PCB-1254)	Accredited	STATE	
10179007	EPA 8082	Aroclor-1260 (PCB-1260)	Accredited	STATE	
10183003	EPA 8151	2,4,5-T	Accredited	STATE	
10183003	EPA 8151	2,4-D	Accredited	STATE	
10183003	EPA 8151	Dicamba	Accredited	STATE	
10183003	EPA 8151	Silvex (2,4,5-TP)	Accredited	STATE	
10184404	EPA 8260	1,1,1-Trichloroethane	Accredited	STATE	
10184404	EPA 8260	1,1,2,2-Tetrachloroethane	Accredited	STATE	
10184404	EPA 8260	1,1,2-Trichloroethane	Accredited	STATE	
10184404	EPA 8260	1,1-Dichloroethane	Accredited	STATE	
10184404	EPA 8260	1,1-Dichloroethylene	Accredited	STATE	
10184404	EPA 8260	1,2-Dichlorobenzene	Accredited	STATE	
10184404	EPA 8260	1,2-Dichloroethane	Accredited	STATE	
10184404	EPA 8260	1,2-Dichloropropane	Accredited	STATE	
10184404	EPA 8260	1,3-Dichlorobenzene	Accredited	STATE	
10184404	EPA 8260	1,4-Dichlorobenzene	Accredited	STATE	
10184404	EPA 8260	2-Chloroethyl vinyl ether	Accredited	STATE	
10184404	EPA 8260	Acrolein (Propenal)	Accredited	STATE	
10184404	EPA 8260	Acrylonitrile	Accredited	STATE	
10184404	EPA 8260	Benzene	Accredited	STATE	
10184404	EPA 8260	Bromodichloromethane	Accredited	STATE	
10184404	EPA 8260	Bromoform	Accredited	STATE	
10184404	EPA 8260	Carbon tetrachloride	Accredited	STATE	
10184404	EPA 8260	Chlorobenzene	Accredited	STATE	
10184404	EPA 8260	Chloroethane	Accredited	STATE	
10184404	EPA 8260	Chloroform	Accredited	STATE	
10184404	EPA 8260	cis-1,3-Dichloropropene	Accredited	STATE	

Laboratory Scope of Accreditation

Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

RCRA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10184404	EPA 8260	Dibromochloromethane	Accredited	STATE	
10184404	EPA 8260	Dichlorodifluoromethane	Accredited	STATE	
10184404	EPA 8260	Ethylbenzene	Accredited	STATE	
10184404	EPA 8260	Methyl bromide (Bromomethane)	Accredited	STATE	
10184404	EPA 8260	Methyl chloride (Chloromethane)	Accredited	STATE	
10184404	EPA 8260	Methylene chloride	Accredited	STATE	
10184404	EPA 8260	o-Xylene	Accredited	STATE	
10184404	EPA 8260	Tetrachloroethylene (Perchloroethylene)	Accredited	STATE	
10184404	EPA 8260	Toluene	Accredited	STATE	
10184404	EPA 8260	trans-1,3-Dichloropropylene	Accredited	STATE	
10184404	EPA 8260	Trichloroethene (Trichloroethylene)	Accredited	STATE	
10184404	EPA 8260	Trichlorofluoromethane	Accredited	STATE	
10184404	EPA 8260	Vinyl chloride	Accredited	STATE	
10185203	EPA 8270	1,2,4-Trichlorobenzene	Accredited	STATE	
10185203	EPA 8270	2,4,6-Trichlorophenol	Accredited	STATE	
10185203	EPA 8270	2,4-Dichlorophenol	Accredited	STATE	
10185203	EPA 8270	2,4-Dimethylphenol	Accredited	STATE	
10185203	EPA 8270	2,4-Dinitrophenol	Accredited	STATE	
10185203	EPA 8270	2,4-Dinitrotoluene (2,4-DNT)	Accredited	STATE	
10185203	EPA 8270	2,6-Dinitrotoluene (2,6-DNT)	Accredited	STATE	
10185203	EPA 8270	2-Chloronaphthalene	Accredited	STATE	
10185203	EPA 8270	2-Chlorophenol	Accredited	STATE	
10185203	EPA 8270	2-Methyl-4,6-dinitrophenol	Accredited	STATE	
10185203	EPA 8270	2-Nitrophenol	Accredited	STATE	
10185203	EPA 8270	4-Chloro-3-methylphenol	Accredited	STATE	
10185203	EPA 8270	4-Nitrophenol	Accredited	STATE	
10185203	EPA 8270	Acenaphthene	Accredited	STATE	
10185203	EPA 8270	Acenaphthylene	Accredited	STATE	
10185203	EPA 8270	Anthracene	Accredited	STATE	
10185203	EPA 8270	Benzo(a)anthracene	Accredited	STATE	
10185203	EPA 8270	Benzo(a)pyrene	Accredited	STATE	
10185203	EPA 8270	Benzo(g,h,i)perylene	Accredited	STATE	
10185203	EPA 8270	Benzo(k)fluoranthene	Accredited	STATE	
10185203	EPA 8270	Benzo[b]fluoranthene	Accredited	STATE	
10185203	EPA 8270	bis(2-Chloroethoxy)methane	Accredited	STATE	
10185203	EPA 8270	bis(2-Ethylhexyl) phthalate (DEHP)	Accredited	STATE	
10185203	EPA 8270	Butyl benzyl phthalate	Accredited	STATE	
10185203	EPA 8270	Chrysene	Accredited	STATE	
10185203	EPA 8270	Dibenz(a,h) anthracene	Accredited	STATE	
10185203	EPA 8270	Diethyl phthalate	Accredited	STATE	
10185203	EPA 8270	Dimethyl phthalate	Accredited	STATE	
10185203	EPA 8270	Di-n-butyl phthalate	Accredited	STATE	

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Laboratory Scope of Accreditation

Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

RCRA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10185203	EPA 8270	Di-n-octyl phthalate	Accredited	STATE	
10185203	EPA 8270	Fluoranthene	Accredited	STATE	
10185203	EPA 8270	Fluorene	Accredited	STATE	
10185203	EPA 8270	Hexachlorobenzene	Accredited	STATE	
10185203	EPA 8270	Hexachlorobutadiene	Accredited	STATE	
10185203	EPA 8270	Hexachlorocyclopentadiene	Accredited	STATE	
10185203	EPA 8270	Hexachloroethane	Accredited	STATE	
10185203	EPA 8270	Indeno	Accredited	STATE	
10185203	EPA 8270	Isophorone	Accredited	STATE	
10185203	EPA 8270	Naphthalene	Accredited	STATE	
10185203	EPA 8270	Nitrobenzene	Accredited	STATE	
10185203	EPA 8270	Pentachlorophenol	Accredited	STATE	
10185203	EPA 8270	Phenol	Accredited	STATE	
10185203	EPA 8270	Pyrene	Accredited	STATE	
10187607	EPA 8310	Acenaphthene	Accredited	STATE	
10187607	EPA 8310	Acenaphthylene	Accredited	STATE	
10187607	EPA 8310	Anthracene	Accredited	STATE	
10187607	EPA 8310	Benzo(a)anthracene	Accredited	STATE	
10187607	EPA 8310	Benzo(a)pyrene	Accredited	STATE	
10187607	EPA 8310	Benzo(g,h,i)perylene	Accredited	STATE	
10187607	EPA 8310	Benzo(k)fluoranthene	Accredited	STATE	
10187607	EPA 8310	Benzo[b]fluoranthene	Accredited	STATE	
10187607	EPA 8310	Chrysene	Accredited	STATE	
10187607	EPA 8310	Dibenz(a,h) anthracene	Accredited	STATE	
10187607	EPA 8310	Fluoranthene	Accredited	STATE	
10187607	EPA 8310	Fluorene	Accredited	STATE	
10187607	EPA 8310	Indeno	Accredited	STATE	
10187607	EPA 8310	Naphthalene	Accredited	STATE	
10187607	EPA 8310	Phenanthrene	Accredited	STATE	
10187607	EPA 8310	Pyrene	Accredited	STATE	
10192606	EPA 9010	Amenable cyanide	Accredited	STATE	
10192606	EPA 9010	Total cyanide	Accredited	STATE	
10193201	EPA 9012	Amenable cyanide	Accredited	STATE	
10193201	EPA 9012	Total cyanide	Accredited	STATE	

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10006209	EPA 120.1	Conductivity	Accredited	STATE	
10008205	EPA 150.1	pH	Accredited	STATE	
10009208	EPA 160.1	Residue-filterable (TDS)	Accredited	STATE	
10009402	EPA 160.2	Residue-nonfilterable (TSS)	Accredited	STATE	
10009800	EPA 160.3	Residue-total	Accredited	STATE	
10013408	EPA 200.7	Titanium	Accredited	STATE	

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Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10013408	EPA 200.7	Total hardness as CaCO3	Accredited	STATE	
10013602	EPA 200.7	Aluminum	Accredited	STATE	
10013602	EPA 200.7	Antimony	Accredited	STATE	
10013602	EPA 200.7	Arsenic	Accredited	STATE	
10013602	EPA 200.7	Barium	Accredited	STATE	
10013602	EPA 200.7	Beryllium	Accredited	STATE	
10013602	EPA 200.7	Cadmium	Accredited	STATE	
10013602	EPA 200.7	Calcium	Accredited	STATE	
10013602	EPA 200.7	Chromium	Accredited	STATE	
10013602	EPA 200.7	Cobalt	Accredited	STATE	
10013602	EPA 200.7	Copper	Accredited	STATE	
10013602	EPA 200.7	Iron	Accredited	STATE	
10013602	EPA 200.7	Lead	Accredited	STATE	
10013602	EPA 200.7	Magnesium	Accredited	STATE	
10013602	EPA 200.7	Manganese	Accredited	STATE	
10013602	EPA 200.7	Molybdenum	Accredited	STATE	
10013602	EPA 200.7	Nickel	Accredited	STATE	
10013602	EPA 200.7	Potassium	Accredited	STATE	
10013602	EPA 200.7	Selenium	Accredited	STATE	
10013602	EPA 200.7	Silver	Accredited	STATE	
10013602	EPA 200.7	Sodium	Accredited	STATE	
10013602	EPA 200.7	Thallium	Accredited	STATE	
10013602	EPA 200.7	Tin	Accredited	STATE	
10013602	EPA 200.7	Vanadium	Accredited	STATE	
10013602	EPA 200.7	Zinc	Accredited	STATE	
10014401	EPA 200.8	Aluminum	Accredited	STATE	
10014401	EPA 200.8	Antimony	Accredited	STATE	
10014401	EPA 200.8	Arsenic	Accredited	STATE	
10014401	EPA 200.8	Barium	Accredited	STATE	
10014401	EPA 200.8	Beryllium	Accredited	STATE	
10014401	EPA 200.8	Cadmium	Accredited	STATE	
10014401	EPA 200.8	Chromium	Accredited	STATE	
10014401	EPA 200.8	Cobalt	Accredited	STATE	
10014401	EPA 200.8	Copper	Accredited	STATE	
10014401	EPA 200.8	Lead	Accredited	STATE	
10014401	EPA 200.8	Magnesium	Accredited	STATE	
10014401	EPA 200.8	Mercury	Accredited	STATE	
10014401	EPA 200.8	Selenium	Accredited	STATE	
10014401	EPA 200.8	Silver	Accredited	STATE	
10014401	EPA 200.8	Thallium	Accredited	STATE	
10014401	EPA 200.8	Vanadium	Accredited	STATE	
10014401	EPA 200.8	Zinc	Accredited	STATE	

Organization

03091

(608) 232-3300

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10015006	EPA 200.9	Antimony	Accredited	STATE	
10015006	EPA 200.9	Arsenic	Accredited	STATE	
10015006	EPA 200.9	Cadmium	Accredited	STATE	
10015006	EPA 200.9	Chromium	Accredited	STATE	
10015006	EPA 200.9	Copper	Accredited	STATE	
10015006	EPA 200.9	Lead	Accredited	STATE	
10015006	EPA 200.9	Silver	Accredited	STATE	
10015006	EPA 200.9	Thallium	Accredited	STATE	
10017400	EPA 204.2	Antimony	Accredited	STATE	
10018209	EPA 206.2	Arsenic	Accredited	STATE	
10023800	EPA 213.2	Cadmium	Accredited	STATE	
10026207	EPA 218.2	Chromium	Accredited	STATE	
10030203	EPA 220.2	Copper	Accredited	STATE	
10034001	EPA 239.2	Lead	Accredited	STATE	
10036609	EPA 245.1	Mercury	Accredited	STATE	
10045008	EPA 270.2	Selenium	Accredited	STATE	
10046603	EPA 272.2	Silver	Accredited	STATE	
10048803	EPA 279.2	Thallium	Accredited	STATE	
10053006	EPA 300.0	Bromide	Accredited	STATE	
10053006	EPA 300.0	Chloride	Accredited	STATE	
10053006	EPA 300.0	Fluoride	Accredited	STATE	
10053006	EPA 300.0	Nitrate	Accredited	STATE	
10053006	EPA 300.0	Sulfate	Accredited	STATE	
10054009	EPA 305.1	Acidity, as CaCO3	Accredited	STATE	
10055002	EPA 310.2	Alkalinity as CaCO3	Accredited	STATE	
10056607	EPA 325.1	Chloride	Accredited	STATE	
10061208	EPA 335.4	Total cyanide	Accredited	STATE	
10063408	EPA 350.1	Ammonia as N	Accredited	STATE	
10067206	EPA 353.2	Total nitrate-nitrite	Accredited	STATE	
10070005	EPA 365.1	Phosphorus, total	Accredited	STATE	
10072205	EPA 375.1	Sulfate	Accredited	STATE	
10074201	EPA 376.1	Sulfide	Accredited	STATE	
10077200	EPA 410.4	Chemical oxygen demand	Accredited	STATE	
10077608	EPA 413.1	Oil & Grease	Accredited	STATE	
10078407	EPA 415.1	Total organic carbon	Accredited	STATE	
10079604	EPA 420.2	Total phenolics	Accredited	STATE	
10103603	EPA 608	4,4'-DDD	Accredited	STATE	
10103603	EPA 608	4,4'-DDE	Accredited	STATE	
10103603	EPA 608	4,4'-DDT	Accredited	STATE	
10103603	EPA 608	Aldrin	Accredited	STATE	
10103603	EPA 608	alpha-BHC (alpha-Hexachlorocyclohexane)	Accredited	STATE	
10103603	EPA 608	Aroclor-1016 (PCB-1016)	Accredited	STATE	

Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10103603	EPA 608	Aroclor-1221 (PCB-1221)	Accredited	STATE	
10103603	EPA 608	Aroclor-1232 (PCB-1232)	Accredited	STATE	
10103603	EPA 608	Aroclor-1242 (PCB-1242)	Accredited	STATE	
10103603	EPA 608	Aroclor-1248 (PCB-1248)	Accredited	STATE	
10103603	EPA 608	Aroclor-1254 (PCB-1254)	Accredited	STATE	
10103603	EPA 608	Aroclor-1260 (PCB-1260)	Accredited	STATE	
10103603	EPA 608	beta-BHC (beta-Hexachlorocyclohexane)	Accredited	STATE	
10103603	EPA 608	delta-BHC	Accredited	STATE	
10103603	EPA 608	Dieldrin	Accredited	STATE	
10103603	EPA 608	Endosulfan I	Accredited	STATE	
10103603	EPA 608	Endosulfan II	Accredited	STATE	
10103603	EPA 608	Endosulfan sulfate	Accredited	STATE	
10103603	EPA 608	Endrin	Accredited	STATE	
10103603	EPA 608	Endrin aldehyde	Accredited	STATE	
10103603	EPA 608	gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	Accredited	STATE	
10103603	EPA 608	Heptachlor	Accredited	STATE	
10103603	EPA 608	Heptachlor epoxide	Accredited	STATE	
10103603	EPA 608	Toxaphene (Chlorinated camphene)	Accredited	STATE	
10104402	EPA 610	Acenaphthene	Accredited	STATE	
10104402	EPA 610	Acenaphthylene	Accredited	STATE	
10104402	EPA 610	Anthracene	Accredited	STATE	
10104402	EPA 610	Benzo(a)anthracene	Accredited	STATE	
10104402	EPA 610	Benzo(a)pyrene	Accredited	STATE	
10104402	EPA 610	Benzo(g,h,i)perylene	Accredited	STATE	
10104402	EPA 610	Benzo(k)fluoranthene	Accredited	STATE	
10104402	EPA 610	Benzo[b]fluoranthene	Accredited	STATE	
10104402	EPA 610	Chrysene	Accredited	STATE	
10104402	EPA 610	Dibenz(a,h) anthracene	Accredited	STATE	
10104402	EPA 610	Fluoranthene	Accredited	STATE	
10104402	EPA 610	Fluorene	Accredited	STATE	
10104402	EPA 610	Indeno	Accredited	STATE	
10104402	EPA 610	Naphthalene	Accredited	STATE	
10104402	EPA 610	Phenanthrene	Accredited	STATE	
10104402	EPA 610	Pyrene	Accredited	STATE	
10107207	EPA 624	1,1,1-Trichloroethane	Accredited	STATE	
10107207	EPA 624	1,1,2,2-Tetrachloroethane	Accredited	STATE	
10107207	EPA 624	1,1,2-Trichloroethane	Accredited	STATE	
10107207	EPA 624	1,1-Dichloroethane	Accredited	STATE	
10107207	EPA 624	1,1-Dichloroethylene	Accredited	STATE	
10107207	EPA 624	1,2-Dichlorobenzene	Accredited	STATE	
10107207	EPA 624	1,2-Dichloroethane	Accredited	STATE	

Organization

03091 **(608) 232-3300**

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10107207	EPA 624	1,2-Dichloropropane	Accredited	STATE	
10107207	EPA 624	1,3-Dichlorobenzene	Accredited	STATE	
10107207	EPA 624	1,4-Dichlorobenzene	Accredited	STATE	
10107207	EPA 624	2-Chloroethyl vinyl ether	Accredited	STATE	
10107207	EPA 624	Acrolein (Propenal)	Accredited	STATE	
10107207	EPA 624	Acrylonitrile	Accredited	STATE	
10107207	EPA 624	Benzene	Accredited	STATE	
10107207	EPA 624	Bromodichloromethane	Accredited	STATE	
10107207	EPA 624	Bromoform	Accredited	STATE	
10107207	EPA 624	Carbon tetrachloride	Accredited	STATE	
10107207	EPA 624	Chlorobenzene	Accredited	STATE	
10107207	EPA 624	Chloroethane	Accredited	STATE	
10107207	EPA 624	Chloroform	Accredited	STATE	
10107207	EPA 624	cis-1,3-Dichloropropene	Accredited	STATE	
10107207	EPA 624	Dibromochloromethane	Accredited	STATE	
10107207	EPA 624	Dichlorodifluoromethane	Accredited	STATE	
10107207	EPA 624	Ethylbenzene	Accredited	STATE	
10107207	EPA 624	Methyl bromide (Bromomethane)	Accredited	STATE	
10107207	EPA 624	Methyl chloride (Chloromethane)	Accredited	STATE	
10107207	EPA 624	Methylene chloride	Accredited	STATE	
10107207	EPA 624	Tetrachloroethylene (Perchloroethylene)	Accredited	STATE	
10107207	EPA 624	Toluene	Accredited	STATE	
10107207	EPA 624	trans-1,3-Dichloropropylene	Accredited	STATE	
10107207	EPA 624	Trichloroethene (Trichloroethylene)	Accredited	STATE	
10107207	EPA 624	Trichlorofluoromethane	Accredited	STATE	
10107207	EPA 624	Vinyl chloride	Accredited	STATE	
10107401	EPA 625	1,2,4-Trichlorobenzene	Accredited	STATE	
10107401	EPA 625	1,3-Dichlorobenzene	Accredited	STATE	
10107401	EPA 625	2,4,6-Trichlorophenol	Accredited	STATE	
10107401	EPA 625	2,4-Dichlorophenol	Accredited	STATE	
10107401	EPA 625	2,4-Dimethylphenol	Accredited	STATE	
10107401	EPA 625	2,4-Dinitrophenol	Accredited	STATE	
10107401	EPA 625	2,4-Dinitrotoluene (2,4-DNT)	Accredited	STATE	
10107401	EPA 625	2,6-Dinitrotoluene (2,6-DNT)	Accredited	STATE	
10107401	EPA 625	2-Chloronaphthalene	Accredited	STATE	
10107401	EPA 625	2-Chlorophenol	Accredited	STATE	
10107401	EPA 625	2-Methyl-4,6-dinitrophenol	Accredited	STATE	
10107401	EPA 625	2-Nitrophenol	Accredited	STATE	
10107401	EPA 625	3,3'-Dichlorobenzidine	Accredited	STATE	
10107401	EPA 625	4-Bromophenyl phenyl ether	Accredited	STATE	
10107401	EPA 625	4-Chloro-3-methylphenol	Accredited	STATE	
10107401	EPA 625	4-Chlorophenyl phenylether	Accredited	STATE	

Organization

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(608) 232-3300

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
10107401	EPA 625	4-Nitrophenol	Accredited	STATE	
10107401	EPA 625	Acenaphthene	Accredited	STATE	
10107401	EPA 625	Acenaphthylene	Accredited	STATE	
10107401	EPA 625	Anthracene	Accredited	STATE	
10107401	EPA 625	Benzidine	Accredited	STATE	
10107401	EPA 625	Benzo(a)anthracene	Accredited	STATE	
10107401	EPA 625	Benzo(a)pyrene	Accredited	STATE	
10107401	EPA 625	Benzo(g,h,i)perylene	Accredited	STATE	
10107401	EPA 625	Benzo(k)fluoranthene	Accredited	STATE	
10107401	EPA 625	Benzo[b]fluoranthene	Accredited	STATE	
10107401	EPA 625	bis(2-Chloroethoxy)methane	Accredited	STATE	
10107401	EPA 625	bis(2-Chloroethyl) ether	Accredited	STATE	
10107401	EPA 625	bis(2-Ethylhexyl) phthalate (DEHP)	Accredited	STATE	
10107401	EPA 625	Butyl benzyl phthalate	Accredited	STATE	
10107401	EPA 625	Chrysene	Accredited	STATE	
10107401	EPA 625	Dibenz(a,h) anthracene	Accredited	STATE	
10107401	EPA 625	Diethyl phthalate	Accredited	STATE	
10107401	EPA 625	Dimethyl phthalate	Accredited	STATE	
10107401	EPA 625	Di-n-butyl phthalate	Accredited	STATE	
10107401	EPA 625	Di-n-octyl phthalate	Accredited	STATE	
10107401	EPA 625	Fluoranthene	Accredited	STATE	
10107401	EPA 625	Fluorene	Accredited	STATE	
10107401	EPA 625	Hexachlorobenzene	Accredited	STATE	
10107401	EPA 625	Hexachlorobutadiene	Accredited	STATE	
10107401	EPA 625	Hexachlorocyclopentadiene	Accredited	STATE	
10107401	EPA 625	Hexachloroethane	Accredited	STATE	
10107401	EPA 625	Indeno	Accredited	STATE	
10107401	EPA 625	Isophorone	Accredited	STATE	
10107401	EPA 625	Naphthalene	Accredited	STATE	
10107401	EPA 625	Nitrobenzene	Accredited	STATE	
10107401	EPA 625	n-Nitrosodimethylamine	Accredited	STATE	
10107401	EPA 625	n-Nitrosodi-n-propylamine	Accredited	STATE	
10107401	EPA 625	n-Nitrosodiphenylamine	Accredited	STATE	
10107401	EPA 625	Pentachlorophenol	Accredited	STATE	
10107401	EPA 625	Phenanthrene	Accredited	STATE	
10107401	EPA 625	Phenol	Accredited	STATE	
10107401	EPA 625	Pyrene	Accredited	STATE	
10122802	EPA 1631	Mercury	Accredited	STATE	
10127409	EPA 1664	Oil & Grease	Accredited	STATE	
20003003	SM 2320 B	Alkalinity as CaCO3	Accredited	STATE	
20012800	SM 4500 F-C	Fluoride	Accredited	STATE	
20031203	SM 6630 C	Methoxychlor	Accredited	STATE	

Print Date 08/09/2002 12:00:19 PM

Organization

03091

En Chem, Inc. - Madison
525 Science Drive
Madison, WI 53711

(608) 232-3300

CWA Certification

Method Code	Method Ref	Analyte	Status	Type	AA
20031407	SM 6640 B	2,4,5-T	Accredited	STATE	
20031407	SM 6640 B	2,4-D	Accredited	STATE	
20031407	SM 6640 B	Silvex (2,4,5-TP)	Accredited	STATE	

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY
Awards the Certificate of Approval

CERTIFICATE NO.: 03091

Date: July 1, 2002

EN CHEM, INC. - MADISON
525 Science Drive
Madison, WI 53711

Agency Interest Number: 85085

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of the accreditation detailed below.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I, Subpart 3. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory.

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION TYPE
CLEAN WATER METHODS			
Endrin Ketone	EPA 608	CERTIFIED	STATE
1,2-Dichloroethylene, total cis & trans	EPA 624	CERTIFIED	STATE
Xylene, meta & para	EPA 624	CERTIFIED	STATE
Xylene, ortho	EPA 624	CERTIFIED	STATE
2,2-oxybis(1-Chloropropane)	EPA 625	CERTIFIED	STATE
2,4,5-Trichlorophenol	EPA 625	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION TYPE
SOLID AND HAZARDOUS WASTE METHODS			
Xylene, meta & para	EPA 8260B	CERTIFIED	STATE
Xylene, ortho	EPA 8260B	CERTIFIED	STATE
2,2-oxybis(1-Chloropropane)	EPA 8270C	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION TYPE
PLANT AND ANIMAL TISSUE METHODS			
Aluminum	EPA 6010B	CERTIFIED	STATE
Antimony	EPA 6010B	CERTIFIED	STATE
Arsenic	EPA 6010B	CERTIFIED	STATE
Barium	EPA 6010B	CERTIFIED	STATE
Beryllium	EPA 6010B	CERTIFIED	STATE
Cadmium	EPA 6010B	CERTIFIED	STATE
Calcium	EPA 6010B	CERTIFIED	STATE
Chromium	EPA 6010B	CERTIFIED	STATE
Cobalt	EPA 6010B	CERTIFIED	STATE
Copper	EPA 6010B	CERTIFIED	STATE
Iron	EPA 6010B	CERTIFIED	STATE
Lead	EPA 6010B	CERTIFIED	STATE
Lithium	EPA 6010B	CERTIFIED	STATE
Magnesium	EPA 6010B	CERTIFIED	STATE
Manganese	EPA 6010B	CERTIFIED	STATE
Molybdenum	EPA 6010B	CERTIFIED	STATE
Nickel	EPA 6010B	CERTIFIED	STATE
Potassium	EPA 6010B	CERTIFIED	STATE
Selenium	EPA 6010B	CERTIFIED	STATE
Silver	EPA 6010B	CERTIFIED	STATE
Sodium	EPA 6010B	CERTIFIED	STATE
Thallium	EPA 6010B	CERTIFIED	STATE
Tin	EPA 6010B	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION AUTH.
PLANT AND ANIMAL TISSUE METHODS			
Vanadium	EPA 6010B	CERTIFIED	STATE
Zinc	EPA 6010B	CERTIFIED	STATE
Aluminum	EPA 6020	CERTIFIED	STATE
Antimony	EPA 6020	CERTIFIED	STATE
Arsenic	EPA 6020	CERTIFIED	STATE
Barium	EPA 6020	CERTIFIED	STATE
Beryllium	EPA 6020	CERTIFIED	STATE
Cadmium	EPA 6020	CERTIFIED	STATE
Calcium	EPA 6020	CERTIFIED	STATE
Chromium	EPA 6020	CERTIFIED	STATE
Cobalt	EPA 6020	CERTIFIED	STATE
Copper	EPA 6020	CERTIFIED	STATE
Iron	EPA 6020	CERTIFIED	STATE
Lead	EPA 6020	CERTIFIED	STATE
Magnesium	EPA 6020	CERTIFIED	STATE
Manganese	EPA 6020	CERTIFIED	STATE
Molybdenum	EPA 6020	CERTIFIED	STATE
Nickel	EPA 6020	CERTIFIED	STATE
Potassium	EPA 6020	CERTIFIED	STATE
Selenium	EPA 6020	CERTIFIED	STATE
Silver	EPA 6020	CERTIFIED	STATE
Sodium	EPA 6020	CERTIFIED	STATE
Strontium	EPA 6020	CERTIFIED	STATE

ANALYTE	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION TYPE
PLANT AND ANIMAL TISSUE METHODS			
Thallium	EPA 6020	CERTIFIED	STATE
Tin	EPA 6020	CERTIFIED	STATE
Vanadium	EPA 6020	CERTIFIED	STATE
Zinc	EPA 6020	CERTIFIED	STATE
Antimony	EPA 7041	CERTIFIED	STATE
Cadmium	EPA 7131A	CERTIFIED	STATE
Chromium	EPA 7191	CERTIFIED	STATE
Copper	EPA 7211	CERTIFIED	STATE
Lead	EPA 7421	CERTIFIED	STATE
Mercury	EPA 7471A	CERTIFIED	STATE
Selenium	EPA 7740	CERTIFIED	STATE
Silver	EPA 7761	CERTIFIED	STATE
Thallium	EPA 7841	CERTIFIED	STATE
4,4'-DDD	EPA 8081A	CERTIFIED	STATE
4,4'-DDE	EPA 8081A	CERTIFIED	STATE
4,4'-DDT	EPA 8081A	CERTIFIED	STATE
Aldrin	EPA 8081A	CERTIFIED	STATE
alpha-BHC	EPA 8081A	CERTIFIED	STATE
alpha-Chlordane	EPA 8081A	CERTIFIED	STATE
beta-BHC	EPA 8081A	CERTIFIED	STATE
delta-BHC	EPA 8081A	CERTIFIED	STATE
Dieldrin	EPA 8081A	CERTIFIED	STATE
Endosulfan I	EPA 8081A	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION AUTH.
PLANT AND ANIMAL TISSUE METHODS			
Endosulfan II	EPA 8081A	CERTIFIED	STATE
Endosulfan Sulfate	EPA 8081A	CERTIFIED	STATE
Endrin	EPA 8081A	CERTIFIED	STATE
Endrin Aldehyde	EPA 8081A	CERTIFIED	STATE
Endrin Ketone	EPA 8081A	CERTIFIED	STATE
gamma-BHC (Lindane)	EPA 8081A	CERTIFIED	STATE
gamma-Chlordane	EPA 8081A	CERTIFIED	STATE
Heptachlor	EPA 8081A	CERTIFIED	STATE
Heptachlor Epoxide	EPA 8081A	CERTIFIED	STATE
Methoxychlor	EPA 8081A	CERTIFIED	STATE
Arachlor-1016	EPA 8082	CERTIFIED	STATE
Arachlor-1221	EPA 8082	CERTIFIED	STATE
Arachlor-1232	EPA 8082	CERTIFIED	STATE
Arachlor-1242	EPA 8082	CERTIFIED	STATE
Arachlor-1248	EPA 8082	CERTIFIED	STATE
Arachlor-1254	EPA 8082	CERTIFIED	STATE
Arachlor-1260	EPA 8082	CERTIFIED	STATE
1,2,4-Trichlorobenzene	EPA 8270C	CERTIFIED	STATE
1,2-Dichlorobenzene	EPA 8270C	CERTIFIED	STATE
1,2-Diphenylhydrazine	EPA 8270C	CERTIFIED	STATE
1,3-Dichlorobenzene	EPA 8270C	CERTIFIED	STATE
1,4-Dichlorobenzene	EPA 8270C	CERTIFIED	STATE
1-Methylnaphthalene	EPA 8270C	CERTIFIED	STATE

ANALYTE	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION AUTH.
PLANT AND ANIMAL TISSUE METHODS			
2,2-oxybis(1-Chloropropane)	EPA 8270C	CERTIFIED	STATE
2,4,5-Trichlorophenol	EPA 8270C	CERTIFIED	STATE
2,4,6-Trichlorophenol	EPA 8270C	CERTIFIED	STATE
2,4-Dichlorophenol	EPA 8270C	CERTIFIED	STATE
2,4-Dimethylphenol	EPA 8270C	CERTIFIED	STATE
2,4-Dinitrophenol	EPA 8270C	CERTIFIED	STATE
2,4-Dinitrotoluene	EPA 8270C	CERTIFIED	STATE
2,6-Dinitrotoluene	EPA 8270C	CERTIFIED	STATE
2-Chloronaphthalene	EPA 8270C	CERTIFIED	STATE
2-Chlorophenol	EPA 8270C	CERTIFIED	STATE
2-Methyl-4,6-Dinitrophenol	EPA 8270C	CERTIFIED	STATE
2-Methylnaphthalene	EPA 8270C	CERTIFIED	STATE
2-Methylphenol	EPA 8270C	CERTIFIED	STATE
2-Nitroaniline	EPA 8270C	CERTIFIED	STATE
2-Nitrophenol	EPA 8270C	CERTIFIED	STATE
3,3'-Dichlorobenzidine	EPA 8270C	CERTIFIED	STATE
3-Nitroaniline	EPA 8270C	CERTIFIED	STATE
4-Bromophenyl Phenyl Ether	EPA 8270C	CERTIFIED	STATE
4-Chloro-3-Methylphenol	EPA 8270C	CERTIFIED	STATE
4-Chloroaniline	EPA 8270C	CERTIFIED	STATE
4-Chlorophenyl Phenyl Ether	EPA 8270C	CERTIFIED	STATE
4-Methylphenol	EPA 8270C	CERTIFIED	STATE
4-Nitroaniline	EPA 8270C	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION CLASS	ACCREDITATION AUTH
PLANT AND ANIMAL TISSUE METHODS			
4-Nitrophenol	EPA 8270C	CERTIFIED	STATE
Acenaphthene	EPA 8270C	CERTIFIED	STATE
Acenaphthylene	EPA 8270C	CERTIFIED	STATE
Anthracene	EPA 8270C	CERTIFIED	STATE
Benzo(a)anthracene	EPA 8270C	CERTIFIED	STATE
Benzo(a)pyrene	EPA 8270C	CERTIFIED	STATE
Benzo(b)fluoranthene	EPA 8270C	CERTIFIED	STATE
Benzo(g,h,i)perylene	EPA 8270C	CERTIFIED	STATE
Benzo(k)fluoranthene	EPA 8270C	CERTIFIED	STATE
Benzoic Acid	EPA 8270C	CERTIFIED	STATE
Benzyl Alcohol	EPA 8270C	CERTIFIED	STATE
Benzyl Butyl Phthalate	EPA 8270C	CERTIFIED	STATE
bis(2-Chloroethoxy)methane	EPA 8270C	CERTIFIED	STATE
bis(2-Chloroethyl) Ether	EPA 8270C	CERTIFIED	STATE
bis(2-Ethylhexyl) Phthalate	EPA 8270C	CERTIFIED	STATE
Carbazole	EPA 8270C	CERTIFIED	STATE
Chrysene	EPA 8270C	CERTIFIED	STATE
Dibenzo(a,h)anthracene	EPA 8270C	CERTIFIED	STATE
Dibenzofuran	EPA 8270C	CERTIFIED	STATE
Diethyl Phthalate	EPA 8270C	CERTIFIED	STATE
Dimethyl Phthalate	EPA 8270C	CERTIFIED	STATE
Di-n-butyl Phthalate	EPA 8270C	CERTIFIED	STATE
Di-n-octyl Phthalate	EPA 8270C	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION AGENCY
PLANT AND ANIMAL TISSUE METHODS			
Fluoranthene	EPA 8270C	CERTIFIED	STATE
Fluorene	EPA 8270C	CERTIFIED	STATE
Hexachlorobenzene	EPA 8270C	CERTIFIED	STATE
Hexachlorobutadiene	EPA 8270C	CERTIFIED	STATE
Hexachlorocyclopentadiene	EPA 8270C	CERTIFIED	STATE
Hexachloroethane	EPA 8270C	CERTIFIED	STATE
Indeno(1,2,3-c,d)pyrene	EPA 8270C	CERTIFIED	STATE
Isophorone	EPA 8270C	CERTIFIED	STATE
Naphthalene	EPA 8270C	CERTIFIED	STATE
Nitrobenzene	EPA 8270C	CERTIFIED	STATE
N-Nitrosodimethylamine	EPA 8270C	CERTIFIED	STATE
N-Nitrosodi-n-propylamine	EPA 8270C	CERTIFIED	STATE
N-Nitrosodiphenylamine	EPA 8270C	CERTIFIED	STATE
Pentachlorophenol	EPA 8270C	CERTIFIED	STATE
Phenanthrene	EPA 8270C	CERTIFIED	STATE
Phenol	EPA 8270C	CERTIFIED	STATE
Pyrene	EPA 8270C	CERTIFIED	STATE
Pyridine	EPA 8270C	CERTIFIED	STATE
Acenaphthene	EPA 8270C - SIM	CERTIFIED	STATE
Acenaphthylene	EPA 8270C - SIM	CERTIFIED	STATE
Anthracene	EPA 8270C - SIM	CERTIFIED	STATE
Benzo(a)anthracene	EPA 8270C - SIM	CERTIFIED	STATE
Benzo(a)pyrene	EPA 8270C - SIM	CERTIFIED	STATE

PARAMETER	ANALYSIS METHOD	ACCREDITATION STATUS	ACCREDITATION TYPE
PLANT AND ANIMAL TISSUE METHODS			
Benzo(b)fluoranthene	EPA 8270C - SIM	CERTIFIED	STATE
Benzo(g,h,i)perylene	EPA 8270C - SIM	CERTIFIED	STATE
Benzo(k)fluoranthene	EPA 8270C - SIM	CERTIFIED	STATE
Chrysene	EPA 8270C - SIM	CERTIFIED	STATE
Dibenzo(a,h)anthracene	EPA 8270C - SIM	CERTIFIED	STATE
Fluoranthene	EPA 8270C - SIM	CERTIFIED	STATE
Fluorene	EPA 8270C - SIM	CERTIFIED	STATE
Indeno(1,2,3-c,d)pyrene	EPA 8270C - SIM	CERTIFIED	STATE
Naphthalene	EPA 8270C - SIM	CERTIFIED	STATE
Phenanthrene	EPA 8270C - SIM	CERTIFIED	STATE
Pyrene	EPA 8270C - SIM	CERTIFIED	STATE

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
RECOGNITION OF CERTIFICATION OR ACCREDITATION

The North Dakota State Department of Health recognizes the certification or accreditation of

En Chem, Inc. - 1090 Kennedy Avenue - Kimberly, Wisconsin

by

The State North Carolina Department of the Environment and Natural Resources

for

All wastewater/groundwater chemistry parameters for which they maintain certification by EPA approved Clean Water Act methods and SW846 methods from the State of North Carolina Department of the Environment and Natural Resources Division of Water Quality Laboratory Certification Program

Certificate Number: R-159

Date of issue: March 3, 2003 Expiration Date: December 31, 2003 Covers: 1/01/03 - 12/31/2003

This certificate remains the property of the North Dakota State Department of Health and may be recalled for cause, at any time, by the department. Recognition of a laboratory's certification or accreditation from another state's certification or accreditation program by the North Dakota Department of Health is not an endorsement or a guarantee of the validity or accuracy of the results reported by the laboratory.

Myra Kosse
Director, Division of Chemistry

Emil Erickson
Certification Officer

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STATE OF NORTH CAROLINA DEPARTMENT OF THE
ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF WATER QUALITY
LABORATORY CERTIFICATION PROGRAM

In accordance with the provisions of N.C.G.S. 143-215.3 (a) (1), 143-215.3 (a)(10) and NCAC 2H.0800:

EN CHEM, INC.

Is hereby certified to perform environmental analysis as listed on Attachment I and report monitoring data to DWQ for compliance with NPDES effluent, surface water, groundwater, and pretreatment regulations.

By reference 15A NCAC 2H .0800 is made a part of this certificate.

This certificate does not guarantee validity of data generated, but indicates the methodology, equipment, quality control procedures, records, and proficiency of the laboratory have been examined and found to be acceptable.

This certificate shall be valid until December 31, 2003

Certificate No. 503

Steve W. Tedder

Attachment I

North Carolina Wastewater/Groundwater Laboratory Certification

Certified Parameters Listing

Lab Name:	EN CHEM, Inc.	Certificate Number:	503
Address:	1090 Kennedy Ave Kimberly, WI 54136-	Effective Date:	01/01/2003
		Expiration Date:	12/31/2003
		Date of Last Amendment:	01/30/2003

The above named laboratory, having duly met the requirements of 15A NCAC 2H.0800, is hereby certified for the measurement of the parameters listed below.

CERTIFIED PARAMETERS

INORGANICS

ALKALINITY
- EPA Method 310.2

COD
- EPA Method 410.4

CHLORIDE
- EPA Method 325.1
- EPA Method 300

CONDUCTIVITY
- EPA Method 120.1

CYANIDE TOTAL
- EPA Method 335.3

FLUORIDE
- EPA Method 300

HARDNESS TOTAL
- EPA Method 200.7

AMMONIA NITROGEN
- EPA Method 350.1

NO2 + NO3 NITROGEN
- EPA Method 353.2

NITRATE NITROGEN
- EPA Method 300

NITRITE NITROGEN
- EPA Method 300

TOTAL PHOSPHORUS
- EPA Method 365.1

OIL & GREASE
- EPA Method 1664 Rev A
- EPA Method 413.1
- SW846 Method 9071A

pH
- EPA Method 150.1

INORGANIC PHENOLS
- EPA Method 420.2

RESIDUE TOTAL
- EPA Method 160.3

RESIDUE DISSOLVED 180 C
- EPA Method 160.1

RESIDUE SUSPENDED
- EPA Method 160.2

SULFATE
- EPA Method 375.1
- EPA Method 300

TOTAL ORGANIC CARBON
- EPA Method 415.1

METALS

ALUMINUM
- EPA Method 200.7
- SW846 Method 6010B

ANTIMONY
- EPA Method 200.7
- SW846 Method 6010B

ARSENIC
- EPA Method 200.7
- SW846 Method 6010B

BARIUM
- EPA Method 200.7
- SW846 Method 6010B

BERYLLIUM
- EPA Method 200.7
- SW846 Method 6010B

CADMIUM
- EPA Method 200.7
- SW846 Method 6010B

CALCIUM
- EPA Method 200.7
- SW846 Method 6010B

CHROMIUM TOTAL
- EPA Method 200.7
- SW846 Method 6010B

COBALT
- EPA Method 200.7
- SW846 Method 6010B

COPPER
- EPA Method 200.7
- SW846 Method 6010B

IRON
- EPA Method 200.7
- SW846 Method 6010B

LEAD
- EPA Method 200.7
- SW846 Method 6010B

MAGNESIUM
- EPA Method 200.7
- SW846 Method 6010B

MANGANESE
- EPA Method 200.7
- SW846 Method 6010B

MERCURY
- EPA Method 245.1
- EPA Method 1631
- SW846 Method 7470A
- SW846 Method 7471A

MOLYBDENUM
- EPA Method 200.7
- SW846 Method 6010B

NICKEL
- EPA Method 200.7
- SW846 Method 6010B

SELENIUM
- EPA Method 200.7
- SW846 Method 6010B

SILVER
- EPA Method 200.7
- SW846 Method 6010B

THALLIUM
- EPA Method 200.7
- SW846 Method 6010B

TIN
- EPA Method 200.7
- SW846 Method 6010B

VANADIUM
- EPA Method 200.7
- SW846 Method 6010B

ZINC
- EPA Method 200.7
- SW846 Method 6010B

ORGANICS

ORGANOCHLORINE PESTICIDES & PCBs
- EPA Method 608

ORGANOCHLORINE PESTICIDES
- SW846 Method 8081A

POLYCHLORINATED BIPHENYLS (PCB'S)
- EPA SW846 Method 8082

PURGEABLE ORGANICS
- EPA Method 624
- SW846 Method 8260B/5030B
- SW846 Method 8260B/5035

BASE NEUTRAL/ACID ORGANICS
- EPA Method 625
- SW846 Method 8270C

CHLORINATED ACID HERBICIDES
- SW846 Method 8151A

This certification requires maintance of an acceptable quality assurance program, use of approved methodology, and satisfactory performance on evaluation samples. Laboratories are subject to civil penalties and/or decertification for infractions as set forth in 15A NCAC 2H.0807.

MINNESOTA MDH DEPARTMENT OF HEALTH

Protecting, maintaining and improving the health of all Minnesotans

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

January 3, 2003

Julie Trivedi
En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

RE: Laboratory Number 055-999-107

Dear Ms. Trivedi:

We have received your laboratory's Application for Certification, appropriate fees and performance evaluation results. After reviewing all the information/documents received, we are issuing certification for the analytes as listed below. The provisional certification is valid until a certification officer makes an on-site inspection of your laboratory.

Laboratory Number 055-999-107 Certification Expiration Date: 24-JUL-2004

*Denotes provisional certification

Clean Water Program

Acidity*	EPA 305.1	Specific Conductance*	EPA 120.1
Alkalinity*	EPA 310.2	Aluminum*	EPA 200.7
Biochemical Oxygen Demand, 5 day*	EPA 405.1	Antimony*	EPA 200.7
		Arsenic*	EPA 200.7
Biochemical Oxygen Demand, 5 day*	SM 18th ED 5210B	Barium*	EPA 200.7
		Beryllium*	EPA 200.7
Biochemical Oxygen Demand, Carb.*	SM 18th ED 5210B	Boron*	EPA 200.7
		Cadmium*	EPA 200.7
Chemical Oxygen Demand*	EPA 410.4	Calcium*	EPA 200.7
Chloride*	EPA 325.1	Chromium*	EPA 200.7
Nitrogen, Ammonia*	EPA 350.1	Cobalt*	EPA 200.7
Nitrogen, Total Kjeldahl*	EPA 351.1	Copper*	EPA 200.7
Nitrogen, Nitrate*	EPA 353.2	Iron*	EPA 200.7
Nitrogen, Nitrate + Nitrite*	EPA 353.2	Lead*	EPA 200.7
Oil and Grease*	EPA 1664	Magnesium*	EPA 200.7
Organic Carbon, Total*	EPA 415.1	Manganese*	EPA 200.7
Phenol, Total Compounds*	EPA 420.2	Mercury*	EPA 1631
Phosphorus, Ortho*	EPA 365.1	Molybdenum*	EPA 200.7
Phosphorus, Total*	EPA 365.1	Nickel*	EPA 200.7
Solids, Total*	EPA 160.3	Potassium*	EPA 200.7
Solids, Dissolved*	EPA 160.1	Silver*	EPA 200.7
Solids, Nonfilterable (TSS)*	EPA 160.2	Sodium*	EPA 200.7
Solids, Volatile*	EPA 160.4		

Clean Water Program (continued)

Thallium*	EPA 200.7	Toluene*	EPA 624
Tin*	EPA 200.7	Ethyl benzene*	EPA 624
Vanadium*	EPA 200.7	m+p-Xylene*	EPA 624
Zinc*	EPA 200.7	o-Xylene*	EPA 624
Dichlorodifluoromethane*	EPA 624	Styrene*	EPA 624
Chloromethane*	EPA 624	Isopropylbenzene*	EPA 624
Vinyl chloride*	EPA 624	n-Propylbenzene*	EPA 624
Bromomethane*	EPA 624	1,3,5-Trimethylbenzene*	EPA 624
Chloroethane*	EPA 624	tert-Butylbenzene*	EPA 624
Trichlorofluoromethane*	EPA 624	1,2,4-Trimethylbenzene*	EPA 624
1,1-Dichloroethene*	EPA 624	sec-Butylbenzene*	EPA 624
Methylene chloride*	EPA 624	p-Isopropyltoluene*	EPA 624
trans-1,2-Dichloroethene*	EPA 624	n-Butylbenzene*	EPA 624
1,1-Dichloroethane*	EPA 624	Naphthalene*	EPA 624
2,2-Dichloropropane*	EPA 624	Acetone*	EPA 624
cis-1,2-Dichloroethene*	EPA 624	Ethyl ether*	EPA 624
Chloroform*	EPA 624	p-Dioxane*	EPA 624
Bromochloromethane*	EPA 624	2-Chloroethylvinylether*	EPA 624
1,1,1-Trichloroethane*	EPA 624	Methyl ethyl ketone*	EPA 624
Carbon tetrachloride*	EPA 624	Butyl benzyl phthalate*	EPA 625
1,2-Dichloroethane*	EPA 624	Di-2(ethylhexyl) phthalate*	EPA 625
Trichloroethene*	EPA 624	Di-n-butyl phthalate*	EPA 625
1,2-Dichloropropane*	EPA 624	Di-n-octyl phthalate*	EPA 625
Bromodichloromethane*	EPA 624	Diethyl phthalate*	EPA 625
Dibromomethane*	EPA 624	Dimethyl phthalate*	EPA 625
cis-1,3-Dichloropropene*	EPA 624	Aldrin*	EPA 608
trans-1,3-Dichloropropene*	EPA 624	alpha-BHC*	EPA 608
1,1,2-Trichloroethane*	EPA 624	beta-BHC*	EPA 608
1,3-Dichloropropane*	EPA 624	delta-BHC*	EPA 608
Tetrachloroethene*	EPA 624	gamma-BHC (Lindane)*	EPA 608
Chlorodibromomethane*	EPA 624	Chlordane*	EPA 608
1,2-Dibromoethane*	EPA 624	4,4'-DDD*	EPA 608
Chlorobenzene*	EPA 624	4,4'-DDE*	EPA 608
1,1,1,2-Tetrachloroethane*	EPA 624	4,4'-DDT*	EPA 608
Bromoform*	EPA 624	Dieldrin*	EPA 608
1,1,2,2-Tetrachloroethane*	EPA 624	Endosulfan I*	EPA 608
1,2,3-Trichloropropane*	EPA 624	Endosulfan II*	EPA 608
Bromobenzene*	EPA 624	Endosulfan sulfate*	EPA 608
2-Chlorotoluene*	EPA 624	Endrin*	EPA 608
4-Chlorotoluene*	EPA 624	Endrin Aldehyde*	EPA 608
1,3-Dichlorobenzene*	EPA 624	Heptachlor*	EPA 608
1,4-Dichlorobenzene*	EPA 624	Heptachlor epoxide*	EPA 608
1,2-Dichlorobenzene*	EPA 624	PCB-1016*	EPA 608
1,2-Dibromo-3-Chloropropane*	EPA 624	PCB-1221*	EPA 608
1,2,4-Trichlorobenzene*	EPA 624	PCB-1232*	EPA 608
Hexachlorobutadiene*	EPA 624	PCB-1242*	EPA 608
1,2,3-Trichlorobenzene*	EPA 624	PCB-1248*	EPA 608
Benzene*	EPA 624	PCB-1254*	EPA 608

Clean Water Program (continued)

PCB-1260*	EPA 608	Anthracene*	EPA 625
Toxaphene*	EPA 608	Benzo(a)anthracene*	EPA 625
4-Chloro-3-methylphenol*	EPA 625	Benzo(a)pyrene*	EPA 625
2-Chlorophenol*	EPA 625	Benzo(b)fluoranthene*	EPA 625
2,4-Dichlorophenol*	EPA 625	Benzo(g,h,i)perylene*	EPA 625
2,4-Dimethylphenol*	EPA 625	Benzo(k)fluoranthene*	EPA 625
2,4-Dinitrophenol*	EPA 625	Chrysene*	EPA 625
2-Methyl-4,6-dinitrophenol*	EPA 625	Dibenz(a,h)anthracene*	EPA 625
2-Nitrophenol*	EPA 625	Fluoranthene*	EPA 625
Pentachlorophenol*	EPA 625	Fluorene*	EPA 625
Phenol*	EPA 625	Indeno(1,2,3-cd)pyrene*	EPA 625
2,4,6-Trichlorophenol*	EPA 625	Naphthalene*	EPA 625
4-Nitrophenol*	EPA 625	Phenanthrene*	EPA 625
Bis-(2-chloroethyl) ether*	EPA 625	Pyrene*	EPA 625
Bis-(2-chloroethoxy)methane*	EPA 625	2,4-Dinitrotoluene*	EPA 625
4-Bromophenylphenyl ether*	EPA 625	2,6-Dinitrotoluene*	EPA 625
4-Chlorophenylphenyl ether*	EPA 625	Isophorone*	EPA 625
2-Chloronaphthalene*	EPA 625	Nitrobenzene*	EPA 625
Hexachlorobenzene*	EPA 625	3,3'-Dichlorobenzidine*	EPA 625
Hexachlorobutadiene*	EPA 625	N-Nitrosodimethylamine*	EPA 625
Hexachlorocyclopentadiene*	EPA 625	N-Nitrosodiphenylamine*	EPA 625
Hexachloroethane*	EPA 625	N-Nitrosodi-n-propylamine*	EPA 625
1,2,4-Trichlorobenzene*	EPA 625	1,1-Biphenyl*	EPA 625
Acenaphthene*	EPA 625	1,2-Diphenylhydrazine*	EPA 625
Acenaphthylene*	EPA 625		

Resource Conservation and Recovery Program

Arsenic*	EPA 6010B	Silver*	EPA 6010B
Arsenic*	EPA 6020	Silver*	EPA 6020
Barium*	EPA 6010B	Zinc*	EPA 6010B
Barium*	EPA 6020	Zinc*	EPA 6020
Cadmium*	EPA 6010B	Toxicity Characteristic Leaching Procedure*	EPA 1311
Cadmium*	EPA 6020	Acetone*	EPA 8260B
Chromium*	EPA 6010B	Carbon disulfide*	EPA 8260B
Chromium*	EPA 6020	Ethyl ether*	EPA 8260B
Copper*	EPA 6010B	p-Dioxane*	EPA 8260B
Copper*	EPA 6020	Methyl ethyl ketone*	EPA 8260B
Lead*	EPA 6010B	Methyl isobutyl ketone*	EPA 8260B
Lead*	EPA 6020	Butyl benzyl phthalate*	EPA 8270C
Molybdenum*	EPA 6010B	Di-2(ethylhexyl) phthalate*	EPA 8270C
Molybdenum*	EPA 6020	Di-n-butyl phthalate*	EPA 8270C
Nickel*	EPA 6010B	Dimethyl phthalate*	EPA 8270C
Nickel*	EPA 6020	beta-BHC*	EPA 8081A
Selenium*	EPA 6010B	gamma-BHC (Lindane)*	EPA 8081A
Selenium*	EPA 6020		

Resource Conservation and Recovery Program (continued)

4,4'-DDT*	EPA 8081A	Fluoranthene*	EPA 8270C-SIM
Endrin*	EPA 8081A	Indeno(1,2,3-cd)pyrene*	EPA 8270C
PCBs*	EPA 8082	Indeno(1,2,3-cd)pyrene*	EPA 8270C-SIM
Toxaphene*	EPA 8081A	Pyrene*	EPA 8270C
2-Methylphenol*	EPA 8270C	Pyrene*	EPA 8270C-SIM
Benzo(a)anthracene*	EPA 8270C	1,1-Biphenyl*	EPA 8270C
Benzo(a)anthracene*	EPA 8270C-SIM	1,2-Diphenylhydrazine*	EPA 8270C
Benzo(a)pyrene*	EPA 8270C	Benzoic acid*	EPA 8270C
Benzo(a)pyrene*	EPA 8270C-SIM	2,4-D*	EPA 8151A
Benzo(b)fluoranthene*	EPA 8270C	Dalapon*	EPA 8151A
Benzo(b)fluoranthene*	EPA 8270C-SIM	Dinoseb*	EPA 8151A
Benzo(k)fluoranthene*	EPA 8270C	Picloram*	EPA 8151A
Benzo(k)fluoranthene*	EPA 8270C-SIM	2,4,5-T*	EPA 8151A
Dibenz(a,h)anthracene*	EPA 8270C	2,4,5-TP (Silvex)*	EPA 8151A
Dibenz(a,h)anthracene*	EPA 8270C-SIM	Acifluorfen*	EPA 8151A
Fluoranthene*	EPA 8270C	Bentazon*	EPA 8151A

Enclosed is your laboratory's certificate.

The following methods cited on the application are not approved under the Clean Water Program:

Analyte	Method Cited
Carbonaceous Biochemical Oxygen Demand	EPA 405.1
Chloride	EPA 300.0
Cyanide	EPA 335.4
Nitrate Nitrogen	EPA 300.0
Nitrite Nigrogen	EPA 300.0
Sulfate	EPA 300.0
Titanium	EPA 200.7

With the exception of cyanide and titanium, certification was granted for other approved methods that were cited on the application.

Certification is denied for the following analytes/analyte categories under the Clean Water Program and Resource Conservation and Recovery Program because no performance evaluation sample result was provided for the term of July 24, 2001, to July 24, 2002:

Analyte	Method Cited
Nitrite Nitrogen	EPA 354.1
Hexavalent Chromium	SM 3500-Cr-D
Mercury	EPA 6020

Certification is denied for the following analytes/analyte categories under the Clean Water Program because the performance evaluation (PE) sample result provided for the term of July 24, 2001, to July 24, 2002, indicated a result outside of the acceptance limits:

Analyte	Method Cited	PE Study
Sulfide	EPA 376.1	ERA WP-87

Minnesota Rule 4740.2030, Subpart. 2, states: "The laboratory shall provide the commissioner with the results of performance from the approved provider within 30 days after the laboratory receives them. When a provider notifies the laboratory that a performance evaluation sample result falls outside acceptable results, the laboratory must promptly take corrective action. Within 30 days after receiving notice of the unacceptable results, the laboratory must submit to the commissioner documentation of the corrective action planned and taken. Within 30 days after receiving notice of unacceptable results, the laboratory must request a follow-up performance evaluation sample from an approved provider. The laboratory shall provide the commissioner with the results of the follow-up performance evaluation within 30 days after receiving them." Please provide documentation on the corrective actions taken by the laboratory in response to the unacceptable result obtained in the study above and to unacceptable results in any other studies analyzed within the last year.

Provisional certification for low-level mercury under the Clean Water Program has been granted. However, due to recent federal legislation, the method your laboratory cited on the application, EPA 1631C, has been replaced by EPA 1631E. Method 1631C has been withdrawn. Please submit a revised standard operating procedure corresponding to the requirements of EPA 1631E along with method detection limits to us within 60 days of the date you receive this letter in order to continue certification of low level mercury.

One of the methods cited on your application, EPA 413.1, for the analysis of Oil and Grease under the Clean Water Program, is not approved for use by the State of Minnesota. Certification for Oil and Grease is granted for EPA 1664.

Method detection limits were not provided for the following analytes/analyte categories:

Analyte	Method Cited
Sulfide	EPA 376.1
Mercury	EPA 245.1, EPA 6020, EPA 7470A, EPA 7471A
Acrolein, Acrylonitrile	EPA 624
Benzidine	EPA 625
Alachlor	EPA 8081A
3-Methylphenol, 2,3,4,6-Tetrachlorophenol, Benzidine, N-nitrosodi-n-butylamine, bis-2-Chloroisopropylether, Pentachlorobenzene, Pronamide, 1,2,4,5-Tetrachlorobenzene	EPA 8270C
Polyaromatic hydrocarbons	EPA 8310

Certification for these analytes and methods is denied.

If your laboratory wishes to renew its certification, send an application, appropriate fees, changes in your QA/Procedure Manual and most recent performance evaluation sample results to Certification, Public Health Laboratory, Minnesota Department of Health (MDH), 30 days prior to the expiration date noted above.

Your laboratory must analyze a performance evaluation sample from an approved provider for each certified analyte by July 24, 2003. The laboratory must forward the results of these performance evaluation samples to the MDH within 30 days from the date your laboratory receives them. In addition, it is the laboratory's duty to notify the MDH within 30 days of changes in laboratory location or ownership, major analytical equipment, test methodology or supervisory staff, as detailed in Minnesota Rules, Chapter 4740, part 4740.2030, subpart 10.

If you have questions, please call the Environmental Laboratory Certification Program at (612) 676-5200, or you may speak directly with one of the certification staff below:

Sharon Dahl	(612) 676-5243
Suzanne Skorich	(612) 676-5676
Susan Wyatt	(612) 676-5674

Sincerely,

Suzanne Skorich, Certification Officer
Environmental Laboratory Section
Public Health Laboratory Division
Minnesota Department of Health
P.O. Box 9441
Minneapolis, Minnesota 55440-9441

/sss
Enclosure

MINNESOTA MDH DEPARTMENT OF HEALTH

Minnesota Department of Health

Certificate

In accordance with Minnesota Law and Rules

En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

Laboratory Number: 055-999-107

has been certified for the analytes listed below and in our letter dated January 3, 2003.

Clean Water Program

Acidity*	EPA 305.1	Phosphorus, Ortho*	EPA 365.1	Copper*	EPA 200.7
Alkalinity*	EPA 310.2	Phosphorus, Total*	EPA 365.1	Iron*	EPA 200.7
Biochemical Oxygen Demand, 5 day*	EPA 405.1	Solids, Total*	EPA 160.3	Lead*	EPA 200.7
		Solids, Dissolved*	EPA 160.1	Magnesium*	EPA 200.7
Biochemical Oxygen Demand, 5 day*	SM 18th ED 5210B	Solids, Nonfilterable (TSS)*	EPA 160.2	Manganese*	EPA 200.7
		Solids, Volatile*	EPA 160.4	Mercury*	EPA 1631
Biochemical Oxygen Demand, Carb.*	SM 18th ED 5210B	Specific Conductance*	EPA 120.1	Molybdenum*	EPA 200.7
		Aluminum*	EPA 200.7	Nickel*	EPA 200.7
Chemical Oxygen Demand*	EPA 410.4	Antimony*	EPA 200.7	Potassium*	EPA 200.7
Chloride*	EPA 325.1	Arsenic*	EPA 200.7	Silver*	EPA 200.7
Nitrogen, Ammonia*	EPA 350.1	Barium*	EPA 200.7	Sodium*	EPA 200.7
Nitrogen, Total Kjeldahl*	EPA 351.1	Beryllium*	EPA 200.7	Thallium*	EPA 200.7
Nitrogen, Nitrate*	EPA 353.2	Boron*	EPA 200.7	Tin*	EPA 200.7
Nitrogen, Nitrate + Nitrite*	EPA 353.2	Cadmium*	EPA 200.7	Vanadium*	EPA 200.7
Oil and Grease*	EPA 1664	Calcium*	EPA 200.7	Zinc*	EPA 200.7
Organic Carbon, Total*	EPA 415.1	Chromium*	EPA 200.7		
Phenol, Total Compounds*	EPA 420.2	Cobalt*	EPA 200.7		

Certification Expiration Date: July 24, 2004
* Denotes Provisional Certification

Jan Malcolm, Commissioner of Health

MINNESOTA MDH DEPARTMENT OF HEALTH

Minnesota Department of Health

Certificate

In accordance with Minnesota Law and Rules

En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

Laboratory Number: 055-999-107

has been certified for the analytes listed below and in our letter dated January 3, 2003.

Clean Water Program (continued)

Dichlorodifluoromethane*	EPA 624	cis-1,3-Dichloropropene*	EPA 624	1,2,3-Trichlorobenzene*	EPA 624
Chloromethane*	EPA 624	trans-1,3-Dichloropropene*	EPA 624	Benzene*	EPA 624
Vinyl chloride*	EPA 624	1,1,2-Trichloroethane*	EPA 624	Toluene*	EPA 624
Bromomethane*	EPA 624	1,3-Dichloropropane*	EPA 624	Ethyl benzene*	EPA 624
Chloroethane*	EPA 624	Tetrachloroethene*	EPA 624	m+p-Xylene*	EPA 624
Trichlorofluoromethane*	EPA 624	Chlorodibromomethane*	EPA 624	o-Xylene*	EPA 624
1,1-Dichloroethene*	EPA 624	1,2-Dibromoethane*	EPA 624	Styrene*	EPA 624
Methylene chloride*	EPA 624	Chlorobenzene*	EPA 624	Isopropylbenzene*	EPA 624
trans-1,2-Dichloroethene*	EPA 624	1,1,1,2-Tetrachloroethane*	EPA 624	n-Propylbenzene*	EPA 624
1,1-Dichloroethane*	EPA 624	Bromoform*	EPA 624	1,3,5-Trimethylbenzene*	EPA 624
2,2-Dichloropropane*	EPA 624	1,1,2,2-Tetrachloroethane*	EPA 624	tert-Butylbenzene*	EPA 624
cis-1,2-Dichloroethene*	EPA 624	1,2,3-Trichloropropane*	EPA 624	1,2,4-Trimethylbenzene*	EPA 624
Chloroform*	EPA 624	Bromobenzene*	EPA 624	sec-Butylbenzene*	EPA 624
Bromochloromethane*	EPA 624	2-Chlorotoluene*	EPA 624	p-Isopropyltoluene*	EPA 624
1,1,1-Trichloroethane*	EPA 624	4-Chlorotoluene*	EPA 624	n-Butylbenzene*	EPA 624
Carbon tetrachloride*	EPA 624	1,3-Dichlorobenzene*	EPA 624	Naphthalene*	EPA 624
1,2-Dichloroethane*	EPA 624	1,4-Dichlorobenzene*	EPA 624	Acetone*	EPA 624
Trichloroethene*	EPA 624	1,2-Dichlorobenzene*	EPA 624	Ethyl ether*	EPA 624
1,2-Dichloropropane*	EPA 624	1,2-Dibromo-3-Chloropropane*	EPA 624	p-Dioxane*	EPA 624
Bromodichloromethane*	EPA 624	1,2,4-Trichlorobenzene*	EPA 624	2-Chloroethylvinylether*	EPA 624
Dibromomethane*	EPA 624	Hexachlorobutadiene*	EPA 624	Methyl ethyl ketone*	EPA 624

Certification Expiration Date: July 24, 2004
* Denotes Provisional Certification

Jan Malcolm, Commissioner of Health

MINNESOTA MDH DEPARTMENT OF HEALTH

Minnesota Department of Health

Certificate

In accordance with Minnesota Law and Rules

En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

Laboratory Number: 055-999-107

has been certified for the analytes listed below and in our letter dated January 3, 2003.

Clean Water Program (continued)

Butyl benzyl phthalate*	EPA 625	Bis-(2-chloroethoxy)methane*	EPA 625	Dibenz(a,h)anthracene*	EPA 625
Di-2(ethylhexyl) phthalate*	EPA 625	4-Bromophenylphenyl ether*	EPA 625	Fluoranthene*	EPA 625
Di-n-butyl phthalate*	EPA 625	4-Chlorophenylphenyl ether*	EPA 625	Fluorene*	EPA 625
Di-n-octyl phthalate*	EPA 625	2-Chloronaphthalene*	EPA 625	Indeno(1,2,3-cd)pyrene*	EPA 625
Diethyl phthalate*	EPA 625	Hexachlorobenzene*	EPA 625	Naphthalene*	EPA 625
Dimethyl phthalate*	EPA 625	Hexachlorobutadiene*	EPA 625	Phenanthrene*	EPA 625
4-Chloro-3-methylphenol*	EPA 625	Hexachlorocyclopentadiene*	EPA 625	Pyrene*	EPA 625
2-Chlorophenol*	EPA 625	Hexachloroethane*	EPA 625	2,4-Dinitrotoluene*	EPA 625
2,4-Dichlorophenol*	EPA 625	1,2,4-Trichlorobenzene*	EPA 625	2,6-Dinitrotoluene*	EPA 625
2,4-Dimethylphenol*	EPA 625	Acenaphthene*	EPA 625	Isophorone*	EPA 625
2,4-Dinitrophenol*	EPA 625	Acenaphthylene*	EPA 625	Nitrobenzene*	EPA 625
2-Methyl-4,6-dinitrophenol*	EPA 625	Anthracene*	EPA 625	3,3'-Dichlorobenzidine*	EPA 625
2-Nitrophenol*	EPA 625	Benzo(a)anthracene*	EPA 625	N-Nitrosodimethylamine*	EPA 625
Pentachlorophenol*	EPA 625	Benzo(a)pyrene*	EPA 625	N-Nitrosodiphenylamine*	EPA 625
Phenol*	EPA 625	Benzo(b)fluoranthene*	EPA 625	N-Nitrosodi-n-propylamine*	EPA 625
2,4,6-Trichlorophenol*	EPA 625	Benzo(g,h,i)perylene*	EPA 625	1,1-Biphenyl*	EPA 625
4-Nitrophenol*	EPA 625	Benzo(k)fluoranthene*	EPA 625	1,2-Diphenylhydrazine*	EPA 625
Bis-(2-chloroethyl) ether*	EPA 625	Chrysene*	EPA 625		

Certification Expiration Date: July 24, 2004
* Denotes Provisional Certification

Jan Malcolm, Commissioner of Health

MINNESOTA MDH DEPARTMENT OF HEALTH

Minnesota Department of Health

Certificate

In accordance with Minnesota Law and Rules

En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

Laboratory Number: 055-999-107

has been certified for the analytes listed below and in our letter dated January 3, 2003.

Resource Conservation and Recovery Program

Arsenic*	EPA 6010B	Toxicity Characteristic Leaching Proc*	EPA 1311	Benzo(b)fluoranthene*	EPA 8270C
Arsenic*	EPA 6020	Acetone*	EPA 8260B	Benzo(b)fluoranthene*	EPA 8270C-SIM
Barium*	EPA 6010B	Carbon disulfide*	EPA 8260B	Benzo(k)fluoranthene*	EPA 8270C
Barium*	EPA 6020	Ethyl ether*	EPA 8260B	Benzo(k)fluoranthene*	EPA 8270C-SIM
Cadmium*	EPA 6010B	p-Dioxane*	EPA 8260B	Dibenz(a,h)anthracene*	EPA 8270C
Cadmium*	EPA 6020	Methyl ethyl ketone*	EPA 8260B	Dibenz(a,h)anthracene*	EPA 8270C-SIM
Chromium*	EPA 6010B	Methyl isobutyl ketone*	EPA 8260B	Fluoranthene*	EPA 8270C
Chromium*	EPA 6020	Butyl benzyl phthalate*	EPA 8270C	Fluoranthene*	EPA 8270C-SIM
Copper*	EPA 6010B	Di-2(ethylhexyl) phthalate*	EPA 8270C	Indeno(1,2,3-cd)pyrene*	EPA 8270C
Copper*	EPA 6020	Di-n-butyl phthalate*	EPA 8270C	Indeno(1,2,3-cd)pyrene*	EPA 8270C-SIM
Lead*	EPA 6010B	Dimethyl phthalate*	EPA 8270C	Pyrene*	EPA 8270C
Lead*	EPA 6020	beta-BHC*	EPA 8081A	Pyrene*	EPA 8270C-SIM
Molybdenum*	EPA 6010B	gamma-BHC (Lindane)*	EPA 8081A	1,1-Biphenyl*	EPA 8270C
Molybdenum*	EPA 6020	4,4'-DDT*	EPA 8081A	1,2-Diphenylhydrazine*	EPA 8270C
Nickel*	EPA 6010B	Endrin*	EPA 8081A	Benzoic acid*	EPA 8270C
Nickel*	EPA 6020	PCBs*	EPA 8082	2,4-D*	EPA 8151A
Selenium*	EPA 6010B	Toxaphene*	EPA 8081A	Dalapon*	EPA 8151A
Selenium*	EPA 6020	2-Methylphenol*	EPA 8270C	Dinoseb*	EPA 8151A
Silver*	EPA 6010B	Benzo(a)anthracene*	EPA 8270C	Picloram*	EPA 8151A
Silver*	EPA 6020	Benzo(a)anthracene*	EPA 8270C-SIM	2,4,5-T*	EPA 8151A
Zinc*	EPA 6010B	Benzo(a)pyrene*	EPA 8270C	2,4,5-TP (Silvex)*	EPA 8151A
Zinc*	EPA 6020	Benzo(a)pyrene*	EPA 8270C-SIM	Acifluorfen*	EPA 8151A
				Bentazon*	EPA 8151A

Certification Expiration Date: July 24, 2004
* Denotes Provisional Certification

Jan Malcolm, Commissioner of Health

MINNESOTA MDH DEPARTMENT OF HEALTH

Minnesota Department of Health

Certificate

In accordance with Minnesota Law and Rules

En Chem, Inc. - Madison
1090 Kennedy Avenue
Kimberly, Wisconsin 54136

Laboratory Number: 055-999-107

has been certified for the analytes listed below and in our letter dated January 3, 2003.

Clean Water Program (continued)

Aldrin*	EPA 608	Dieldrin*	EPA 608	PCB-1221*	EPA 608
alpha-BHC*	EPA 608	Endosulfan I*	EPA 608	PCB-1232*	EPA 608
beta-BHC*	EPA 608	Endosulfan II*	EPA 608	PCB-1242*	EPA 608
delta-BHC*	EPA 608	Endosulfan sulfate*	EPA 608	PCB-1248*	EPA 608
gamma-BHC (Lindane)*	EPA 608	Endrin*	EPA 608	PCB-1254*	EPA 608
Chlordane*	EPA 608	Endrin Aldehyde*	EPA 608	PCB-1260*	EPA 608
4,4'-DDD*	EPA 608	Heptachlor*	EPA 608	Toxaphene*	EPA 608
4,4'-DDE*	EPA 608	Heptachlor epoxide*	EPA 608		
4,4'-DDT*	EPA 608	PCB-1016*	EPA 608		

Certification Expiration Date: July 24, 2004
* Denotes Provisional Certification

Jan Malcolm, Commissioner of Health

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
HTRW CENTER OF EXPERTISE
12565 WEST CENTER ROAD
OMAHA, NEBRASKA 68144-3869

REPLY TO
ATTENTION OF:

August 21, 2001

Hazardous, Toxic and Radioactive Waste
Center of Expertise

En Chem, Inc.
ATTN: Julie Trivedi
525 Science Drive
Madison, WI 53711-1060

Gentlemen:

This correspondence addresses the recent evaluation of En Chem, Inc. of Madison, WI by the U.S. Army Corps of Engineers (USACE) for chemical analysis in support of the USACE Hazardous, Toxic and Radioactive Waste Program.

Your laboratory is now validated for the parameters listed below:

METHOD	PARAMETERS	MATRIX[1]
8330	Explosives	Water[2]
8330	Explosives	Solids[2]
8151A	Herbicides	Water[2]
8151A	Herbicides	Solids
8081A	Organochlorine Pesticides	Water[2]
8081A	Organochlorine Pesticides	Solids
8082	Polychlorinated Biphenyls	Water[2]
8082	Polychlorinated Biphenyls	Solids[2]
8270C	Semivolatile Organics	Water[2]
8270C	Semivolatile Organics	Solids[2]
6010B/7000A	TAL Metals[3]	Water[2]
6010B/7000A	TAL Metals[3]	Solids[2]
8260B	Volatile Organics	Water[2]
8260B	Volatile Organics	Solids

Remarks:

1) 'Solids' includes soils, sediments, and solid waste.

2) The laboratory has successfully analyzed a performance evaluation sample for this method/matrix.

3) TAL Metals: Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Enclosed for your information is a copy of the Laboratory Inspection and Evaluation Report. Your laboratory has responded to the deficiencies as noted in the report. No further responses are necessary.

Based on the successful analysis of the performance evaluation samples, the results of the laboratory inspection, and your Corrective Action Report, your laboratory will be validated for sample analysis by the methods listed above. The period of validation is 24 months and expires on August 21, 2003.

The USACE reserves the right to conduct additional laboratory inspections or to suspend validation status for any or all of the listed parameters if deemed necessary. It should be noted that your laboratory may not subcontract USACE analytical work to any other laboratory location without the approval of this office. This laboratory validation does not guarantee the delivery of any analytical samples from a USACE Contracting Officer Representative.

Any questions or comments can be directed to Richard Kissinger at (402) 697-2569. General questions regarding laboratory validation may be directed to the Laboratory Validation Coordinator at (402) 697-2574.

Sincerely,

for Marcia C. Davies, Ph.D.
Director, USACE Hazardous,
Toxic and Radioactive Waste
Center of Expertise

Enclosure

DEPARTMENT OF THE NAVY

NAVAL FACILITIES ENGINEERING SERVICE CENTER
1100 23RD AVE
PORT HUENEME CA 93043-4370

IN REPLY REFER TO:
NFESC 413
November 8, 2001

Ms. Julie Trivedi
Interim Quality Assurance Officer
En Chem, Inc.
525 Science Drive
Madison, WI 53711-1060

Dear Ms. Trivedi,

This correspondence addresses the status of En Chem, Inc. of Madison, Wisconsin in the Navy Installation Restoration (IR) Quality Assurance (QA) Program as administered by the Naval Facilities Engineering Service Center (NFESC).

Your laboratory is accepted to perform sample analysis for the methods listed in Table 1. The period of acceptance expires August 21, 2003. This acceptance does not guarantee the delivery of any analytical samples. Acceptance is facility specific and can not be transferred to an affiliated or subcontract laboratory.

Acceptance is based on the latest assessment executed by the United States Army Corps of Engineers Hazardous, Toxic and Radioactive Waste (USACE-HTRW) Omaha, Nebraska. The period of acceptance corresponds with the date established by USACE-HTRW. The Army's assessment included an onsite inspection performed on June 26-28, 2001, and the processing of proficiency testing (PT) samples.

The Navy reserves the right to conduct additional laboratory assessments or to suspend or revoke acceptance status for any or all of the listed parameters if deemed necessary.

Table 1

METHOD	PARAMETER	MATRIX
8330	Explosives	Water(1) / Solids(1)
8151A	Herbicides	Water(1) / Solids
8081A	Organochlorine Pesticides	Water(1) / Solids
8082	Polychlorinated Biphenyls	Water(1) / Solids(1)

8270C	Semivolatile Organics	Water[1] / Solids[1]
6010B/7000A	TAL Metals: Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc	Water[1]/Solids[1]
8260B	Volatile Organics	Water[1] / Solids

Acceptance for use for parameters not identified on the table will be determined by Navy project personnel.

The laboratory should notify NFESC if there are parameters not presented on Table 1 that the laboratory expects to run on a routine basis in support of Navy installation restoration projects. In these circumstances the laboratory's capability to run the tests will be reviewed and the table will be modified accordingly.

Questions concerning the information provided should be directed to the NFESC IR QA Program coordinator, Ms. Patricia Moreno at (805) 982-1659, or via email at morenop@nfesc.navy.mil.

Sincerely,

Douglas A. Zillmer
Supervisor, Consultation/Information
Management Branch

[1] The laboratory has successfully analyzed a PT sample for this method/matrix sent by USACE-HTRW.

APPENDIX I

LABORATORY FORMS

Title

Form I-1 Bottle Request Form

Form I-2 Chain of Custody Record

Form I-3 Cooler Receipt Log

Form 1-4 Transfer to Kimberly COC

Form I-5 Laboratory Tracking Sheet

Form I-6 Nonconformance Form

Form I-7 NELAP Bottle Coding Form

Form I-8 Sample Receiving Nonconformance Form

En Chem, Inc.
Bottle Request Form

SHIP SAMPLES TO: En Chem, Inc. - 1241 Bellevue St., Suite 9 - Green Bay, WI 54302 - 920.469.2436

Client Name:_____
Client Contact:_____
Project #:_____
Project Name:_____
Project State:_____
Sample Date:_____
Sample Type:_____

Bottle Requestor:_____
Date Bottles Needed:_____
Date Requested:_____

Bottle Preparer:_____
Date Prepared:_____
Checked By:_____

Deliver to:_____
_____
_____
_____
Attn:_____
Phone:_____

Shipping Charge:_____
Method of Shipment:_____
Client Fed Ex/UPS #:_____
Cooler #'s: _____
Number/Size of Coolers:_____

EnChem Project Manager/Phone #: _____

Check if Required: _Temp. Blank __Chains of Custody __Labels __Custody Seals __Trip Blank

# of Smpls	# of Bottles	Size	Type	Preserv.	Associated Parameters	Bottle Lot Number

Comments:

(Please Print Legibly)

Company Name: _____

Branch or Location: _____

Project Contact: _____

Telephone: _____

Project Number: _____

Project Name: _____

Project State: _____

Sampled By (Print): _____

EN CHEM INC.

1241 Bellevue St., Suite 9
Green Bay, WI 54302
920-469-2436
FAX 920-469-8827

CHAIN OF CUSTODY

102357

Page _____ of _____

P.O. # _____ Quote # _____

Mail Report To: _____

Company: _____

Address: _____

Invoice To: _____

Company: _____

Address: _____

Mail Invoice To: _____

*Preservation Codes

A=None B=HCL C=H2SO4 D=HNO3 E=EnCore F=Methanol G=NaOH
H = Sodium Bisulfate Solution I = Sodium Thiosulfate J = Other

FILTERED? (YES/NO)

PRESERVATION (CODE)*

ANALYSES REQUESTED

TOTAL # OF BOTTLES SENT

Data Package Options - (please circle if requested)

Sample Results Only (no QC)
EPA Level II (Subject to Surcharge)
EPA Level III (Subject to Surcharge)
EPA Level IV (Subject to Surcharge)

Regulatory Program	Matrix Codes
UST	W=Water
RCRA	S=Soil
SDWA	A=Air
NPDES	C=Charcoal
CERCLA	B=Biota
	Sl=Sludge

LABORATORY ID (Lab Use Only)	FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX									CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)

Rush Turnaround Time Requested (TAT) - Prelim
(Rush TAT subject to approval/surcharge)

Date Needed: _____

Transmit Prelim Rush Results by (circle):

Phone Fax E-Mail

Phone #: _____

Fax #: _____

E-Mail Address: _____

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

En Chem Project No.

Sample Receipt Temp.

Sample Receipt pH (Wet/Metals)

Cooler Custody Seal

Present / Not Present

Intact / Not Intact

Version 2.0: 1/02

En Chem, Inc. Cooler Receipt Log

Batch No._____

Project Name or ID_____ No. of Coolers:_____Temps:_____

A. Receipt Phase: Date cooler was opened:_____ By:_____

1: Were samples received on ice? (Must be ≤ 6 C)....YES NO[2]

2. Was there a Temperature Blank?....YES NO

3: Were custody seals present and intact? (Record on COC)....YES NO

4: Are COC documents present?....YES NO[2]

5: Does this Project require quick turn around analysis?....YES NO

6: Is there any sub-work?....YES NO

7: Are there any short hold time tests?....YES NO

8: Are any samples nearing expiration of hold-time? (Within 2 days).... YES[1] NO Contacted by/Who_____

9: Do any samples need to be Filtered or Preserved in the lab?.... YES[1] NO Contacted by/Who_____

B. Check-in Phase: Date samples were Checked-in:_____ By:_____

1: Were all sample containers listed on the COC received and intact?....YES NO[2] NA

2: Sign the COC as received by En Chem. Completed....YES NO

3: Do sample labels match the COC? ....YES NO[2]

4: Completed pH check on preserved samples.. ....YES NO NA
(This statement does not apply to water: VOC, O&G, TOC, DRO, Total Rec. Phenolics)

5: Do samples have correct chemical preservation?....YES NO[2] NA
(This statement does not apply to water: VOC, O&G, TOC, DRO, Total Rec. Phenolics)

6: Are dissolved parameters field filtered?....YES NO[2] NA

7: Are sample volumes adequate for tests requested? ....YES NO[2]

8: Are VOC samples free of bubbles >6mm ....YES NO[2] NA

9: Enter samples into logbook. Completed....YES NO

10: Place laboratory sample number on all containers and COC. Completed....YES NO

11: Complete Laboratory Tracking Sheet (LTS). Completed....YES NO NA

12: Start Nonconformance form. ....YES NO NA

13: Initiate Subcontracting procedure. Completed....YES NO NA

14: Check laboratory sample number on all containers and COC. ....._____...YES NO NA

Short Hold-time tests:

48 Hours or less	7 days	Footnotes
Coliform (6 hrs)	Flashpoint	1 Notify proper lab group immediately.
Hexavalent Chromium (24 Hrs)	TSS	2 Complete nonconformance memo.
BOD	Total Solids	
Nitrite or Nitrate	TDS	
Low Level Mercury	Sulfide	
Ortho Phosphorus	Free Liquids	
Turbidity	Total Volatile Solids	
Surfactants	Aqueous Extractable Organics- ALL	
Sulfite	Unpreserved VOC's	
En Core Preservation	Ash	
Color		

Rev. 4/11/03, Attachment to 1-REC-5.
Subject to QA Audit.

Reviewed by/date_____

p:/everyone/forms/samplereceiving/crl.doc

EN CHEM INC.

Green Bay to Kimberly Sample Transfer Record

Client: _____

QT? ☐ yes ☐ no Due: _____

Rec Temp: _____

ANALYSES REQUESTED

TOTAL # OF BOTTLES SENT

Lab No.	Collection Date	Collection Time	Matrix															COMMENTS

Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

COMMENTS:

Cooler Custody Seal (if applicable)
Intact / Not Intact

Version 1.0: 10/02

LOCATION: _____

LTS

Shelf	Sample number(s)	IN	OUT	IN	OUT	IN	OUT	Depleted Y/N Date	Disposal Date & Haz Code	Return or Store

Comments: _____

NELAC BOTTLE CODING ASSIGNMENT		CLIENT NAME/CONTACT:			
EnChem PROJECT NO:		PROJECT NAME/NUMBER:			
		Tests Requested:			
Code	Container Size and Preservation	Water	Soil	Other	Comments

En Chem, Inc.

NONCONFORMANCE REPORT

Laboratory Section:
Inorganic _____
Organic _____

Number (QA Assigned): _____
Date: _____
Initiator: _____

Project Numbers: _____
Sample Numbers: _____

LIMS Test Group ID: _____

Describe the nonconformance / occurrence: _____

Action taken for this occurrence: _____

Section Review: _____ **Date:** _____

QA Officer's Approval: _____ **Date:** _____

Corrective action follow-up comments: _____

Copy Routing:
Project Manager: _____

THE ORIGINAL WILL BE ON FILE IN THE QUALITY ASSURANCE OFFICE

SAMPLE ENTRY NONCONFORMANCE MEMO			CLIENT NAME/CONTACT:
EnCHEM PROJECT NO:			PROJECT NAME: PROJECT NUMBER:
Problem	Lab ID	Field ID	Comments/Corrective Action
Project Notes			
No Ice / Temperature / Preservation			
Hold Time			
Headspace			
Labeling			
Container / Volume			
Broken Bottles/ Cracked Cap			
Other			

APPENDIX J

SOP LISTING

En Chem - Madison	Title	Control		
SOP #	GENERAL (GEN)	Rev. #	DATE	Status
GEN-1	Preparation of Standard Operating Procedure	4	12/98	FINAL
GEN-2	Distribution, Receipt, Return and Accessibility of QA Documents	3	11/98	FINAL
GEN-3	Determination of Sample Holding Times	1	7/99	FINAL
GEN-4	Data Recording, Signatures, Dates, and Data Handling	8	1/15/02	FINAL
GEN-5	Sample Disposal	2	9/6/2001	FINAL
GEN-6	Data Reduction, Review, Validation, and Reporting	1	7/11/01	FINAL
GEN-7	Sample Chain of Custody	4	5/97	FINAL
GEN-8	Acknowledgement of Exposure to and Revision of Standard Operating Procedures	2	12/98	FINAL
GEN-9	Purchasing/ Supply Request/ Receiving	1	10/96	**Archive**
GEN-10	Courier Service	1	6/96	**Archive**
GEN-11	Closed			
GEN-12	Hazardous Waste Handling Procedures	1	1/30/02	**Draft**
GEN-13	Preparing Archive Boxes	1	11/00	FINAL
GEN-14	Saturday Sample Receipt	0	5/98	FINAL
GEN-15	Nonconformance Memos	2	10/24/01	FINAL
GEN-16	Laboratory Notebooks	1	3/00	FINAL
GEN-17	Software Installation/Validation	0	11/98	FINAL
GEN-18	Training of Employees and Maintenance of Training Files	0	11/98	FINAL
GEN-19	Laboratory Contingency Plan for Sample Analysis	0	11/98	FINAL
GEN-20	Data Review Checklists for Level 4 Data Packages	0	12/98	**Archived** See Gen-6
GEN-21	Standard Laboratory Deliverable Formats	0	12/98	FINAL
GEN-22	Level 4 Data Package Assembly	0	12/98	FINAL
GEN-23	Policy for Data Confidentiality and Release of Data	0	11/98	FINAL
GEN-24	Label Removal	0	11/98	FINAL
GEN-25	Recordkeeping, Handling, and Disposition	0	11/98	FINAL
GEN-26	Identification of QC Samples on Laboratory Data	0	12/98	FINAL

En Chem - Madison	Title	Control		
SOP #	GENERAL (GEN)	Rev. #	DATE	Status
GEN-27	Project Management	0	1/99	FINAL
GEN-28	Review and Verification of Data Downloads	0	2/99	FINAL
GEN-29	Resolution of Client Complaints	0	3/00	FINAL
GEN-30	Sample Acceptance Policy	0	4/00	FINAL
GEN-31	Sample Narratives	0	4/00	FINAL
GEN-32	Archive Database Entry/Query	0	5/00	FINAL
GEN-33	Hazardous Waste Contingency Plan	0	3/00	**Archive**
GEN-34	Archive Box Retrieval	0	5/00	FINAL
GEN-35	Special Requirements for Analysis	1	11/00	FINAL

En Chem - Madison	Title	Control		
SOP #	LABORATORY (LAB)	Rev. #	DATE	Status
LAB-1	Pipettor Calibration	3	3/00	FINAL
LAB-2	Laboratory Corrective Action Form			**Archived**
LAB-3	Nonconformance Memos			**Archived**
LAB-4	Labeling of Reagents and Solutions			**Archived**
LAB-5	Recording of Solvent and Reagent Lot Numbers	1	8/96	Final
LAB-6	Charting of Recoveries in Control Samples	3	12/98	Final
LAB-7	Corning 220 pH Meter Operation	2	11/00	Final
LAB-8	Traceability of Analytical Standards	2	2/97	Final
LAB-9	Acid Handling	1	4/00	Final
LAB-10	Thermom/Inst Temp Cal.	1	6/99	Final
LAB-11	Compositing and Homogenizing of Samples	1	4/00	Final
LAB-12	Refrigerator and Freezer Temperature Monitoring	5	1/9/02	Final
LAB-13	Drying Oven Temperature Monitoring	2	9/96	Final
LAB-14	MDL Determination	2	3/00	Final
LAB-15	DI Water System Check	3	11/98	Final
LAB-16	Soils, Total Solids	2	5/01	Final
LAB-17	Monitoring and Changing Compressed Gas Cylinders	1	4/00	Final
LAB-18	Automatic Dishwasher Hobart Am-14	1	6/01	Final
LAB-19	Handling and Homogenization of Small Rodent Samples prior to Extraction and Digestion	0	10/99	Final
LAB-20	Orion pH Meter	1	4/00	Final
LAB-21	Preservation of VOC Samples in Solid Matricies by Method 5035	0	2/98	Final
LAB-22	Traceability of Laboratory Reagents	0	11/98	Final
LAB-23	ASTM- Soils, Total Solids.	1	4/00	Final
LAB-24	Automatic Dishwasher	0	4/99	Final
LAB-25	Inorganics Glassware Cleaning	1	4/00	Final
LAB-26	Toploader Balance Operation	1	4/00	Final
LAB-27	Preparation of Biological Tissues for Laboratory Determinations	0	6/99	Final
LAB-28	US Berkel Meat Chopper	0	8/00	Final
LAB-29	Waring Laboratory Blender	0	8/00	Final

En Chem - Madison	Title	Control		
SOP #	LABORATORY (LAB)	Rev. #	DATE	Status
LAB-30	Manual Integrations	1	10/19/01	Final
LAB-31	Solid Sample Homogenization	0	1/15/02	**Draft**
LAB-32	Raynger PM IR Temperature Gun Verification & Reading Correction	0	1/30/02	Final

En Chem - Madison	Title	Control		
SOP #	METALS (MET)	Rev. #	DATE	Status
MET-1	Closed			
MET-2	Acid Digestion of Water for Dissolved or Total Recoverable Metals-ICP	8	2/00	FINAL
MET-3	Acid Digestion of Water for Total Metals-ICP	7	2/00	FINAL
MET-4	Acid Digestion of Water for Total Metals-GFAA	6	2/00	FINAL
MET-5	Acid Digestion of Water for Arsenic and Selenium-GFAA	7	2/00	FINAL
MET-6	Acid Digestion of Solid Sample	9	10/00	FINAL
MET-7	Acid Digestion of Solid Samples for Silver, Antimony and Mercury	7	3/00	FINAL
MET-8	Acid Digestion of Solid Sample-GFAA			**Archived**
MET-9	Total Solids Dried at 103-105°C			**Archived**
MET-10	GFAA Spectrophotometer 5100Z (2)	3	4/00	FINAL
MET-11	AA Spectrophotometer P.E. 3100			**Archived**
MET-12	Open			
MET-13	Furnace Analysis of Lead	6	4/00	FINAL
MET-14	Furnace Analysis of Selenium	5	7/99	FINAL
MET-15	Furnace Analysis of Antimony	3	4/00	FINAL
MET-16	Furnace Analysis of Thallium	5	4/00	FINAL
MET-17	Open			
MET-18	Furnace Analysis of Silver	5	4/00	FINAL
MET-19	Analytical Calculations and Significant Figures			**Archived**
MET-20	Furnace Analysis of Cadmium	7	4/00	FINAL
MET-21	Furnace Analysis of Arsenic	6	4/00	FINAL
MET-22	Furnace Analysis of Chromium	6	4/00	FINAL
MET-23	Furnace Analysis of Copper	3	4/00	FINAL
MET-24	Furnace Analysis of "Screen Samples"			**Archived**
MET-25	GFAA Spectrophotometer 5100Z (1)			**Archived**
MET-26	Closed			
MET-27	ICP-AES	11	1/4/02	FINAL
MET-28	ICP-P2			**Archived**
MET-29	Hardness by Calculation	3	4/00	FINAL
MET-30	Mercury Analysis of Aqueous Samples by CVAA	7	3/01	FINAL
MET-31	Mercury Analysis of Compositional Samples by CVAA	9	12/27/01	FINAL
MET-32	Digital Hotplate/Stirrer PMC 730			Trans. to LCH SOP
MET-33	TCLP Leaching Procedure			Trans. to

En Chem - Madison	Title	Control		
SOP #	METALS (MET)	Rev. #	DATE	Status
				LCH SOP
MET-34	TCLP Neutral Leach			Trans. to LCH SOP
MET-35	SPLP Leaching Procedure			Trans. to LCH SOP
MET-36	EPTox Leaching Procedure			Trans. to LCH SOP
MET-37	EPW (Water) Leach Indiana Leach Test			Trans. to LCH SOP
MET-38	ZHE Extraction Procedure for Volatile Compounds			Trans. to LCH SOP
MET-39	MEP Leaching Procedure			Trans. to LCH SOP
MET-40	ASTM Shake Extraction of Solid Waste With Water			Trans. to LCH SOP
MET-41	AFS Leaching Procedure			Trans. to LCH SOP
MET-42	TJA ICP Instrument Operating Procedure	3	7/00	FINAL
MET-43	Hexavalent Chromium Flame AA Analysis			**Archived**
MET-44	Hexavalent Chromium Chelation Extraction			**Archived**
MET-45	Microwave Digestion Aqueous	3	6/01	FINAL
MET-46	Microwave Digestion Compositional	3	6/01	FINAL
MET-47	Questron Q-wave 3000 Operation	2	2/00	**Archived**
MET-48	ZHE Vessel Cleaning Procedure	0	1/97	Trans. to LCH SOP
MET-49	Hexavalent Chromium Colorimetric			**Archived**
MET-50	Graphite Furnace Atomic Absorption Spectrometer			**Archived**
MET-51	Acid Volatile Sulfide			**Archived**
MET-52	TJA ICAP 61E			**Archived**
MET-53	Alkaline Extraction of Hexavalent Chromium			**Archived**
MET-54	GFAA Spectrophotometer 5100Z (3)			**Archived**
MET-55	Cation Exchange Capacity	0	7/00	FINAL
MET-56	Spiking Procedure for Metals Analysis	2	3/00	FINAL
MET-57	FIMS AA Spectrophotometer	2	3/00	FINAL
MET-58	Determination of Trace Metals by ICP-MS	4	8/00	FINAL
MET-59	Acid Digestion of Biota Samples	1	3/00	FINAL

En Chem - Madison	Title	Control		
SOP #	METALS (MET)	Rev. #	DATE	Status
MET-60	MARS5 CEM Microwave	0	8/17/01	FINAL
MET-61	Hot Block Tube Volume Verification	0	10/24/01	FINAL

En Chem - Madison	Title	Control		
SOP #	**Quality Assurance (QAU)**	Rev. #	Date	Status
QAU-1	Quality Assurance Facility Audit Procedures	2	12/98	Final

En Chem - Madison	Title	Control		
SOP #	RECEIVING	Rev. #	Date	Status
REC-1	LIMS Representation of Special Requests	0	5/94	**Archived**
REC-2	Sample Bottle Tags	1	9/97	Final
REC-3	Sample Bottle Requests and Preparation	2	1/15/02	Final
REC-4	Subcontracting	1	11/30/01	Final
REC-5	Cooler Receipt Log	2	5/01	Final
REC-6	Closed			
REC-7	Sample Receipt and Log-in	3	5/01	Final
REC-8	Chain of Custody	2	11/30/01	Final
REC-9	Balance Calibration and Tare Wt. of 60-mL Containers	1	10/96	Final
REC-10	Sample Storage	1	8/96	Final
REC-11	EnCore Sampler Extrusion	0	9/96	Final
REC-12	Closed			
REC-13	Balance Cal. & Initial Weighing for Total Solids	1	9/96	Final

En Chem - Madison	Title	Control		
SOP #	SEMIVOLATILES (SVO)	Rev. #	Date	Status
SVO-1	Extraction of Water Samples for Base/Neutral/Acids	4	7/9/2001	Final
SVO-2	Extraction for TCLP Base/Neutral/Acids	3	2/98	Final
SVO-3	Extraction of Water Samples for Base/Neutral/Acids Continuous Liquid-Liquid Extraction	4	12/98	Final
SVO-4	Extraction of Soil Samples for Base/Neutral/Acids	3	2/98	Final
SVO-5	Extraction of Soil Samples for Base/Neutral/Acids CLP Protocol	2	8/96	Final
SVO-6	Extraction of Water Samples for Organochlorine Pesticides/PCBs	4	7/00	Final
SVO-7	Extraction for TCLP Organochlorine Pesticides	3	2/98	Final
SVO-8	Extraction of Organochlorine Pesticide/PCB Water Samples CLP Protocol	2	5/97	Final
SVO-9	Extraction of Water Samples for Organophosphorus Pesticides	1	2/94	**Archived**
SVO-10	Extraction of Soil Samples for Organochlorine Pesticides/PCBs	3	7/98	Final
SVO-11	Extraction of Organochlorine Pesticide/PCB Soil Samples CLP Protocol	2	5/97	Final
SVO-12	Extraction of Soil Samples for Organophosphorus Pesticides	1	3/97	**Archived**
SVO-13	Extraction of Water Samples for Chlorinated Herbicides	4	1/9/02	Final
SVO-14	Extraction for TCLP Chlorinated Herbicides	2	3/97	Final
SVO-15	Extraction of Water Samples for Total Petroleum Hydrocarbons as Diesel	1	2/94	**Archived**
SVO-16	Extraction of Water Samples for Diesel Range Organics (DRO)	2	6/95	**Archived**

En Chem - Madison	Title	Control		
SOP #	SEMIVOLATILES (SVO)	Rev. #	Date	Status
SVO-17	Extraction of Total Petroleum Hydrocarbons as Diesel Soil Samples	1	2/94	**Archived**
SVO-18	Extraction of Soil Samples for Diesel Range Organics (DRO)	2	6/95	**Archived**
SVO-19	Medium Level Extraction of Soil Samples for Base/Neutral/Acids	2	5/97	Final
SVO-20	Medium Level Extraction of Soil Samples for Base/Neutral/Acids CLP Protocol	2	5/97	Final
SVO-21	Medium Level Extraction of Soil Samples for Toxaphene and PCBs	2	5/97	Final
SVO-22	Extraction of Oil Samples for PCBs	3	3/00	Final
SVO-23	Extraction of Water Samples for Total Petroleum Hydrocarbons by Infrared Spectroscopy	1	2/97	Final
SVO-24	Extraction of Soil Samples for Total Petroleum Hydrocarbons by Infrared Spectroscopy	2	2/97	Final
SVO-25	Florisil Cleanup	2	3/97	Final
SVO-26	Gel Permeation Chromotography	2	11/97	Final
SVO-27	Sulfur Cleanup	1	9/96	Final
SVO-28	Sulfuric Acid Cleanup	2	8/96	Final
SVO-29	Total Petroleum Hydrocarbons as Diesel (Cal. Method.)	1	2/94	**Archived**
SVO-30	Diesel Range Organics	2	2/94	**Archived**
SVO-31	Analysis of Organophosphorus Pesticides	0	2/94	**Archived**
SVO-32	Analysis of Chlorinated Herbicides	3	1/10/02	Final
SVO-33	Analysis of Toxaphene	3	6/99	Final
SVO-34	Analysis of PCBs	1	2/94	**Archived**
SVO-35	Analysis of Organochlorine Pesticides and PCBs	4	12/97	**Archived**
SVO-36	Analysis of Organochlorine Pesticides and PCBs CLP Protocol	2	8/96	Final

En Chem - Madison	Title	Control		
SOP #	SEMIVOLATILES (SVO)	Rev. #	Date	Status
SVO-37	Analysis of BNA Compounds by GC/MS	10	1/10/02	Final
SVO-38	Analysis of BNA Compounds by GC/MS CLP Protocol	0	2/94	Final
SVO-39	Extraction of Soil Samples for PAHs by HPLC	0	5/96	Final
SVO-40	Extraction of Water Samples for PAHs by HPLC	0	5/96	Final
SVO-41	Analysis of Polynuclear Aromatic Hydrocarbons (PAH)	2	12/97	Final
SVO-42	Herbicides in Soil Extraction	2	1/9/02	Final
SVO-43	Glassware Cleaning	2	12/98	Final
SVO-44	Prevention of Cross Contamination and Prescreening of Solvents	0	3/97	Final
SVO-45	Extraction of PCB Wipe Samples	1	4/00	Final
SVO-46	Benzene Analysis by FID			**Archived**
SVO-47	Analysis of Water Samples for Methanol	0	9/96	Final
SVO-48	Open			
SVO-49	Analysis of PAH Method 610	2	6/00	Final
SVO-50	Determination of Nitroglycerin in Soil/Sediment by HPLC	0	8/97	Final
SVO-51	Analysis of Organochlorine Pesticides by GC	5	6/00	Final
SVO-52	Analysis of Polychlorinated Biphenyls (PCBs) by GC	3	1/00	Final
SVO-53	Sonic Probe Use and Maint.	1	6/99	Final
SVO-54	Extraction of Neutrogena Coal Tar Based Samples for PAH.	1	3/99	Final
SVO-55	Extraction of Neutrogena Coal Tar Based Samples for Benzo(a)Pyrene.	0	3/99	Final
SVO-56	ASE	0	7/99	**Archived**
SVO-57	Florisil Column Cleanup for PCB's	0	4/99	Final
SVO-58	Silica Gel Cleanup and	0	4/99	Final

	Separation of Pesticides and PCB's.			
SVO-59	Determination of Lipids in Tissues, Fats, and Plants.	0	4/99	Final
SVO-60	Extraction of Biological Samples for Organochlorine Pesticides/PCB's	1	7/00	Final
SVO-61	Extraction of Biological Samples for PAH's	1	2/00	Final
SVO-62	Congener specific analysis of PCB in Tissue	2	10/31/01	Final
SVO-63	Analysis of PAH in Soil, Water and Biota by GC/MS-SIM	2	12/00	Final
SVO-64	Congener specific analysis of PCB in Soils and Sediments	2	11/05/01	Final
SVO-65	Congener specific analysis of PCB in Water	1	11/05/01	Final
SVO-66	Extraction of Biological Samples for PAH's by GC/MS-SIM	0	4/01	Final
SVO-67	Extraction of Soil Samples for PAH's by GC/MS-SIM	2	4/01	Final
SVO-68	Determination of N-Methyl Carbamates and N-Methyl Carbamoyl Oximes in Water	0	5/00	Final
SVO-69	Nitroaromatics and Nitramines in Soil/Sediments by HPLC	1	1/10/02	Final
SVO-70	Extraction of Biota Samples for Base/Neutral/Acids	0	7/00	Final
SVO-71	Nitroaromatics and Nitramines in Water by HPLC	1	1/10/02	Final
SVO-72	Generation of Diazomethane from Diazald	0	8/00	Final
SVO-73	Analysis of Semivolatile (BNA) Compounds by GC/MS in Biological Matrices	0	8/00	Final
SVO-74	Extraction of Water Samples for Pentachlorophenol by GC/MS-SIM	0	11/00	Final
SVO-75	Analysis of Pentachlorophenol in Water by GC/MS-SIM HP-5973	0	11/00	Final
SVO-76	Extraction of Water Samples for PAH's by GC/MS-SIM	0	4/01	Final

En Chem - Madison	Title	Control		
SOP #	Volatile Organics (VOA)	Rev. #	Date	Status
VOA-1	Storage Blank Preparation and Analysis	0	8/97	Final
VOA-2	Closed			
VOA-3	Prep. of VOA Stock and Working Standards	1	3/95	**Archived**
VOA-4	Analysis of Volatile Organics by ELCD/PID GC	1	8/94	**Archived**
VOA-5	Volatile Organics Analysis by GC/MS 8260	9	1/10/02	Final
VOA-5 Addendum	Prep & Analysis of Methanol Extracted Vegetable Oil	0	10/23/01	Final
VOA-6	Low Level VOA by GC/MS Method 524.2	1	8/94	Final
VOA-7	VOA GC/MS Report Submission	1	2/95	**Archived**
VOA-8	IOP for VOA GC/MS	1	3/95	Final
VOA-9	Volatile Organics Analysis of Solid Matricies Methods 5035/8260B	3	1/10/02	Final
VOA-10	Glassware Cleaning Procedure	0	7/98	Final
VOA-11	Volatile Organics Analysis by GC/MS Method 624	0	6/00	Final
VOA-12	Analysis of Low Concentration Water for Purgeable VOCs	0	10/16/01	Final

En Chem - Madison	Title	Control		
SOP #	WET CHEMISTRY (WCM)	Rev. #	DATE	Status
WCM-1	Total Suspended Solids Dried at 103-105°C Volatile Solids Ignited at 550°C	9	12/19/01	FINAL
WCM-2	Total Organic Carbon (TOC) in Water	9	4/99	FINAL
WCM-3	Phenolics, Total Recoverable Distillation	3	4/00	FINAL
WCM-4	Oil & Grease, Total Recoverable, Gravimetric Separatory Funnel Extraction	2	8/99	FINAL
WCM-5	Chemical Oxygen Demand Open Reflux Method Mid Level	4	8/96	**Archived**
WCM-6	OPEN			
WCM-7	Nitrogen, Ammonia, Colorimetric, Distillation	2	3/94	**Archived 10/97**
WCM-8	Phenolics, Total Recoverable Automated Analysis	7	1/01	FINAL
WCM-9	Total Organic Carbon Analysis in Soils, Sludge, and Solid Waste	12	8/3/01	FINAL
WCM-10	Total Solids Dried at 103-105°C; Volatile Solids Ignited at 550°C	4	4/00	FINAL
WCM-11	Total Dissolved Solids Dried at 180°C; Volatile Solids Ignited at 550°C	4	8/99	FINAL
WCM-12	Alkalinity, Titrimetric, pH 4.5	5	8/96	**Archived**
WCM-13	Alkalinity, Titrimetric, pH 8.3 & 4.5	5	10/00	FINAL
WCM-14	Iodide Analysis, Titrimetric	2	8/96	**Archived 12/97**
WCM-15	Bromide Analysis, Titrimetric	1	8/96	**Archived 12/97**
WCM-16	Acidity, Titrimetric	2	8/99	FINAL
WCM-17	Conductivity	5	8/99	FINAL
WCM-18	TOC Analyzer	5	4/99	FINAL
WCM-19	Chloride, Automated Analysis	7	1/01	FINAL
WCM-20	Sulfate	6	1/01	FINAL
WCM-21	Sulfide-Water	4	7/99	FINAL
WCM-22	Sulfides Titrimetric-Soil	4	7/99	FINAL
WCM-23	Total Cyanide, Automated Analysis	7	11/00	FINAL
WCM-24	Turbidity	3	8/99	FINAL
WCM-25	Nitrogen, Ammonia, Distillation Procedure	6	1/01	FINAL
WCM-26	TKN, Colorimetric	2	8/96	**Archived 12/97**

En Chem - Madison	Title	Control		
SOP #	WET CHEMISTRY (WCM)	Rev. #	DATE	Status
WCM-27	UV-Vis Single Beam Spectrophotometer	2	8/96	**Archived 12/97**
WCM-28	Total Alkalinity Automated Analysis	6	1/01	FINAL
WCM-29	Automated Ion Analyzer System	5	3/00	FINAL
WCM-30	Cyanide Distillation Aqueous and Compositional	1	9/97	**Archived 10/97**
WCM-31	Reactive Cyanide and Sulfide, Preparation	4	4/00	FINAL
WCM-32	Chemical Oxygen Demand Open Reflux Method Low Level	4	8/96	**Archived**
WCM-33	Nitrate-Nitrite Automated Analysis	7	1/01	FINAL
WCM-34	Cyanide, Weak and Dissociable Distillation	1	7/99	FINAL
WCM-35	Cyanide Amenable to Chlorination- Distillation	2	7/99	FINAL
WCM-36	Nitrogen- Nitrite Automated Analysis	4	1/01	FINAL
WCM-37	Midi-Dist Cyanide Distillation	4	11/00	FINAL
WCM-38	Color	1	8/99	FINAL
WCM-39	COD - Colorimetric Manual (Vial Low)	5	10/00	FINAL
WCM-40	COD - Colorimetric Manual (Vial Mid)	4	4/00	FINAL
WCM-41	Oil and Grease, Total Recoverable, Compositional	4	3/00	FINAL
WCM-42	Fluoride by Ion Selective Electrode - Aqueous	9	12/28/01	FINAL
WCM-43	Fluoride by Ion Selective Electrode - Soils	4	8/99	FINAL
WCM-44	Phosphorus, All Forms Automated Analysis	5	3/00	FINAL
WCM-45	Flashpoint	2	8/99	FINAL
WCM-46	Paint Filter Liquids Test	2	8/99	FINAL
WCM-47	Specific Gravity	2	3/00	FINAL
WCM-48	Ferrous Iron	2	1/01	FINAL
WCM-49	Nitrogen Ammonia Ion Selective Electrode	1	8/99	FINAL
WCM-50	Bromide, Automated Analysis	1	8/99	FINAL
WCM-51	Biochemical Oxygen Demand	1	1/01	FINAL
WCM-52	Total Kjeldahl Nitrogen, I.S.E.	1	7/99	**Archived**
WCM-53	Turbidimetric Sulfate	1	8/99	FINAL
WCM-54	pH Analysis	1	8/99	FINAL
WCM-55	Settleable Solids	1	8/99	FINAL
WCM-56	Oxidation Reduction Potential- Eh	1	8/99	FINAL

En Chem - Madison	Title	Control		
SOP #	WET CHEMISTRY (WCM)	Rev. #	DATE	Status
WCM-57	Free Acidity, Titrimetric	1	8/99	FINAL
WCM-58	Ammonia Nitrogen- Automated Analysis	4	1/01	FINAL
WCM-59	Ion Chromatography - IOP	2	3/00	FINAL
WCM-60	Anions by Ion Chromatography	6	12/27/01	FINAL
WCM-61	Chromium, Hexavalent-Colorimetric	1	1/01	FINAL
WCM-62	Alkaline Extraction of Hexavalent Chromium	2	4/01	FINAL
WCM-63	AVS and SEM in Sediment	1	4/00	FINAL
WCM-64	Total Kjeldahl Nitrogen	2	1/01	FINAL
WCM-65	Thiocyanate Determination	2	10/00	FINAL
WCM-66	Particle Size Reduction	0	9/00	FINAL
WCM-67	Oil & Grease, SPE	0	7/23/01	FINAL
WCM-68	O&G SPE-DEX 4790 System	0		**Draft**
WCM-69	Apollo 9000 IOP	1	8/3/01	FINAL
WCM-70	TOC Water by Appolo 9000	1	8/3/01	FINAL
WCM-71	Preservation of Aqueous Samples for Low Level Mercury	0	8/01	FINAL
WCM-72	Cold-Vapor Atomic Fluorescence Spectrometry Mercury Analysis	2	11/30/01	FINAL

APPENDIX K

METHOD REFERENCES

En Chem, Inc. Method References

1. Federal Register, Volume 44, No. 223, December 3, 1979, 40 CFR Part 136, pp. 69464 to 69575.

2. "Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act," CFR Part 136, October 26, 1984.

3. "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-79-020, U.S. Environmental Protection Agency, March 1979.

4. "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, USEPA, (3rd Edition).

5. Standard Methods for the Examination of Water and Wastewater, 18th ed., American Public Health Association.

6. "The Analysis of Aromatic Chemicals in Water by the Purge and Trap Method," Method 503.1, U.S. Environmental Protection Agency, Physical and Chemical Methods Branch, Cincinnati, Ohio, May 1980.

7. "Evaluation of Selected Lipid Methods for Normalizing Pollutant Bioaccumulation", Environmental Toxicology and Chemistry, Volume 10, 1992

8. "Official Methods of Analysis of the Association of Official Analytical Chemists," Methods Manual, 17th ed.

9. "Methods for Benzidine, Chlorinated Organic Compounds, Pentachlorophenol, and Pesticides in Water and Wastewater," Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio, September 1978.

10. "Annual Book of ASTM Standards, Sections 11.01 and 11.02, Water and Environmental Technology," American Society for Testing and Materials.

12. The Determination of Polychlorinated Biphenyls in Transformer Fluid and Waste Oils," Physical and Chemical Methods Branch, Environmental Monitoring and Support Laboratory, USEPA, Cincinnati, Ohio, April 1981.

13. "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue," Physical and Chemical Methods Branch, Environmental Monitoring and Support Laboratory, USEPA, Cincinnati, Ohio, (April 1981).

14. Manual of Analytical Methods for Analysis of Pesticides in Human and Environmental Samples, USEPA, EPA 600/8-80-038 (June).

15. USEPA Contract Laboratory Program Statements of Work (CLP-SOW) OLM01.8, OLM03.1, and ILM04.0

Axys Analytical Services, Ltd.
Policy and Procedures Manual

Appendix A includes the AXYS Policy and Procedures Manual, which is only available in the hardcopy format of this document.

Appendix B

CQM, ARI, SET, The Mineral Lab QA Plans

ANALYTICAL
RESOURCES
INCORPORATED

Quality

Assurance

Plan

Quality Assurance Plan

Analytical Resources, Inc.
4611 S. 134th Place, Suite 100
Tukwila, WA 98168-3240

Revision 11.0

This Quality Assurance Plan is approved and authorized for release by:

_____
Mark Weidner
Laboratory Director

_____
Brian Bebee
Laboratory Manager

_____
David Mitchell
Quality Assurance Manager

Quality Assurance Plan

Analytical Resources Inc.

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SECTION 1: INTRODUCTION

Quality Assurance Policy and Objectives

Analytical Resources, Inc. (ARI) is dedicated to providing accurate and reliable data in a timely manner. The management of ARI is committed to analytical excellence and will provide the facilities and a professional environment to achieve this goal. The quality assurance program detailed in this document sets forth the policies and procedures that are followed by ARI to ensure that all reported results are both legally defensible and of the highest quality.

To ensure that data quality goals are achieved, the following characteristics must be considered:

Precision, Bias and Accuracy

For all analyses, there is a degree of uncertainty or error in the measurement process. This measurement error is generally one of two types: random error (precision) or systematic error (bias). Precision is a measure of agreement between replicate measurements. Bias is considered to be the difference between the expected value and the true value for a measurement or series of measurements. Accuracy is a determination of how closely a measurement is to the expected value. Both precision and bias are considered when determining the accuracy of measurements. Precision, bias and accuracy are evaluated through the use of method guidelines, and project and laboratory control limits.

Representativeness

Representativeness is an indicator of how closely one sample aliquot resembles another aliquot from the same bulk source or sample site. Sample representativeness is more easily obtained for particulate-free water samples than for solid samples or viscous liquids. Representativeness is an important consideration in achieving other data quality objectives.

Completeness

Completeness is an indicator of the number of valid (useable) data points compared to the overall number of data points obtained. Valid data are normally obtained when sample collection and analysis is performed in accordance with specified methods and procedures. Completeness is often expressed as a percentage: the higher the number of valid data points, the higher the overall completeness percentage. Conversely, fewer valid data points will result in an overall lower percentage of completeness. Project specifications will dictate the required level of completeness.

Comparability

Comparability is an indicator of how confidently one data set can be compared with another, as well as the consistency between data sets. Stable analytical conditions and adherence to standard procedures, combined with high levels of accuracy, help to ensure that results obtained over a period of time will be comparable.

Timeliness

To ensure that the most accurate results possible are obtained, samples must be processed within specified time periods. Analytical holding times have been established to allow sufficient time for sample processing without compromising sample integrity. It is important that, while meeting timeliness requirements, other data quality objectives are still considered and met.

Documentation

Complete and accurate documentation is essential for verifying the integrity of analytical results. Achievement of other quality objectives cannot be used to substantiate data quality without full documentation of the analytical process. Documentation must be concise and readily available for subsequent review.

The quality assurance program at ARI has been developed to ensure that the specified data quality objectives are met for all reported results and the highest degree of completeness possible is achieved.

1.2 Ethics Policy on Data Quality and Confidentiality

To ensure that data quality or confidentiality is not compromised, ARI has established the following policy on corporate ethics. Following are steps that must be taken when the quality or confidentiality of data is suspected or known to be compromised. This policy applies to all ARI employees at every organizational level.

General

ARI's corporate commitment to integrity and honesty in the workplace is clearly stated in the ARI Employee's Handbook, under "Standards of Conduct". The Standards of Conduct statement is attached as Appendix N. The ARI commitment to excellence in data quality extends to and includes all aspects of data production, review and reporting.

Any attempt by management or any employee to compromise this commitment presents a case for serious disciplinary action. Any indications or allegations of waste, fraud or abuse will

be rigorously investigated by ARI management, with the penalties for verified cases to be employment termination, and if appropriate, prosecution. In addition to these steps, any such charges related to data generated for the federal government will also be reported to the Inspector General of the appropriate department.

Circumstances

All ARI employees will immediately report to management any information concerning the misrepresentation or possible misrepresentation of analytical data (or any associated components).

Misrepresentation of data includes (but is not limited to) the following:

Altering an instrument, computer or clock to falsify time or output
Altering the content of a logbook or data sheet in order to misrepresent data
Falsifying analyst identity
Changing documents with correction fluid with the intent of falsifying information
Preparing or submitting counterfeit data packages or reports
Unauthorized release (either written or verbal) of confidential data
Illegal calibration techniques (peak shaving, fraudulent integrator parameters)
Any attempt to misrepresent data or events as they actually occur in the course of data production or reporting

Responsibilities

It is the responsibility of all ARI employees to report any situation which may be adverse to data quality or confidentiality, or which may impact the final data quality. All ARI employees have the obligation to discuss known or suspected violations of this policy with laboratory management, who in turn are obliged to inform the ARI Laboratory Manager. If a satisfactory resolution is not obtained or is not possible at laboratory level, all ARI employees have the right and responsibility to discuss the matter directly with the ARI Laboratory Manager.

It is the responsibility of the ARI Laboratory Manager to promptly investigate any reports of known or suspected violations. The ARI Laboratory Manager has the authority and responsibility to resolve all known or potential violations of the policy.

It is the responsibility of ARI management to provide all of its employees with the facilities, equipment, and training to achieve the quality goals stated in the policy. It is the responsibility of ARI to provide our clients with data of known and documented quality.

Documentation

To reaffirm an awareness of and commitment to the highest standards of data quality, excellence, and integrity, all employees are required to sign the following "Commitment to Excellence in Data Quality" statement:

"As an ARI employee, I have the right and responsibility to report any situation which may be adverse to quality or which may impact the final quality or integrity of data produced for our clients."

"I will report immediately to management any information concerning the misrepresentation or possible misrepresentation of analytical data (or any of its associated components). Examples of this include (but are not limited to): alteration of an instrument computer or clock, alteration of the contents of logbooks and/or data sheets in order to misrepresent data, misrepresentation of analyst identity, intentional falsification of documents with correction fluid ("white-out"), preparation and submittal of counterfeit data packages, use of illegal calibration techniques (peak shaving, use of fraudulent integrator parameters, etc.), or any attempt to misrepresent data or events as they actually occur in the course of an analysis."

"I will likewise alert management of any situation or activity which may be adverse to the confidentiality of clients' data."

"I will not knowingly participate in any such activity, nor fail to report such activities of which I may become aware. I understand that any voluntary participation on my part in such activities may result in the termination of my employment, and possible legal prosecution."

"Where circumstances permit, I will report any actual or suspected violations of this policy to my lab or section supervisor. If a satisfactory resolution is not obtained or is not possible at that level, I have the right and obligation to discuss the matter directly with the ARI Laboratory Manager."

Confidentiality

All information related to client projects, such as client work plans, documentation and analytical data will be considered confidential. This information will be released only to the

client or an authorized representative. Should an outside agency request information related to a client project, the client will be contacted for approval prior to releasing any information.

Some programs or contractual agreements (such as the USEPA Contract Laboratory Program) may have specific requirements for protecting a clients confidentiality Project Managers will be responsible for strict control of access to any such confidential information or documentation. All data generated from the analysis of confidential samples will also be considered confidential.

SECTION 2.0: QA MANAGEMENT AND RESPONSIBILITIES

The principal tenet of the Quality Assurance Program at Analytical Resources Inc. (ARI) is that every employee knows she/he is a vital component of the program, and holds a responsibility to produce high-quality, defensible data in a timely manner. While production of quality data is a global philosophy, held by the entire laboratory, each section is responsible for ensuring that the data produced within that section meets the required quality objectives.

2.1 Overall Structure

The Board of Directors shall direct ARI's QA Policy and shall determine the Philosophy of the QA Program. It shall be the responsibility of the Laboratory Director to translate this policy into practical procedures with respect to the business plan developed for ARI, and direct the Laboratory Manager and Section Managers regarding the incorporation of these procedures into daily laboratory activities.

The Laboratory Manager is responsible for coordination of laboratory activities to result in an integrated approach to quality data production. The Laboratory Manager will coordinate Client Services, Laboratory Section Management, Computer Services, and Data Services to ensure that project requirements and data quality objectives are met.

The Laboratory Section Managers and Supervisors shall hold the final authority in decisions concerning implementation of QA policy, with the contributions of the Laboratory Director, Laboratory Manager, QA Manager and Project Managers. Section Managers and Section Supervisors shall instruct employees in the proper employment of QA policies.

Each Section Supervisor will ensure that analyses are completed within required holding times, that data is submitted within required submission times, and all analyses are performed according to the current Standard Operating Procedures (SOPs). They will ensure that any client modifications or QA issues are well documented for each sample set and that all required documents are complete when submitted with each data set.

The analytical staff shall execute all methods following QA policies, and will write SOPs reflecting the methods exactly as performed. These SOPs will be reviewed for compliance by

Section Managers and the Laboratory Director, and once approved will be submitted to the Quality Assurance Program Manager (QAPM).

The QAPM will be responsible for controlling Company SOPs and other internal documents, overseeing the scheduling and completion of detection limit studies. The QAPM will coordinate the production of control charts and distribution of control limit data to all laboratory sections. The QAPM will administer the blind QA proficiency tests and performance samples as described in the QA Program. The QAPM will verify that QA policies and procedures are followed through out ARI.

Data reviewers will be responsible for ensuring that all samples have been analyzed by the approved and requested methods, that data calculations are performed correctly, and that analyses meet the Data Quality Objectives of the client. They shall also be responsible for ensuring that the documentation from each laboratory section is intact and complete.

Computer Services is responsible for ensuring that the Laboratory Information Management System (LIMS) correctly reflects the preparations and analyses performed and that the LIMS is updated with the current SOP, MDL, RL and QL data as submitted from the QAPM. Computer Services personnel are also responsible for ensuring that all electronic deliverables for clients are formatted correctly as requested by the Project Managers and that this data matches the hardcopy deliverables submitted.

Client Services (Project Managers, Sample Receiving, and Sales Management), shall be responsible for ensuring that the laboratories understand and can meet project specific analytical requirements and DQO.

In the event any key employee is temporarily (7 to 60 days) absent from ARI, her/his duties will be assigned to the designated replacement listed in the following paragraphs. ARI employees are required familiarize their Designated Replacement with the information necessary to complete required tasks during their absence. Whenever possible absences will be planned well in advanced and scheduled using the Request for Leave Form available from The Human Resources Department.

2.2 Hierarchical Responsibilities

Laboratory Director

> *It shall be the responsibility of the Laboratory Director to translate QA policy into practical procedures with respect to ARI¢s business plan, and to direct the Laboratory Manager and Section Managers in the implementation of these procedures in daily laboratory activities.*

The Director shall interpret overall QA Policy, and determine the broad practicality of policies based on methodologies, technological advances, and the current environmental market. It shall be the interpretation of these policies that will, in turn, direct the growth ARI, the addition or withdrawal of methods to ARI's repertoire, and ARI's marketing focus.

At a minimum of twice a year the Laboratory Director shall include on the agenda of the Board of Directors meeting a discussion of ARI's QA Policy. This discussion will include the reputation of ARI for producing quality analyses, the affect of QA policies on turn-around time, competitive edge and cost-of-analysis, needs for stricter or more flexible policies, and the response of employees to the QA policies in place at that time.

At a minimum of once a month the Director shall attend management meetings, which include on the agenda the subject 'QA Program'. This format will allow for the dissemination of information on any QA issues addressed in the laboratory or by the Board of Directors. Management shall also use these meetings to discuss requirements of clients that are not met ARI's present QA Program, and the appropriate response to these requirements.

The Laboratory Director may be required to act as a technical advisor at any impromptu meetings called by management to address QA issues that cannot be immediately resolved within a laboratory section.

It shall also be the Director's authority and responsibility to hold final review approval for all SOPs of ARI. Once an SOP has been updated and reviewed by the laboratory section, it shall go through the Section and Laboratory Managers for approval, and then to the Laboratory Director for final approval before the SOP is released.

Designated Replacement: The Laboratory Manager

Laboratory Manager

The Laboratory Manager is responsible for coordination of laboratory activities to result in an integrated approach to quality data production. It shall be the Laboratory Manager's responsibility to coordinate Client Services, Laboratory Management, Computer Services, and Data Services to ensure that QA Program requirements and data quality objectives are met.

The Laboratory Manager is required to attend all monthly management meetings, at which the QA Program will be an agenda item. Management shall use these meetings to discuss requirements of clients that are not met by ARI's present QA Program, the appropriate response to these requirements, and dissemination of information on any QA issues addressed in the laboratory or by the Board of Directors.

It is the responsibility of the Laboratory Manager, along with the QA Manager, Laboratory Director, Section Managers and Client Services, to determine in which QA Proficiency Programs the Laboratory will participate, and those accreditations that ARI will pursue. It is the responsibility of the Laboratory Manager, with the Section Managers, to ensure that all laboratory sections perform the tasks required by the QA Manager to pursue each accreditation or to complete a scheduled audit.

The Laboratory Manager has the responsibility of balancing client requests and requirements with the QA policies of ARI. It is the Laboratory Manager's task to evaluate a client's Data Quality Objectives (submitted through Client Services), and with the Section Managers to determine the feasibility of laboratory performance. Feasibility will be based on the quality objectives requested, current QA Manual, present workload (in-house and scheduled/pending), the technology in place, and staffing levels available. Current workload in-house will be evaluated using reports from Computer Services, and scheduled/pending workload will be evaluated using written and verbal input from Client Services.

The Laboratory Manager has the authority to direct Client Services to discontinue the bidding/contracting process for a new project, refuse samples, or to re-schedule projects based on Data Quality Objectives or current workload. The Laboratory Manager also shall evaluate staffing and equipment needs based on information from the Section Managers and

Client Services and may elect to meet new project requirements by increasing staffing levels or purchasing additional equipment.

The Laboratory Manager serves as a senior-level technical reference for all laboratory activities, and as such will be brought in to advise on out-of-control events and trends, corrective actions, and/or other QA issues that require his/her expertise.

Designated Replacement: 1: The Technical Director

Laboratory Section Managers

> *The Section Managers shall hold the final authority in decisions concerning implementation of QA policy, with the contributions of the Laboratory Director, Laboratory Manager, QAPM and Project Managers. Section Managers are responsible for correcting out of control events within their respective laboratories. Section Managers and supervisors shall instruct employees in the proper employment of QA Policies.*

Laboratory Sections Managers shall have the final authority in decisions concerning QA policy. It is their expertise that will determine the final acceptable format of each method SOP, as they are the best resource to integrate methods into ARI's philosophy.

Laboratory Section Managers are responsible for completing or delegating updates of laboratory procedures and quality assurance manual sections as scheduled by the QA Manager.

The Section Managers are best able to determine capacity of the Laboratory Sections. To ensure that analyses are completed within required hold times, the Section Managers will give Supervisors the authority to balance employee workloads and modify employee work schedules. It is the Section Manager's responsibility to take reports from supervisors and work with the Laboratory Manager to increase staffing levels or reject samples as needed. It is the Section Manager's responsibility to work with the Laboratory Manager and the section supervisor and analysts to ensure that sample capacity does not affect the quality of data generated from that laboratory section.

It is the responsibility of the Laboratory Section Managers, along with the QA Manager, Laboratory Director, Laboratory Manager and Client Services, to determine in which QA

Proficiency Programs the Laboratory will participate, and which accreditation processes ARI will pursue. It is the responsibility of the Section Managers, with the Section Supervisors, to ensure that all laboratory sections perform the tasks required by the QA Manager to pursue each accreditation or to complete a scheduled audit.

The Section Manager will be responsible for reviewing training records of analysts produced by the Section Supervisor. Training shall be the responsibility of the Section Supervisor, but it is the responsibility of the Section Manager to oversee this training.

It is the Section Managers' responsibility to work with the Section Supervisor and Project Manager to assure that Project Requirements are achievable and valid for the given methods. At times, ARI's clients have requests or requirements for methods that are 1) not the method of choice in the laboratory, 2) not presently performed by the laboratory, or 3) unachievable by the instrumentation used in the laboratory. It is the responsibility of the Section Supervisor, Section Manager and Project Manager to work with the client to resolve these issues before samples are accepted.

Clients may also request modifications to the methods that must be approved by the Section Supervisor, the Section Manager and the QAPM. These modifications must be thoroughly documented and all pertinent information on modifications must be conveyed to the analysts, sample preparation sections, sample receiving, and computer services, as needed for implementation.

The Section Manager is responsible for resolution of out-of-control events that have not or cannot be resolved by the analysts or Section Supervisor.

The Section Manager has the authority to re-classify analysts or require additional training of analysts based on their performance.

Designated Replacement: An alternate Laboratory Section Manager to be assigned by the Laboratory Manager.

Section Supervisors

It is the responsibility of each section Supervisor to ensure that analyses are completed following the most current version of ARI¢s SOP, within required holding

and turn around times, and assure that analyses meet the Data Quality Objectives of each project. They will ensure that any client modifications or QA issues are well documented for each sample set, and that all documentation is complete when submitted with each data set.

To ensure that analyses are completed within required hold times, the Supervisors have the authority to balance employee workloads and modify employee work schedules. The Section Supervisors, with the input of the Section Manager, have the authority to request overtime from employees should the workload warrant the additional effort, or to modify employee schedules to extend the operating hours of the laboratory section.

The Section Supervisors shall oversee the day-to-day section operations, using LIMS printouts and verbal or written workload estimates and requests from Project Managers to adjust section efforts as needed. It is also the Section Supervisors' responsibility to inform management (Section Manager, Data Review, and Project Managers), when capacities are limited, so that the appropriate adjustments can be made to reduce workloads or increase laboratory capacities. At no time should sample capacity be allowed to affect the quality of data generated from any laboratory section.

It is the Section Supervisor's responsibility to assure that employees have the proper training for their positions. This training will include training in the methods, use of the LIMS system if applicable, training in correct documentation procedures, and all information necessary for adherence to the ARI QA Program. The Supervisor shall either perform the training personally, or designate the trainer for given methods or procedures. It is the Supervisor's responsibility to test each employee for each method or procedure, and to thoroughly document each employee's advances and current capabilities. The Supervisor shall have the authority to require further training or supervision for any employee, and shall be the authority to approve each employee for working without supervision. There will be a training record for each employee. These will be kept in the laboratory section; copies will be submitted to the QA Manager for record keeping.

It is the Supervisor's responsibility to work with the Section Manager and Project Manager to ensure that Project Requirements are achievable and valid for the given methods. At times clients have requests and/or requirements for methods that are 1) not the method of choice in

the laboratory, 2) not presently part of the method as performed by the laboratory, or 3) unachievable by the instruments used in the laboratory. It is the responsibility of the Supervisor, Section Manager and Project Manager to work with the client to resolve these issues before samples are accepted.

It is the responsibility of the Section Supervisor to ensure that each analyst reads and understands all requirements submitted with each sample set, including those for any special analyte, calibration, or data deliverable. It is the Section Supervisor's responsibility to clarify any issues, with the input of the Section Manager and the Project Manager for the client.

Clients also at times will request modifications to methods, which must be approved by the Supervisor and Section Manager. These modifications must be thoroughly documented and all pertinent information on modifications must be conveyed to the analysts, sample preparation sections, sample receiving, and computer services as needed for implementation.

It is the Supervisor's responsibility to ensure that each employee understands the requirements of all projects they work with. This may necessitate section meetings or project-specific cross-section teams to work with Project Managers for large, specialty projects to ensure that everyone has the same understanding of project requirements.

The Supervisor is responsible for resolution of out-of-control events that have not or cannot be resolved by the analysts, and for ensuring that the analysts complete all documentation. If the Supervisor and laboratory section analysts cannot resolve the issues in a timely manner, the Supervisor's will request the assistance of laboratory management to bring the section into compliance. The Supervisor will also inform Project Management and his/her Section Manager of possible delays, and inform Data Review of possible time constraints they may face in preparation of data submissions from the lab section.

The Section Supervisors shall have the authority to use professional judgement in requiring samples be re-prepared, and shall determine which analysts have the authority to require re-preparation of samples.

It is the responsibility of the Section Supervisor to inform the QAPM, Section Manager and the Computer Services section of any changes in methodologies that will require revision of SOPs,

MDLs, Control Limits or the LIMS programming. This includes changes in spiking compounds, spiking levels, preparation methods and analytical methods.

Designated Replacement: A trained analyst to be assigned by the prior to the absence by the Section Supervisor or if that is not possible by the Laboratory Section Manager.

Analysts

> *The analytical staff shall execute all methods following QA Policies, and will write SOPs reflecting the methods exactly as performed. These SOPs will be reviewed for compliance by Section Managers, the Laboratory Manager, and the Laboratory Director, and once approved will be submitted to the QA Manager.*

The analysts are responsible for following the current SOPs (with project-specific modifications if required) in preparing and analyzing client samples and quality control samples to meet the project specific Data Quality Objectives. It is the analyst's responsibility to ensure that he/she understands all requirements of a project before proceeding with sample preparation or analysis.

Analysts are responsible for working with the Supervisor to ensure that all sample preparations and analyses are performed within required holding times and required turn-around times, and that all documentation is completed in a timely fashion. It is each analyst's responsibility to bring any recurrent or anticipated problems to the attention of laboratory management.

It is each analyst's responsibility to correct his/her own errors, to document corrective actions thoroughly, to perform peer review, and to ensure that fellow employees within the section follow documentation procedures.

The Section Supervisor may give lead analysts responsibility for training and evaluation of new staff members. This training will include instruction in the methods, use of the LIMS system if applicable, correct documentation procedures, and all information necessary for adherence to the ARI QA Program. Analysts will be responsible for maintaining all instruments and equipment in optimum operating condition and documenting this maintenance as required by the QA Program.

It is the responsibility of each analyst to request the assistance of Supervisors or Managers in resolving out-of-control situations that cannot be corrected in a timely manner, and to perform the documentation of all corrective action activities.

Quality Assurance Program Manager (QAPM)

> *The QAPM will be responsible for controlling Company SOPs and other internal documents. The QAPM will oversee the scheduling and completion of detection limit studies and control charts. The QAPM will administer the training program, analyst's proficiency documentation and performance evaluation analyses as described in the QA Program. The QAPM will verify that QA policies and procedures are followed at all levels in the Company. The QAPM will produce a "Quality Assurance report to Management" each calendar quarter.*

The QAPM is responsible for the oversight of the QA Program as defined by the Board of Directors and interpreted by the Laboratory Director and Laboratory Managers.

Part of this oversight will be monitoring of the QA Program through submission of performance evaluation samples, blind QA samples and double-blind QA samples. It is the responsibility of the QAPM, along with the Laboratory Manager, Laboratory Director, Section Managers and Client Services, to determine in which QA Proficiency Programs the Laboratory will participate. The QAPM will be responsible for submitting these samples to the laboratory for analysis, overseeing submission of the results to the appropriate agencies, and for control of documented proficiency results.

The QAPM will be responsible for scheduling laboratory section SOP and procedural reviews and revisions, and section updates of the Quality Assurance Manual. It is the responsibility of the QAPM to work with each Section Manager to attempt to stagger these review schedules across the year within each laboratory section. The QAPM will also be responsible for maintaining document control of all SOPs, bench sheets, logbooks, and other forms used within the laboratory.

All laboratory sections, on an annual basis, will perform detection limit studies for each method used within each section. It is the responsibility of the QAPM to schedule, review, compile, and distribute the results of these studies.

The QAPM is responsible for evaluation of the laboratories' adherence to defined protocols through periodic audits of completed projects and of the laboratory facilities. Following the audit schedule (Appendix K), the QA Manager will perform the scheduled audit and prepare an evaluation that will be submitted to the Board of Directors in the Quarterly QA Report to Management.

The QAPM will be responsible for evaluation of outside accreditation requested by Client Services. The QA Manager will deliberate with the Laboratory Managers and Laboratory Director on the feasibility of pursuing accreditation based on the scope of the accreditation, the effort required to pursue accreditation and the scope of work that might become available once the accreditation is obtained. If a decision is made to pursue an accreditation, it is the responsibility of the QAPM to coordinate laboratory efforts towards the accreditation.

The QAPM will produce a quarterly "Quality Assurance Report to Management" to be distributed to ARI management personnel by the tenth working day of each quarter as described in Section 13 of this LQAP.

The QAPM will serve as a resource for quality-related issues for all Laboratory Sections, and will serve management in an advisory capacity.

The QAPM will have documented training in elementary statistics and Quality Systems theory.

Designated Replacement: The Quality Assurance Specialist.

Data Reviewers

> *Data reviewers will be responsible for ensuring that all samples have been analyzed by the approved and requested methods, that data calculations are performed correctly, and that analyses meet the Data Quality Objectives of the client. They shall also be responsible for ensuring that the documentation from each laboratory section is intact and complete.*

Data reviewers shall ensure that all samples are analyzed according to approved methods by reviewing the data released by each laboratory section. The data will be evaluated for compliance with all Data Quality Objectives as defined in the method SOP or in the project-specific quality assurance plan, including instrument tuning and calibration, holding time, spiking level, and spiking recovery criteria. Data reviewers will also verify 100% of manual

calculations, spot check computer calculations, check electronic data for correct sample matching, and do a 100% check on any manually entered data. Analytical parameters, which have concentration interdependence, will be evaluated in relationship to each other.

Final reports generated will be evaluated to ensure that laboratories are using the current detection limit/reporting limit values and the current control limits. Data will be checked to ensure that all QA issues are addressed and fully documented. Reviewers are responsible for working with Laboratory Supervisors, Laboratory Managers and Project Managers when out-of-control events are incompletely documented, or if data is found to not meet Data Quality Objectives of a project without documentation.

It is the responsibility of data reviewers to work with Computer Services to ensure that the LIMS is updated to the current limits and methods used within the laboratory.

Designated Replacement: Laboratory Section Supervisors or Managers from the same Laboratory Section.

Computer Services

> *Computer Services is responsible for ensuring that the LIMS correctly reflects the preparations and analyses performed and that the LIMS is updated to include the current SOP, MDL, RL and QL data, as submitted by the QA Manager. Computer Services personnel are also responsible for ensuring that all electronic deliverables for clients are formatted correctly as requested by the Project Managers and that electronic data matches the hardcopy deliverables submitted.*

It is the responsibility of the Computer Services Manager to update, or to designate the task of updating, the LIMS as determined by Laboratory Management, including adjustment to current MDL/RL data, additions of analytes to methods, changes in method designations or changes in calculations for methodologies.

Computer Services will be responsible for generating the worklist scripts required to allow analysts to enter data into the LIMS, and for generating the report scripts that produce final hardcopy or electronic reports for clients.

Computer Services Management and personnel are also responsible for generation and review of electronic data deliverables (EDD), as requested by clients through Project

Management. Computer Services personnel will review the EDD for compliance with the Software Quality Assurance SOP before it is released to the client.

Computer Services will be responsible for informing laboratory Section Managers and Project Managers of any discrepancies found between the EDD and the hardcopy, and for following up on corrections to hardcopy and EDD as required.

Designated Replacement: Technical Director

Client Services

> *Client Services (CS) (Project Managers, Sample Receiving, and Sales Management) personnel are the primary interface between ARI's clients and the laboratory sections. CS staff shall be responsible, with the assistance of the Section Managers and Supervisors, for ensuring that the laboratories understand and can meet the Data Quality Goals and Requirements of each Project before committing laboratory services to the project. CS will monitor the quality of sample processing after they are received.*

Client Services Management and Project Managers shall ensure that the laboratories can meet the data quality objectives for a project. The Project Managers are responsible for knowing the capabilities of the laboratory, in order to develop project proposals or accept samples without consultation with laboratory management. It is the responsibility of Client Services to consult with the Laboratory Manager and Section Managers, or supervisors designated by Management, when data quality goals are not included in standard Company policies. Clients may, at times, request modifications to methods that must be approved by the Supervisor and Section Manager. These modifications must be thoroughly documented and all pertinent information on modifications must be conveyed to the analysts, sample preparation sections, sample receiving, and computer services as needed for verification of feasibility. Laboratory Management may determine that a project should not be pursued based on the specific Data Quality Objectives and on current or projected laboratory capacity.

Project Managers shall be responsible for ensuring that project requirements and analytical requests are submitted correctly to all laboratory sections. Once samples have been logged into the laboratory, it is the responsibility of the Project Managers to ensure that all information is available to the laboratories concerning the Data Quality Objectives and deliverables

requirements. It is also the responsibility of the Project Managers to convey changes in client requirements to the laboratories and ensure that all paperwork reflects the changes if necessary.

It is the responsibility of Project Managers and Client Services Management to assure that specific EDD formats are submitted to Computer Services and approved as feasible before contracting with a client to provide the EDD.

It is the responsibility of Project Managers to notify clients of out-of-control events, “problem” samples, or anticipated turn-around time delays, as conveyed to them by Laboratory Management. It is also the responsibility of Project Management to work with Laboratory Management in setting priorities during times of heavy sample workloads.

Project Managers shall be responsible for coordinating data submissions and compiling hardcopy data for final submission to the client. This involves conducting a fourth level data review, from which any data which is found to contain errors that were not found earlier in the review process is returned to the Data Reviewer for correction and/or corrective action. The Project Manager will be responsible for compiling all analyst notes into a project narrative. This will include discussion of any sample receipt discrepancies, sample preparation and analysis difficulties or non-compliance, and any corrective actions that may have been required during processing. It will also discuss quality control analyses and results if applicable to the sample set.

Project Managers shall work with Laboratory Management in determination of the direction of growth for ARI, as the Project Managers are best able to define the analytical needs of clients based on new technologies and new environmental regulations.

Designated Replacement: Sample Receiving and Business Development staff will be replaced by their peers or temporary employees. Project Managers work in teams of two. This allows one team member to cover for the other during a temporary absence.

SECTION 3: PERSONNEL QUALIFICATIONS AND TRAINING

The production of quality analytical data is dependent upon a laboratory staff with qualifications and training necessary to perform assigned tasks. All personnel employed by ARI will receive adequate training and instruction specific to their responsibilities. Prior to assigning a staff member full responsibility for performing a laboratory procedure, her/his skills will be evaluated and verified acceptable. It is the obligation of ARI's supervisors and managers to ensure that personnel are qualified to successfully perform all assigned duties.

ARI's training program is described in SOP 1017S (*Training and Demonstration of Proficiency*). The procedures described in this SOP assure that all ARI employees are proficient at the tasks required to produce quality analytical data. The SOP also provides for periodic review of each employees training and proficiency status, which may indicate any need for additional or remedial training. All training and review procedures are documented as described in the SOP. Appendix B of this document includes specific requirements of the training program and examples of the forms used to document training.

Basic elements of ARI's training program are:

1. All employees are required to read and document their knowledge of non-technical documents that describe general policies in place at ARI. These documents include ARI's *Employee Manual* and ARI's *Chemical Hygiene Plan*.
2. All employees are required to read and document their knowledge of ARI's *Laboratory Quality Assurance Plan* and quality assurance policies.
3. All new employees must attend a Quality Assurance Orientation during which ARI's general and specific requirements for the production of quality analytical data are emphasized. A typical orientation agenda is included in Appendix B.
4. All new employees will attend a Technical Orientation conducted by their laboratory supervisor or manager. The technical orientation is used to provide specific information about laboratory operation to the employee and to assess the new employee's education

and skill level. The section supervisor or manager is responsible for determining the level of training necessary for each staff member.

5. All employees will complete an 'on the job' training program designated by their supervisor. The training program will be laboratory, SOP and employee specific. Training programs follow the general outline provided in Appendix B. The training is incremental with each step documented in an employees Training File. While an analyst is in the training period, her/his supervisor or trainer must approve all analytical work. Upon completion of the training program the employee is considered proficient and may perform without supervision the SOPs listed in the training program.

6. The proficiency of each employee to perform a given laboratory SOP will be continually monitored and documented as described SOP 1017S. An employee must continually generate data with acceptable Data Quality Objectives (DQOs) for a given SOP to be considered proficient. Unacceptable DQOs or insufficient number of analyses performed in a calendar quarter will result in revocation of proficiency. This will result in a remedial training program.

7. Periodically, as described in SOP 1017S, internal and/or external Performance Evaluation (PE) samples will be used to document staff competency. Technicians and analysts will participate in the preparation and analysis of blind samples for all methods they routinely perform. Results of these blind samples will be evaluated to verify staff proficiency. Staff members associated with acceptable performance evaluation samples will be considered proficient for those methods. Conversely, unacceptable performance evaluation sample results may signal the need for additional or remedial training.

8. Project Managers shall work with Laboratory Management in determination of the direction of growth for ARI, as the Project Managers are best able to define the analytical needs of clients based on new technologies and new environmental regulations.

9. A training file is established for each technical employee. The file will document an employee's experience, training and proficiency. The training file will document each specific PE sample analysis performed by an analyst. Either an employee's supervisor or

Quality Assurance Program personnel will update the training file. The training file will be maintained in the employee's laboratory as outlined in SOP 1017S.

SECTION 4: FACILITIES AND EQUIPMENT

4.1 Facilities

ARI's facilities have been designed to allow for efficient sample processing and analysis while maintaining consideration for the health and safety of the staff. The facility, consisting of two main buildings and an annex, accommodates the following operations:

Sample receipt and storage
Sample container preparation and shipment
Sample preparation and analysis (organic and inorganic)
Project planning and management
Quality assurance
Data review and report generation
Computer programming and operations
Records storage
Instrument spare parts storage
Short-term hazardous waste storage

A detailed description of ARI's facilities is included as Appendix C.

4.2 Security

Facilities

To ensure that security at ARI is maintained, access to the facilities is limited to employees and escorted visitors. Upon arrival, ARI visitors are required to register at the reception desk, and must sign out prior to leaving. Visitors will be escorted at all times. A receptionist constantly monitors the main entrance. Other laboratory entrances remain closed at all times and can only be opened from the outside by key or an electronic release. Key access to the facility is controlled; keys are issued on a limited basis depending on access needs.

As a result of controlled access and a monitored alarm system, the entire facility is considered a secure area. This eliminates the need for locked sample storage refrigerators, data storage areas or file cabinets. However, all storage refrigerators located in a courtyard area outside a main building are secured with key locks

Data Access

The Computer Services Manager controls security of, and access to, electronic data on the LIMS. Security measures are required to ensure data integrity, but must not be so restrictive as to prevent data accessibility. The security measures taken at ARI are to prevent intentional intrusion by outside parties. These measures include building security, limited computer system access, password systems and the use of virus protection programs. ARI's Intranet is protected from outside tampering by a proxy server (firewall) connection to the Internet.

LIMS - System Security

Building/Computer Room Security

Access to the building is restricted to employees, vendors with security passes, and escorted visitors. Room 203 contains the computer and main console for the LIMS system. This room will remained closed and locked unless Computer Services personnel are present on site. Access to this room will be limited to Computer Services personnel, employees requiring access to computer supplies, escorted repair technicians, and escorted visitors. Only Computer Services personnel will be allowed access to the main console.

System Password Policy

User name and password restrict access to the LIMS computer. Access by modem must require both a user password and a modem password. The modem password will be given to a limited number of users, who are authorized to access the system from off-site, to Computer Services personnel, and to NWA LIMS Technical Support as needed and required by contract.

Database Access Restrictions

Interaction with the database is menu-controlled and allows the LIMS Manager to restrict access. Technicians may be given the ability to fill a limited number of worklists, with no authorization to distribute data. Some users may be given "read only" access to the database.

Users will be given access to the database only to complete tasks for those analyses for which they are responsible. No users are to be given access to the shell or command prompt unless 1) they have completed the appropriate training and 2) administrative access to the computer systems is required by their job function

4.3 Safety

Ensuring that all sample processing and analysis procedures are performed under safe conditions is an important consideration at ARI. While safety is the responsibility of all staff members, ARI's Safety Committee meets monthly to review the safety activities of all laboratory sections and to ensure that all operations and equipment meet safety criteria. *The Chemical Hygiene Plan* details those safety procedures and requirements that must be followed at ARI. *The Chemical Hygiene Plan* is reviewed annually and updated as needed to incorporate any changes to ARI's safety program.

4.4 Instrumentation and Support Equipment

4.4.1 Instrumentation

Generation of quality data is dependent upon instrumentation and support equipment that is in optimum operating condition. All instrumentation will be optimally maintained per method requirements and manufacturer recommendations. Preventative maintenance will be performed on a routine basis, with more frequent maintenance during periods of increased sample load or after analysis of highly contaminated samples. Preventative maintenance is instrument and analysis specific, and each maintenance logbook has been designed specifically for the instrument type. Required maintenance procedures are listed in analytical SOPs. Each maintenance logbook will detail the type and frequency of maintenance for that instrument. Each maintenance logbook is kept with the instrument. Non-routine maintenance and repairs will be performed as necessary. Spare parts are kept on hand when possible; necessary parts are ordered on an expedited basis to minimize downtime. All maintenance and repair activities will be documented in the appropriate logbooks.

Currently available Laboratory Instrumentation is detailed in Appendix C.

4.4.2 Support Equipment

4.4.2.1 Thermometers - – All thermometers in use at ARI are traceable to an NIST standard and are calibrated or verified annually. The procedures are described in SOP 1020S.

4.4.2.2 Water Baths, Incubators and Ovens – The temperature of water baths and ovens currently used in the analytical process are monitored daily. Temperatures are recorded on

temperature logs that are audited monthly by Quality Assurance personnel. Temperature controls on these devices are calibrated annually by an outside vendor. Calibration reports are filed in the QA Office.

4.4.2.3 Refrigerators and Freezers - Refrigerators and freezers are assigned an acceptable operating range of temperatures. The temperature is monitored daily. Corrective Action is required for all out of range temperatures.

4.4.2.4 Balances – The accuracy of all balances is verified prior to daily use with two Class S weights that bracket the normal weighting range of the balance. All analytical balances are professionally cleaned and calibrated annually by an outside contractor. Class S weights are calibrated every three years by an outside contractor. Calibration reports are filed in the QA Office.

4.4.2.5 pH Meters – pH meters are standardized prior to daily use with at least two standards, one at 4.0 and one at 7.0 pH units. The meters are checked prior to each use with a pH 7.0 buffer.

4.4.2.6 Variable Volume Pipettes – The accuracy of variable volume pipettes is verified monthly following the procedure in SOP 1015S.

4.4.2.7 Sample Containers – Upon client request ARI will supply sample containers for collection of field samples. All containers supplied for organic and trace metals analyses are certified pre-cleaned by the manufacturer. The manufacturer's certification is above ARI's reporting limit for some analyses. When this is the case ARI performs a Method Blank analysis using a container from a given lot and certifies that the lot is suitable for sample collection. Containers for Conventional analyses are not pre-cleaned and are certified internally by ARI following the procedures in SOP 1021S.

Container lot numbers are recorded when they are shipped out and when they are logged into ARI's LIMS.

4.4.3 Chemical Standards and Reagents

4.4.3.1 Reagent Water Supply

ARI maintains various sources of reagent/ de-ionized water. All reagent / de-ionized water used within the laboratory meets or exceeds ASTM Type II Standards. The water available in the Metals Laboratory is ASTM Type I. Water used in the Volatile Organic Laboratory is also filtered through activated charcoal to remove organic compounds. The quality of water from each source is monitored and documented daily. Routine maintenance, out of control events and corrective actions are documented for each system in a logbook.

4.4.3.2 Chemical Standards

All quantitative standards used for calibration in an analytical process are traceable to a National Institute of Standards & Technology standard if one exists. Non-traceable standards are verified against traceable standards or through the analyses of Standard Reference Materials. A Certificate of Analysis is filed in the QA Section or laboratory for all quantitative standards. The source, date of receipt, required storage conditions and an expiration date will be documented for all standards. All containers used to store standards will be labeled with an expiration date. Receiving, storage and preparation of calibration standards is described in SOPs 526S (Metals Analysis), 620S (Conventional Analysis), 704S (Volatile Organic Analysis) and 1012S (GC and GC-MS Analyses).

4.4.3.3 Chemical Reagents

Many of the analytical processes in use at ARI require chemical reagents that are not directly used in the calibration process. These reagents are used to accomplish such tasks as analyte preservation, adjustment of pH, the forming of colorimetric indicators, etc. These reagents are purchased in a grade and purity sufficient for their intended use. The receipt of all reagents is recorded in the Chemical Receiving Logbook where a unique Inventory Number is assigned to each reagent. Each original reagent container is labeled with an Inventory Number, the date it is opened and an expiration date as appropriate. A Certificate of Analysis is obtained for reagents when available and archived in the QA Office.

Solutions prepared from reagents are recorded in the Reagent Preparation Logbook. The logbook includes a unique Reagent Number that is traceable to the Chemical Receiving Logbook. Reagent containers are labeled with Reagent Number, date of preparation, expiration date, and preparer's identification.

Procedures for Reagent Receiving and Preparation are detailed in SOP 1013S.

Trace Metals Acids

To ensure the quality of acids, nitric and hydrochloric, used for trace metals analyses, only the highest quality, certified "metals free" acids are purchased. Each lot received is analyzed for purity prior to use in the laboratory to assure that it is acceptable for use. Whenever possible, entire lots will be reserved for use exclusively by ARI. This minimizes the possibility of receiving contaminated or unacceptable acid.

Solvents

To ensure the quality of solvents used for sample preparation and analysis, the highest purity of solvents required for sample processing will be used. Purity checks will be performed on solvent lots received by the laboratory. Only those solvent lots determined acceptable will be used for sample processing. Whenever possible, entire solvent lots will be reserved for use. This minimizes the possibility of receiving contaminated or unacceptable solvents.

Compressed Gases

To reduce the possibility of system contamination, compressed gases and liquids used for operating analytical instrumentation will be of a specified purity level. Any cylinder suspected of introducing contamination into a system will be promptly replaced.

4.5 Computer Systems

ARI maintains several data systems. These are used to automate such diverse functions as accounting, payroll, sales and marketing, sample receiving, instrument data collection, production of hardcopy and electronic data deliverables, intra- and internet applications and project management. Specific information about these systems is contained in Appendix C and various SOPs.

ARI maintains a Laboratory Information Management System (LIMS) that stores raw data, calculates final results and produces final reports (both hardcopy and electronic). The LIMS system is the major data system used at ARI. A separate Software Quality Assurance Plan outlines the QA/QC procedures for the LIMS system.

SECTION 5: LABORATORY DOCUMENTATION AND RECORDS

All laboratory operations and procedures performed during sample processing are documented in logbooks, notebooks and on laboratory forms and bench sheets. Consistent use of standard documents throughout the laboratory ensures that all activities will be traceable and serves as objective evidence of the work performed.

All procedures performed at ARI will be detailed in Standard Operating Procedures (SOPs). Sample preparation and analysis SOPs will reference approved analytical methods and detail the actual procedures followed by ARI staff. SOPs for non-analytical activities will detail the procedures developed specifically for use at ARI.

5.1 Responsibilities

All staff members are responsible for complete and accurate documentation of laboratory activities. Each laboratory section develops a comprehensive set of documents (bench sheets, forms, etc.) to record all activities performed in that section. All staff members are responsible for reviewing and understanding SOPs, and must sign a record to document this fact. The QAPM is responsible for maintaining control of laboratory documents and ensuring their consistent use.

To ensure that all documents, SOPs in particular, accurately reflect the activities performed at ARI, section supervisors and managers are required to review all documents annually and recommend changes to the QAP. The QAPM is responsible for coordinating document revisions and ensuring that all staff members have access to the most current laboratory documents.

5.2 Document Control

ARI's Quality Assurance Program requires that all forms and SOPs used within the laboratory be monitored to ensure that only the currently approved version of the documents are in use, centrally organized, and readily available to all staff members. All documents will include a revision date. The LQAP and SOPs will also have an effective date. The time between the revision and effective dates will be used for training and orderly implementation of changes.

Electronic copies of laboratory documents will be maintained as part of the quality assurance files. Each laboratory section maintains working copies of pertinent forms and SOPs. The QAPM coordinates the generation of new forms or SOPs and modifications to existing documents. Log number assignments will be as follows:

Laboratory Section	Form Number	SOP Number
Client Services	0001 - 0999	001-099
Computer Systems	1000 - 1999	100-199
Data Services	2000 - 2999	200-299
Extractions	3000 - 3999	300-399
GC Laboratory	4000 - 4999	400-499
Metals Laboratory	5000 - 5999	500-599
Conventional Laboratory	6000 - 6999	600-699
Volatile Organic Laboratory	8000 - 8999	700-799
Semi-volatile Laboratory	7000 - 7999	800-899
Quality Assurance Monitoring	10000 - 10999	1000-1099

Document numbers will be include an F for forms and an S for SOPs i.e. 101F or 1234S. Document Control Logs of all forms and SOPs, detailing the form name and number, revision number and revision date will be maintained by the QA Officer. Outdated documents will be maintained in an electronic archive file.

The QA Officer will distribute new and revised documents to the appropriate laboratory sections. Section staff will replace outdated copies of the document with the revised version. Laboratory forms and SOPs will be generated or revised on an “as needed” basis, and will be reviewed and revised as at least annually. Only the latest version of a form or SOP will be available in each laboratory. Section supervisors will periodically review these documents and recommend changes to be implemented by the QAPM. A comprehensive review of all laboratory documentation will be performed annually at the direction of the QAPM.

To maintain document security, release of documents to clients or other outside agencies will be controlled by the QAPM. The QAPM will record the document to be released, revision number, person and agency receiving the document, and the release date. All documents generated by the laboratory will be considered proprietary. ARI permission must be obtained by anyone releasing the document to other agencies or including the document in a project or quality assurance plan.

5.3 Reference Documentation

To provide an understanding of the procedures employed to generate quality data, a comprehensive set of reference materials is available to staff members. All activities performed within the laboratory can be referenced to a method or SOP. The laboratory maintains copies of the following method compilations:

Code of Federal Regulations (Section 40)
Test Methods for Evaluating Solid Waste (USEPA SW-846)
USEPA Contract Laboratory Program Statement of Work for Organics Analysis
USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis
Methods for Chemical Analysis of Water and Waste (USEPA 500 and 600 series methods)
Standard Methods for the Examination of Water and Wastewater
Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound (PSEP)
US Naval Facilities Engineering Support Activity –NFESC (formerly NEESA).
Hazardous Waste Remedial Actions Program (HAZWRAP)
State of Alaska Department of Environmental Conservation (ADEC)
Oregon Department of Environmental Quality (DEQ) Petroleum Hydrocarbon Methods
Washington Department of Ecology (WDOE) Guidan*ce for Remediation of Releases* from Underground Storage Tanks (Appendix L)
AFCEE
EPH/VPH Methods
National Environmental Laboratory Accreditation Conference

Other methods followed within the laboratory are also available. Published modifications to analytical methods will be reviewed and incorporated into laboratory SOPs. If a method for a parameter is developed by ARI, it will be detailed in an SOP. SOPs will be available for all laboratory activities. Each laboratory section will maintain a file or notebook of SOPs pertinent to that section. A compilation of all laboratory SOPs is maintained as part of the Quality Assurance Program files. A listing of laboratory SOPs is included as Appendix E.

The Quality Assurance Manual provides an overview of the laboratory-wide Quality Assurance program. A copy of the Quality Assurance Manual is distributed to all laboratory sections. Distribution of the QAP is coordinated by the QAPM.

ARI maintains a file of various laboratory and environmental publications and reference texts. These reference materials are available to all staff members. Operation and maintenance manuals are available for all equipment and instrumentation used within the laboratory. Additionally, senior level staff members are available to serve as reference sources. These staff members have numerous years of pertinent experience and can provide insight and guidance for all procedures and laboratory activities.

5.4 Quality Assurance Policies

Quality Assurance Policies provide standards and procedures to guide ARI employees in proper implementation of the QA Program. Appendix N includes current QA Policies.

5.6 Worksheets and Logbooks

Use of Laboratory Forms and Logbooks

All activities noted on laboratory forms and logs will be recorded in blue ink. Initials of the staff member performing the activity, as well as the date the activity is performed will be noted on all forms and logs. Any supplementary information about the activity, such as unusual observations or suspected procedural errors will be noted on the forms and logs. Laboratory notebooks will be prepared and controlled by the QAPM or his/her designee.

Changes to existing information will be annotated by drawing a single line through the original entry and initialing and dating the deletion. Correct information will be written above the deleted entry. The use of correction fluids or other techniques that cover the entry in its entirety are not used on laboratory documents.

Since sample processing within an analytical laboratory involves many detailed steps, documentation can be quite extensive and varied. The following guidelines will be followed to encourage consistency in laboratory record keeping:

Standard Logbooks

Preparation of all stock and working standards is documented in the appropriate standards logbook. Each entry includes preparation date, initial and final concentrations (including solute and solvent amounts), standard ID number, expiration date and the identity of the person preparing the standard. Stock solution entries include standard lot number and supplier. Working solution entries include the stock solution ID number. Commercially prepared stock standards are recorded in the stock standard logbook.

Sample Storage Temperature Logs

The temperature of the storage refrigerator and the recorder's initials is recorded on the temperature log each day a unit is opened. Any actions taken, such as adjustment or notifying the QAPM of out of control events and corrective actions, must be noted in the comment section for that date.

Balance Calibration Logs

The true and measured values for each calibration check weight are recorded, along with the date and recorder's initials. Any actions taken, such as notifying the QAPM of malfunctions is indicated alongside the entry for that date.

Instrument Logs

The Instrument Run Logs must detail all samples analyzed on a given instrument for a given parameter. Instrument conditions, analysis date, analyst initials and standard or sample identifications in the analytical sequence must be recorded in the log. Comments related to sample analysis and minor maintenance are noted on the instrument logs. For GC/MS analyses, instrument performance is documented by recording internal standard response alongside the sample identification.

Sample Preparation/Analysis Worksheets

Sample preparation and analysis activities are documented on appropriate worksheets. Sample identifications, weights or volumes used, intermediate cleanups, final volumes, preparation dates and analyst initials will be noted as well as any observations about

sample condition. Any issues encountered during sample preparation are also noted. Surrogate and spiking solution ID numbers, and concentrations added to the samples, must be indicated on the bench sheet.

For some parameters, analytical results are summarized on an analysis worksheet. Sample identifications, sample preparation information, sample results, quality control results, analysis date, analyst initials and reported detection limits must be indicated on the worksheet. Any necessary data qualifiers are also noted on the worksheet.

Maintenance Logs

All major maintenance performed on instrumentation or laboratory equipment must be documented. Maintenance performed, date and analyst performing the maintenance, and steps taken to verify that the maintenance was successful are detailed in the log.

Individual Laboratory Notebooks

Staff members preparing USEPA CLP samples must maintain unique laboratory notebooks for these analyses. Each case submitted is documented on a separate, sequentially numbered page. A listing of all samples prepared as part of the case, the date and the preparer's initials, and any notes specific to sample preparation must be annotated in the logbook. Individual notebooks are used only when required by a specific contract. All sample preparation information is recorded on a laboratory bench sheet.

5.5 Document /Data Storage and Archival

Logbooks

All active logbooks will remain in the appropriate laboratory sections. Completed logbooks will be forwarded to the QAPM for archival.

Magnetic Tapes and Diskettes

When instrument capabilities permit, all data generated is archived and stored on magnetic tapes or disks. The electronic media remains on file for approximately two years.

Chromatograms and Instrument Documentation

Hard copies of chromatograms, instrument calibrations, quantification reports and any other printed documentation generated during sample analysis are maintained as part of the permanent data files. All hardcopy data remain on file at ARI for seven (7) years or longer as specified by contract.

Project Data and Documentation

Project data and support documentation will be filed a minimum of seven (7) years, or as specified by contract. Data and project documentation for USEPA Contract Laboratory Program case projects will be purged or shipped to the appropriate regions following contract requirements.

SECTION 6: SAMPLE CONTROL

All samples analyzed by the laboratory will be monitored in accordance with sample control procedures. Sample control includes operations such as container preparation, sample collection, receipt and storage, and tracking of the sample throughout all processing steps. Documentation of all sample control activities and adherence to standard procedures is an important aspect of ensuring that data quality objectives are met.

6.1 Sample Collection

Production of quality analytical data begins with proper sample collection. Improper sampling procedures may result in inaccurate final results. Although the laboratory is not routinely involved with sample collection, it will minimize the possibility for error by providing clients with appropriate sample containers and sampling instructions for the requested parameters. If, upon receipt, sample integrity appear to be compromised, the client will be immediately notified to allow for re-sampling if necessary.

6.2 Sample Container Preparation and Shipment

To minimize the possibility of contamination from containers furnished by outside sources, the laboratory will furnish all necessary sample containers for client projects if requested by the client. Sample containers pre-cleaned to EPA specifications are supplied for most parameters. Containers for special purposes may be acquired upon request. Lot numbers for containers are tracked to link bottle orders to lot numbers.

For sample identification purposes, a sample label is affixed to each sample container prior to the sampling event. The sample label allows for recording of the following information at the time of collection: client name, client sample identification, sampling site, date and time of sample collection, analytical parameters, and any preservatives used. Sample labels provided by ARI are coated to prevent bleeding of recorded information if labels become wet.

To ensure that the correct number of appropriate sample containers are prepared and submitted to the client, a Bottle Request is completed by a Client Services staff member or Project Manager at the time sample containers are ordered by the client. All necessary preservatives are also noted on the Bottle Request. The Bottle Request is then forwarded to

appropriate personnel in the Client Services/Sample Receiving section for order preparation. All required containers will be gathered and preservatives added as specified. A copy of the Bottle Request accompanies the sample containers to allow the client to verify that the order is properly filled. Additional containers will be supplied for quality control purposes and in case of container breakage or sampling complications. Each cooler sent to a client with sample containers must contain a temperature blank to be used to assess the cooler temperature when it arrives back at ARI. A complete listing of containers and preservatives used within the laboratory is included as Appendix F.

To facilitate transportation of containers to the sampling site, sample containers will be placed in coolers along with appropriate packing material. The inclusion of packing materials, such as vermiculite or “bubblewrap”, is provided to minimize the possibility of container breakage and cross-contamination. Sample containers will be organized in the coolers per analytical or client specifications. Depending on client preference and project requirements, coolers and sample containers will be shipped to a specified location, delivered by ARI courier, or held at the laboratory for pick up. To ensure that sample identification, analytical parameters, and sample custody are properly documented, Chain of Custody records will accompany all sample container shipments. When appropriate, as for drinking water source sampling events or for parameters that require preservation in the field, sample collection instructions will also be included with shipments.

6.3 Sample Admission

All samples received by the laboratory are processed in a central Sample Receiving area. To ensure the safety of staff members receiving samples, coolers will be opened under a hood or in a well-ventilated area. Appropriate protection, such as disposable gloves, safety glasses and laboratory coats will be worn during sample receipt and log-in. Additionally, all general safety practices as specified in the Chemical Hygiene Plan will be employed.

Upon receipt, sample coolers will be inspected for general condition and custody seals. Time and date of sample receipt, as well as identification of the staff member receiving the samples, will be indicated on each Chain of Custody record accompanying the shipment. Cooler temperatures will be determined by placing a thermometer in the temperature blank container

for two minutes immediately after the cooler is opened, or by directly measuring the temperature in the cooler by placing a thermometer in the cooler. If samples cannot be logged-in within 30 minutes after receipt, the sample coolers will be tagged and placed in the walk-in sample storage refrigerator for short-term storage. Chain of Custody records for the stored coolers will remain in Log-In to ensure that processing of the stored samples is not overlooked.

Samples to be processed will be removed from the coolers and organized by sample identification. The number and type of sample containers received will be verified against the Chain of Custody record. Each sample container will be examined to verify that the condition is acceptable and that sample integrity has not been compromised during shipment. Sample containers broken during shipment should be handled according to procedures detailed in the Chemical Hygiene Plan (Section 5, Waste Disposal Procedures).

After sample organization and initial inspection has been completed, sample information will be entered into the LIMS, and a Service Request will be generated for the sample set. The Service Request serves as a work order for the laboratory. The Service Request will contain the following information:

Client Name
Client Project Name and/or Number
Client Contact
Verified Time of Sample Receipt (VTSR)
Required Turnaround Time
Laboratory Job Number
Client Sample Identifiers(s)
Laboratory Sample Number(s)
Required Parameters
Additional Analytical Requirements/Comments

Also entered into the LIMS are the number of sample containers for each sample, sample conditions, and cooler temperatures.

A sequential laboratory job number will be assigned to each sample set. Laboratory sample numbers, determined by the job number and a sequential letter, will be assigned to each sample. Containers for each sample will also be numbered sequentially. These identifiers will

be used to monitor the sample set and container throughout sample processing. All samples logged for the sample set and the analytical parameters required for each sample will be indicated on the Service Request. Client specific quality control requirements and any other pertinent information indicated on the Chain of Custody Record will also be noted. Discrepancies between the Chain of Custody record and sample containers will be noted, as well as discrepancy resolutions. To reduce the possibility of inaccurate sample processing, the sample receiving staff working with the Project Manager will resolve all discrepancy issues prior to releasing the samples to the analytical sections.

Upon completion of sample log-in, all documentation will be placed in a master folder and forwarded to the assigned Project Manager for review and approval. The master folder will be color-coded as follows:

Master File Color	Designation
Red	Accelerated Turnaround less than 1 week
Yellow	Accelerated Turnaround 1-2 weeks
Clear	Routine Turnaround

The Project Manager will review all aspects of the documentation, specify any additional analytical requirements and resolve any remaining discrepancies before sample processing begins. After Project Manager final approval has been obtained (indicated by the Project Managers initials and the date on the Service Request and laboratory-specific parameter sheets), the master file will be returned to Log-In for preparation of laboratory job folders. A job folder will be created for each laboratory section involved in sample processing for a given project. Laboratory job folders are color-coded as follows:

Job Folder Color	Designation
Red	Accelerated Turnaround (< 7 days)
Yellow	Accelerated Turnaround (7-14 days)
Orange	Organic Sample Preparation (Routine TAT)
Blue	Performance Evaluation Samples
Neutral (manila)	Routine
Pink (or other)	Client Specific

Copies of the Service Request and all pertinent laboratory-specific documentation required to accurately complete sample analysis will be placed in each laboratory job folder. Laboratory job folders will then be distributed to appropriate laboratory sections for analysis and incorporation into the section tracking system.

Subcontracting Policies

In some instances, ARI cannot perform certain analyses due to current laboratory workload limitations or specific analytical equipment requirements. In these instances it becomes necessary to subcontract work to other laboratories. In order to guarantee that data quality and defensibility are of the same high standards that ARI strives to achieve within our laboratory, policies regarding selection and use of subcontractor laboratories have been set.

Upon receipt of approval from our clients, ARI will submit samples to other labs under strict chain-of-custody. The sample information and analytical requirements are first entered into the ARI LIMS in the same way that samples for in-house analyses are processed. Subcontractor laboratories are contacted to verify their preparedness, and samples are then submitted to them using ARI chain-of-custody forms. These chain-of-custody documents are included in the master folder for the project.

Before a laboratory can be used as a subcontractor for any project, certain requirements must be met. Documentation of any certification or accreditation required for the project will be

obtained. The laboratory is also required to submit a Quality Assurance Plan for reviewed by the ARI QAPM. In certain cases, the ARI QAPM or designee will perform an on-site laboratory walk-through. The laboratory must be willing to maintain an annual contract with ARI, and must list ARI as a co-insured on the subcontract laboratory's liability insurance policies. Financial stability is also evaluated on a lab-by-lab basis. If the analysis to be subcontracted is also performed at ARI, the subcontract laboratory will analyze, on a periodic basis, performance evaluation samples submitted blind by the ARI QA Officer. Samples will only be subcontracted to a laboratory if it successfully meets the above requirements.

6.4 USEPA Contract Laboratory Program Sample Admission

Samples received from the USEPA Contract Laboratory Program (CLP) will be processed according to contract specifications. Sample log-in will be documented in logbooks specifically designated for contract samples. General safety practices will be employed while processing CLP samples. Contract specific procedures are performed in addition to routine sample receiving tasks. The designated EPA Sample Custodian will perform sample log-in for CLP samples.

Upon receipt, shipment coolers will be examined for the presence of custody seals and the condition of seals and coolers. Condition and any discrepancies will be noted. After the shipment coolers have been opened, verification will be made that all required documentation has accompanied the sample shipment. Each sample container will be inspected for condition and the presence of sample tags. Samples and custody documentation will be compared and reviewed to verify agreement. Any discrepancies between the documentation, sample containers, and/or sample tags will be noted. In general, any condition noted that may affect sample integrity or custody will be fully documented.

A sequential number from a range of numbers specifically designated for EPA Cases will be assigned to the sample set. Samples will be logged in Sample Delivery Groups (SDGs) based on the number of samples received for the specific Case. An SDG is defined as a group of samples within a Case received within 14 days, up to 20 samples. Should sample shipments for a Case occur over a period greater than 7 days, or should more than 20 samples be received for the sample Case within 7 days, additional SDGs will be assigned. The SDG

number is assigned based on the lowest sample number in the first delivery of samples received within the SDG.

Sample information will initially be recorded on the USEPA CLP/RAS/SAS Log-In Record. Also recorded on this document will be shipping, chain of custody, and sample condition information. Required analytical parameters for each sample will be noted. The Sample Log-In form will be completed in conjunction with the Log-In Record. The Sample Log-In form incorporates general shipping and sample receipt information, as well as sample identifications and sample tag numbers. Additionally, the USEPA CLP/RAS/SAS Service Request will be completed and will serve as the laboratory work order for contract analyses.

Throughout the log-in process, any discrepancies or inconsistencies noted will be immediately brought to the attention of the EPA Project Manager (EPA PM). The EPA PM will resolve the issue or, if necessary, contact the Sample Management Office (SMO) for resolution. All communications between the laboratory and the SMO will be fully documented. Upon completion of log-in but prior to preparation of laboratory job folders, all documentation will be forwarded to the EPA PM for review. The EPA PM will review all aspects of the documentation, specify any additional analytical requirements, and resolve any remaining discrepancies in the documentation. After EPA PM approval has been obtained, the documentation file will be returned to Log-In for preparation of laboratory job folders. At this time, a Sample Delivery Group/Traffic Report Cover Sheet, which summarizes sample receipt information, is generated by the EPA PM and forwarded to the SMO along with custody documentation.

6.5 Sample Custody

To ensure the traceability of sample possession, chain of custody is documented from sample collection to completion of final analysis, and is maintained during sample storage in archive prior to disposal. This is achieved through completion of a written chain of custody record. Custody of all samples and extracts processed by the laboratory is documented at each step of the analytical process.

The National Enforcement Investigations Center (NEIC) of EPA defines custody in the following ways:

It is in your actual possession, or
It is in your view, after being in your physical possession, or
It was in your possession, then you locked or sealed it up to prevent tampering, or
It is in a secure area.

Sample handling may vary and specific custody procedures have been developed for each laboratory section.

Custody at Sample Log-in

A Chain of Custody Record must accompany all samples received by the laboratory. This record documents all sampling activities as well as persons handling the samples prior to receipt by the laboratory. Sample receiving staff assumes custody of samples upon receipt from the client or courier. Samples will remain in the custody of Sample receiving until the samples are delivered to a laboratory section. Should samples require shipment to a subcontracting laboratory, a separate Chain of Custody Record will be completed to document the sample transfer. Chain of Custody records will be included with sample data reports in the final analytical package submitted to the client. Copies of these records will be filed with project data.

Custody of Volatile Organic Analysis (VOA) Samples

Upon completion of sample the sample receiving process, samples requiring analysis for volatile organic analysis will be placed in the storage refrigerator for “active samples” in the VOA Laboratory. To avoid possible cross-contamination of low level samples, those samples known or suspected to contain high levels of contaminants will be stored in a separate refrigerator prior to analysis.

Samples removed from storage for analysis are considered to be in the custody of the analyst responsible for sample processing. All samples to be analyzed will be listed in the analytical logbook for the selected instrument. Laboratory and client sample identifications, the bottle number and Identification of the analyst performing the analysis will be indicated in the logbook. If it is necessary for sample custody to be transferred to another instrument or analyst, the second analyst will record this information. Thus, custody of a given sample can be traced throughout the analytical process, regardless of the number of instruments or

analysts involved. Analysts will initial all raw data generated from sample analysis, to further document sample custody.

After completion of sample analysis, soil and intact water sample containers will be placed in the refrigerator designated for sample archival. Any water sample remaining in the container after completion of analysis will be considered compromised and will be discarded. The samples will remain in archive and in the custody of the VOA laboratory until final disposal.

Custody of Semi-volatile Organic Analysis (SVOA) Samples

Upon completion of sample log-in, samples requiring extraction for organic parameters will be placed in the walk-in storage refrigerator designated for active samples. This storage refrigerator is also used for storage of samples for conventional (wet-chemistry) analyses. All samples placed in this storage refrigerator will be logged into the *Walk-in Admission Logbook*. Removal of samples from the refrigerator for processing by Extractions or Conventional personnel must be indicated in the *Walk-in Admission Logbook*. Samples stored in this walk-in refrigerator remain in Log-In custody until removed to a laboratory for processing.

The analyst responsible for the custody and initial handling of samples within the sample preparation laboratory will be indicated on the Sample Preparation Worksheet. All analysts involved in the subsequent steps of sample processing will also be indicated on the worksheet. Residual sample volumes will be archived in the refrigerator designated for extractable organic samples. Transfer of residual samples to this refrigerator will be documented in the *Sample Archive Refrigerator Logbook*. Transfer of prepared sample extracts to the appropriate analytical sections will be documented in the Extract Log in the preparation laboratory and in the Extract Log in the analytical section. Upon extract transfer, the analytical section receiving the extract assumes custody.

Extracts removed from storage for analysis are considered to be in the custody of the analyst responsible for analysis. Removal of extracts for analysis will be indicated in the Extract Log in the analytical section. All extracts to be analyzed will be indicated in the analytical logbook for the selected instrument. Laboratory and client sample identifications, as well as the analyst performing the analysis will be indicated in the logbook. Analysts will initial raw data generated

from extract analysis to further document sample custody. After completion of analysis, extracts will be placed in the refrigerator designated for archive. Extracts will remain in storage and in the custody of the analytical section until final disposal.

Custody of Inorganic and Metals Samples

Upon completion of the sample receiving process, samples requiring preparation or analysis for inorganic parameters will be placed in the designated storage walk-in refrigerators. Samples requiring conventional analyses will be placed in the refrigerator also used for storage of extractable organic samples. Selected samples such as those requiring a critical analysis are placed directly in the laboratory. Removal of samples from the refrigerators for digestion and/or analysis will be indicated in the *Walk-in Admission Logbook* for the appropriate refrigerator. Samples stored in the walk-in refrigerators remain in Log-In custody until the laboratory removes the samples for processing.

The analyst responsible for custody and initial handling of samples within the metals preparation laboratory will be indicated on the Sample Digestion Worksheet. All analysts involved in the subsequent steps of sample processing will also be indicated on the worksheet. Transfer of completed sample digests to the metals instrument (analysis) laboratory will be documented by the metals preparation laboratory. Upon transfer of digests, custody is considered to be the responsibility of the analytical section receiving the digests.

Digests removed from storage are considered to be in the custody of the responsible analyst. . All digests to be analyzed will be indicated in the analytical logbook for the selected instrument. Laboratory sample identifications and the analyst performing the analysis will be indicated in the logbook. If it is necessary for digest custody to be transferred to another instrument or analyst, the second analyst records this information. Thus, custody of a given digest can be traced throughout the analytical process, regardless of the number of instruments or analysts involved. Analysts will initial all raw data generated from digest and analysis to further document sample custody. After completion of analysis, digests will be stored by and remain in the custody of the analytical laboratory personnel until final disposal.

The analyst performing the sample analysis will remove samples requiring analysis for other inorganic (conventional) parameters from storage. Removal will be documented in the *Walk-in Admission Logbook*. Custody of the sample will be considered to be the responsibility of that analyst. All samples to be analyzed will be indicated on the worksheet for the required parameter. Laboratory sample identifications and the analyst performing the analysis will be indicated on the worksheet. If it is necessary for sample custody to be transferred to another instrument or analyst, the second analyst will record this information. Thus, custody of a given sample can be traced throughout the analytical process, regardless of the number of instruments or analysts involved. The analysts' initials will be indicated on the worksheet to further document sample custody.

Special Chain of Custody Requirements

Should a client project require additional or more detailed custody documentation, requirements will be incorporated into the procedures for that project. Samples processed as part of the USEPA Contract Laboratory Program require more stringent chain of custody procedures. For this program, removal of samples and extracts for analysis (or any reason) will be documented in the Sample Control Log. Date, time and reason for removal, and date and time of return, will be fully documented. Removal of samples or extracts for permanent archiving or disposal will also be fully documented in the Sample Control Log.

6.6 Sample Archival and Disposal

After completion of analysis, unused sample aliquots are routinely stored for a specified period of time: 30 days for water samples and 60 days for soil samples. Colored markers are placed on samples with specific storage requirements during the sample receiving process. The color-coding is defined in the following table:

Label Color	Storage Requirement
Red	Hold until further notice
Orange	Suspected Hazardous
Yellow	Shared Sample containers

Samples submitted for archival will be logged into the Sample Archive Logbook. Laboratory and client identifications, as well as archive date will be indicated in the logbook. The anticipated disposal date for the sample set will also be noted. The logbook will be reviewed several times during each week to determine samples scheduled for disposal. On or soon after the scheduled disposal date, the samples will be removed from archive storage and disposed.

In consideration of disposal requirements for hazardous samples, each sample processed by the laboratory will be evaluated for contamination levels based on final analytical results. Those samples containing analytes of interest at or above regulated disposal levels will be identified and handled as hazardous waste. A designated staff member is responsible for monthly disposal of hazardous waste at a local disposal site and is also responsible for maintenance of all hazardous waste disposal records. Specific guidelines for handling hazardous samples and waste are detailed in the Chemical Hygiene Plan (Section 5, Waste Disposal Procedures).

SECTION 7: PROJECT MANAGEMENT AND TRACKING

7.1 Project Management

Concise and accurate communication between a client and ARI, and within the laboratory, is a extremely important requirement for generating quality analytical results. All clients contracting with ARI will be assigned to a Project Manager The Project Manager confirms that project requirements are consistent with laboratory capabilities, and coordinates with laboratory sections to provide analytical results within specified project timelines. Project organization, monitoring, and follow-up is the responsibility of Project Management staff.

Client project requirements and Project Managers' areas of expertise will be considered for client assignment. To ensure that all clients and projects receive the attention necessary for successful project completion, Project Manager workloads will also be considered. Project Managers will serve as the central focus for all project related activities and communications.

The Project Manager will review work plans and requirements for all pending projects. Any questions related to the work plan will be addressed prior to project commencement. The Project Manager will consult with appropriate analytical sections to clarify any issues regarding procedures and capabilities. Project deliverables requirements will also be addressed at this time. Upon receipt and log-in of project samples, the Project Manager will review all documentation to ensure that samples were properly logged in, and that analytical and QC requirements were correctly specified. The Project Manager will also provide any additional project related information that will assist the analytical sections with sample analysis. Laboratory sections will not process a sample until Project Manager approval has been given. Exceptions are parameters with critical (less than 48 hour) holding times or those that arrive on weekends or holidays when none of the Project Managers can be contacted.

Throughout the project, the Project Manager will monitor all analytical activities to help ensure that the project is completed and delivered on schedule. Any issues arising during sample processing will be promptly discussed with the client. Likewise, the analytical staff will be informed of any client concerns or project modifications. The Project Manager will also address any issues that arise during subsequent review of the analytical data by the client.

7.2 Project Tracking

Monitoring the laboratory workload ensures that adequate staffing and equipment will be available to produce quality analytical data and meet client needs. At the time a client project is tentatively scheduled, information regarding the project will be documented in the Project Management Database. Project particulars, sample quantities, parameters and anticipated sample delivery dates will be specified, as well as any prearranged analytical costs. Project work plans and any other project information will be kept on file with the Project Manager. Schedules for pending projects are communicated to the lab sections through periodic distribution of database printouts. Upon receipt of project samples, the project Inquiry number will be referenced to ensure project requirements are accurately specified. The original project documentation will be placed in the master folder as part of the project file.

Each laboratory section analyzing project samples will be responsible for ensuring that all analyses are accurately completed by the required date. All staff members are required to be aware of holding times, special analytical requirements, and required turnaround times. Analytical sections will remain in close communication with the Project Management staff so that any issues arising during sample analysis can be promptly addressed or discussed with the client.

Project Managers or their designee are responsible for monitoring project status. Sample status reports are generated as needed from LIMS and are distributed to lab sections and Project Managers. These reports allow the Project Managers to review project status and identify any samples which must be expedited to meet project timelines. Additionally, verbal communication between Project Managers and lab sections provides information about project status.

After sample analysis, report generation, and final review have been completed, data and final reports will be forwarded to the Project Manager. If requested, preliminary and interim results will be forwarded to the client. When all final data are available, the Project Manager will assemble the final package, verifying that all analyses were completed and project requirements met. A project narrative detailing the particulars of sample processing will be generated. After assembly and prior to shipment, the Project Manager will perform a final,

cursory review of the package for any inconsistencies or incorrect information. The package will then be forwarded to clerical personnel for photocopying and shipment. The Project Manager will determine final analytical costs and submit this information to the Accounting department for invoicing. Upon completion, all raw data and documentation associated with each client project will be compiled and stored as part of the laboratory project files. A chart detailing laboratory workflow as described in this section is included as Appendix G.

7.3 USEPA Contract Laboratory Program Project Tracking

Samples received as part of the USEPA Contract Laboratory Program are monitored in a manner similar to other projects. The EPA Project Manager coordinates all scheduled projects. At the time a project is scheduled, the EPA Project Manager will record the project specifics in the PMDB. The case number, EPA region from which the case originates, scheduled sample shipping date, number of samples and analytical parameters requested will be recorded. Upon receipt of scheduled samples, the EPA Project Manager will be responsible for project monitoring and coordination of final deliverables package preparation and shipment. The EPA Project Manager is also responsible for maintaining all USEPA CLP project files.

SECTION 8: ANALYTICAL METHODS

To ensure that all data generated are consistent and comparable, clearly defined procedures will be followed for all aspects of sample processing, control and management. Standard Operating Procedures (SOPs) provide detailed guidelines for completing a procedure. Document control procedures and periodic audits will ensure that operations are performed in accordance with the most current SOPs. All routine deviations from published will be noted in the SOPs. Analysis specific deviation will be noted in Analyst Notes and in the Analytical Narrative.

8.1 Responsibilities

It is the responsibility of staff members to perform all procedures in accordance with the guidelines specified in the Standard Operating Procedures. Laboratory management is responsible for ensuring that SOPs are followed throughout the laboratory. The QAPM is responsible for coordinating periodic review and revision of existing SOPs and generation of additional SOPs. The QAPM is also responsible for maintaining SOP document control and ensuring that the most current versions of all SOPs are available to staff members.

8.2 Methods

Laboratory procedures will reference established methods as specified in the following publications:

Code of Federal Regulations (Section 40)
Test Methods for Evaluating Solid Waste (USEPA SW-846)
USEPA Contract Laboratory Program Statement of Work for Organic Analysis
USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis
Methods for Chemical Analysis of Water and Waste (USEPA 500 and 600 series)
Standard Methods for the Examination of Water and Wastewater
Protocols for Measuring Selected Environmental Variables in Puget Sound (PSEP)
Navy Installation Restoration Laboratory Quality Assurance Guide(February 1996)
Hazardous Waste Remedial Actions Program (HAZWRAP)
State of Alaska Department of Environmental Conservation (ADEC)
Oregon Department of Environmental Quality (DEQ) Petroleum Hydrocarbon Methods
Washington Department of Ecology (WDOE) Guidan*ce for Remediation of Releases* from Underground Storage Tanks (Appendix L)

The laboratory will adhere to established methods whenever possible. Occasionally, however, procedures determined to provide more accurate final results will be incorporated into the method. Should the laboratory procedures deviate from the established method, all modifications will be detailed in the associated SOP. A listing of laboratory SOPs is included as Appendix E.

8.3 Standard Operating Procedures

Standard Operating Procedures (SOPs) are detailed, step-by-step instructions for completing a laboratory operation. SOPs will address all procedures within the laboratory, from initial project identification to final data archival. SOPs will be generated for procedures developed within the laboratory and for those that follow established methods.

To ensure consistency in defining procedural guidelines, all SOPs will contain the following sections:

Scope and Application
Definitions
Equipment
Documentation and Forms
In-house Modifications to Referenced Method
Procedures
Review
Quality Control
Corrective Actions
Miscellaneous Notes and Precautions
Method References
Appendices

SOPs will be monitored through the laboratory document control system. Each SOP will be assigned a document control number as detailed in Section 5.2 of this LQAP. SOPs are revised whenever a laboratory procedure is changed or modified. All SOPs are reviewed and revised as necessary at least once a year. Personnel normally performing the procedure or analysis perform the review. SOPs will be generated for each new procedure implemented within the laboratory. Review, modification, new SOP generation, and distribution will be coordinated through the QAPM. The QAPM will periodically audit the laboratory sections to

verify that the most current versions of all SOPs are in use. Document release will be controlled as detailed in section 5.2.

8.4 Method Selection and Use

Method selection will be based on availability of analytical instruments and equipment, chemical standards, expected method performance and marketability. Methods that are defined and accepted by regulatory agencies and familiar to ARI's clients are preferred. The Laboratory Manager and QAPM in consultation with marketing, client service, and laboratory supervisory staff are responsible for selecting appropriate methods. Client or project-specific methods may be used when appropriate.

The most recently promulgated method will be used for all procedures. Non-promulgated methods will be investigated if requested by a client. Section supervisors and managers are responsible for ensuring that the procedures in use reflect the requirements of the promulgated methods. Any modifications made to the method must be documented in the SOPs. Method modifications may be acceptable, provided all acceptance criteria specified in the method are met.

Section supervisors and managers review newly promulgated methods. SOPs will be modified as necessary to reflect the new methods. When possible, the annual SOP review will be coordinated with anticipated method promulgation dates. This is especially useful for large method compilations, such as SW-846. If the annual SOP review and method promulgation cannot be coordinated, SOPs will be revised as soon as possible after a method has been promulgated, especially when method changes are significant.

SOPs will be generated to reflect the most commonly used methods and protocols. If more than one method is used for an analysis, separate SOPs should be generated. Several methods may be incorporated into one SOP, provided that each method is clearly identified and defined in the SOP. Method modifications or special requirements for ongoing projects, or for specific programs (Navy, CLP, etc.), will be incorporated into the SOP. These requirements will be annotated to indicate that they are project/program specific. Analysts and technicians will be responsible for ensuring that, when required, project or program specific procedures are followed. SOPs will be controlled as specified in section 5.2.

8.5 Method Performance

Method performance must be demonstrated for all new methods prior to using methods for sample analysis. Section supervisors and managers are responsible for ensuring that method performance is demonstrated and support procedures have been performed.

Method performance will be demonstrated in the following manner:

A draft SOP will be generated for the method. The SOP must provide sufficient detail to perform the analysis and must accurately reflect the published method. Any steps in the method for which analyst discretion is allowed must be clearly defined.

A method detection limit (MDL) study must be performed for the method. Method detection limits must be verified to be at or lower than any method-specified detection limits. Method detection and reporting limits must be established.

Method precision and accuracy must be evaluated. This may be determined using an MDL or IDL study. Replicates will be evaluated for precision; analyte values will be compared to spike amounts to determine accuracy. Any method-specified precision and accuracy criteria must be met.

All method performance results will be reviewed and compiled by the section supervisor. Results will be filed with the QA section. A final SOP will be generated and distributed.

SECTION 9: INSTRUMENT CONTROL

9.1 Detection Limits

To verify that reported limits are within instrument and method capabilities, three levels of detection have been established: instrument detection limits, method detection limits, and reporting limits. Instrument and method detection limits are statistically based values, determined from replicate analyses of analytical standards. Whereas reporting limits are arbitrary numbers based upon the experience and judgement of the analyst. Reported values will be qualified based on the established limits. All limits will be summarized an controlled by the QAPM and are included as Appendix I.

Instrument Detection Limits

The instrument detection limit (IDL) is considered to be the smallest signal above background noise that an instrument can reliably detect. This limit reflects whether or not the observed signal has been caused by a real signal or is only a random fluctuation of noise from the blank. The IDL does not take into consideration the performance or efficiency of analytical methods.

Instrument detection limits are determined annually, or when ever a major change has been made, for each instrument in the metals analysis laboratory. Seven replicates, of a blank, or standards containing analytes at levels three to five times the expected IDLs are analyzed on three non-consecutive days. The IDL value for an analyte is three times the average of the standard deviations from the three replicate sets of analyses.

Method Detection Limits

The method detection limit (MDL) is considered to be the lowest concentration of an analyte that a method can detect with 99% confidence. Method detection limits will be established for all analytical parameters according to the guidelines specified in the Code of Federal Regulations, Section 40. Seven replicate samples are fortified with target analytes at levels that are one to five times (but not exceeding 10 times) the expected detection limits. The MDL for an analyte is determined to be the standard deviation of the replicates times the appropriate student's t-test value. More than seven replicates may be processed, but all replicates must

be used in the MDL determination. To report data without qualification, statistically determined MDLs cannot exceed any method specified MDLs.

Laboratory supervisors or managers review all statistically determined MDLs for accuracy and validity. The section supervisor or manager is responsible for ensuring that any unusable MDL studies are reprocessed. Once accepted, MDL study results and associated raw data will be forwarded to the QA section for further review and additional approval. MDLs approved by both section management and QA will be considered final and acceptable for use.

MDL studies will be conducted for all analyses performed by the laboratory on representative water, sediment and, tissue samples when appropriate and suitable sample matrices are available. MDL studies for inorganic analyses are only performed on aqueous samples. MDL studies will be performed on all instruments used for sample analysis. To allow for reevaluation of method performance, MDL studies will be performed on an annual basis. The QAPM is responsible for ensuring that all MDL studies are performed at least annually. Section supervisors and managers are responsible for determining if and when additional MDL studies should be performed due to changes in analytical methods, instrumentation or personnel.

Reporting Limits

Reporting Limits (RL) are the lowest quantitative value routinely reported. Analytical results below the RL will be expressed as “less than” the reporting limit. RLs are estimated values based upon the MDLs, experience and judgement of the analyst, method efficiency, and analyte sensitivity. No reporting limit will be lower than its corresponding MDL. RLs will be verified on a regular basis either by having a calibration standard at the limit or by analyzing a standard at the RL immediately following initial calibration.

Analytical Standards

Generation of high quality results is dependent upon the use of accurately prepared analytical standards. Many stock standards used within the laboratory are commercially prepared solutions with certified analyte concentrations. Neat standards used for stock standard

preparation are of the highest purity obtainable. Standard preparations are fully documented in appropriate logbooks.

Responsibilities

It is the responsibility of each laboratory employee involved with standards preparation to ensure that all standards are correctly and accurately prepared through the use of good laboratory practices and analytical verification. It is also the responsibility of these staff members to properly document the receipt and/or preparation of all standards. Management is responsible for ensuring that all staff members follow specified standards preparation and inventory procedures. The QAPM is responsible for periodically auditing standard preparation records to verify compliance with the laboratory Quality Assurance Program.

Organic Standards Preparation

Two types of standards are utilized for extractable organic compounds: neat standards from which stock solutions are prepared, and commercially prepared stock solutions from which working solutions are prepared. The type of standard depends upon availability. Commercially prepared standards are preferred when available.

Preparation of stock solutions will be documented in the Stock Solutions Log. To ensure traceability, commercially prepared stock solutions will also be documented in the Stock Standard Solutions Log. Each solution will be assigned a stock number determined by the page number and entry number on the page, preceded by “S” to indicate the solution is a stock, volatile stock standards are labeled “VS”. For example, the third entry on page 44 will be assigned the stock number S44-3. For stock solutions prepared from neat standards, the compound, supplier, lot number, preparation schematic, preparation date, expiration date, and analyst initials will be recorded. After preparing the standard, another analyst should review the preparation information to verify accuracy. For commercially prepared stock solutions, the compound, supplier, lot number and expiration date will be recorded. As a stock solution is not actually prepared in-house for these commercial solutions, it is not necessary to record or verify a preparation schematic.

Preparation of working solutions (including spike and surrogate solutions) will be documented in the Working Standard Solutions Logbook. Each solution will be assigned a working standard number determined by the page number and entry number on the page. For example, the second entry on page 73 will be assigned the working standard number 73-2. For volatile organic standards, the working standard number is preceded by "VW". The compound, stock solution reference, preparation schematic, preparation date, expiration date, and analyst initials will be recorded. After preparing the standard, another analyst will review the preparation information to verify accuracy. After analyzing the standard and confirming that it is acceptable, analytical verification will be documented in the logbook.

Discarded or consumed standards will be annotated in the logbook by drawing a single line through the entry, indicating "discarded" or "consumed" above the line with confirming initial and date. Existing standard numbers will not be reused. Instead, each new stock or working solution made will be assigned a new number.

Standards preparation will be performed in accordance with good laboratory practices. Syringes, glassware and other preparation equipment will be thoroughly cleaned prior to and after use. To ensure accuracy, standard material weights and solution volumes will be exact. Neat standards that are less than 97% pure must be corrected for concentration. Standard solutions will be stored in amber bottles with Teflon-lined caps. Each standard solution will be labeled with the solution number, compound, analyst initials and expiration date. Stock solutions will be stored in the appropriate standards freezer, working solutions will be stored in the appropriate standards refrigerator.

Metals Standard Preparation

Commercially prepared single element stock solutions are used for all elements. Preparation of working solutions from these single element stocks will be documented in the Solutions Logbook. Preparation of check standards will also be documented in the Solutions Logbook. The element, preparation schematic, preparation date, expiration date, and analyst initials will be recorded. Working calibration standards are prepared weekly for furnace and ICP analyses and as needed for ICP-MS. Calibration verification standards are prepared daily for GFA analyses and as needed for ICP and ICP-MS analyses.

Standards preparation will be performed in accordance with good laboratory practices. All preparation equipment will be thoroughly cleaned prior to and after use. To ensure accuracy, solution volumes will be exact.

Inorganic (Wet Chemistry) Standard Preparation

Working standards for wet chemistry parameters will be prepared on a daily basis, prior to starting an analysis. Stock and check standard solutions will be replaced as solutions expire or are consumed. Stock and check standard solutions will be labeled with the compound, preparation data (weight and volume), units of concentration, preparation date, expiration date, and analyst initials.

Standards preparation will be performed in accordance with good laboratory practices. Glassware and other preparation equipment will be thoroughly cleaned prior to and after use. To ensure accuracy, standard material weights and solution volumes will be exact. Stock standards will be stored in containers appropriate for the parameter.

9.3 Calibration

Instrumentation and equipment used for sample processing and analysis must be operating optimally to ensure that accurate analytical results are generated. Verification of optimum operation is accomplished through various tuning and calibration procedures. Criteria for determining the accuracy of calibration are specified for all instrumentation and equipment. Prior to sample analysis, calibrations will be analyzed and evaluated against specified acceptance criteria. Acceptance criteria are either published as part of the method or generated at ARI using control charts. Calibration verifications will also be analyzed throughout an analytical sequence to ensure that instrument performance continues to meet acceptance criteria.

Gas Chromatography/Mass Spectrometry (GC/MS)

All GC/MS systems will be evaluated through analysis of an instrument performance check solution and calibration standards. The composition of the standards varies depending on the analysis performed on the system. System evaluation will be performed prior to sample

analysis. Evaluation criteria used for GC/MS analyses are as specified for the SW846 methods.

Instrument Performance Check Solution - Prior to analysis, the system will be evaluated to ensure that mass spectral ion abundance criteria are met. Bromofluorobenzene (BFB) is analyzed for volatile organic analyses, Decafluorotriphenylphosphine (DFTPP) is analyzed for semi-volatile organic analyses. All ions must meet method-specified criteria.

The instrument performance check solution will be analyzed at a minimum of every 12 hours during the analytical sequence. Each analysis of the check solution will be verified against the specified criteria.

Calibration - After instrument performance has been verified, each GC/MS system will be calibrated to verify response linearity. For volatile organic analyses, up to eight standards ranging from 1 µg/L to 200 µg/L will be analyzed (10 µg/L to 200 µg/L for CLP analyses). For semi-volatile organic analyses, five to seven standards ranging from 2 µg/L to 80 µg/L will be analyzed (10 µg/L to 80 µg/L for CLP analyses). The standard levels evaluated will vary depending on the compound. Initial calibration results will meet percent relative standard deviation acceptance criteria.

A continuing calibration verification standard at a mid-level concentration (routinely 50 µg/L for VOA and 250 µg/L for SVOA) will be analyzed at a minimum of every 12 hours during the analytical sequence. For continuing calibrations, minimum response factor and percent difference criteria will be considered in evaluating the acceptability of the calibration. Initial and continuing calibration acceptance criteria for volatile and semi-volatile organic analyses are presented in Appendix J. All calibration data printouts will include the following documentation:

Date of calibration,
Identification of standard used
Identification of person performing the calibration

The analyst performing the calibration will include documentation of any problems encountered during the calibration analyses with the data, and will also note any corrective actions taken. The calibration data will be tabulated, and summary statistics will be generated. These results will be kept on file with the raw data in the Data Services section.

Internal Standard Responses - Internal standard responses and retention times in all standards will be evaluated immediately after analysis. This will serve as a baseline from which all sample internal standard responses and retention times will be evaluated.

Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC)

Each GC and HPLC system will be calibrated to verify response linearity. Depending on the parameter, five to six standards at concentrations covering the linear range of the instrument will be analyzed. Percent relative standard deviations for initial calibrations will not exceed SW-846 limits when applicable or 25% for GC analyses and 30% for HPLC analyses in the absence of SW-846 guidance.

A continuing calibration standard at mid-range concentration will be analyzed after every 10 samples, or more frequently if the method or conditions warrant. Percent differences between initial and continuing calibrations will not exceed SW-846 limits when applicable or 25% for GC analyses and 30% for HPLC analyses.

Calibration for organochlorine pesticides will follow SW-846 guidelines. The initial calibration sequence specifies the analysis of Resolution Check, Performance Evaluation, three-point initial calibration, individual standards and instrument blanks. Criteria for evaluating these standards are as follows:

Performance Evaluation - The Performance Evaluation standard will be analyzed immediately following the Resolution Check standard. All standard peaks will be completely resolved. Individual breakdowns of DDT and Endrin will be less than or equal to 15% on both columns. A Performance Evaluation standard will also be analyzed at the end of the calibration sequence.

Initial Calibration - An initial calibration consisting of levels of standard concentrations will be analyzed immediately following the analysis of aroclor 1660 curve and individual aroclor and Toxaphene standards. The percent relative standard deviation (RSD) will not exceed SW-846 guidelines or 20% on each column.

Continuing Calibration - A midpoint Aroclor 1660 and or a midpoint pesticide standard along with a performance evaluation standard are analyzed after every ten (10) sample analyses. The continuing calibration standards will be within 85 - 115% of the initial calibration. The Performance Evaluation standard will meet previously specified criteria.

The analytical sequence may continue indefinitely, provided that calibration criteria are met throughout the sequence. Additionally, retention times for all compounds will fall within the

retention time windows established by the initial calibration sequence of the three standard concentration levels.

All calibration data printouts will include the following documentation:

Date of calibration,
Identification of standard used, and
Identification of person performing the calibration.

The analyst performing the calibration will include documentation of any problems encountered during the calibration analyses with the data, and will note any corrective actions taken. The calibration data will be tabulated, and summary statistics will be generated.

Metals

Analytical instrumentation for metals will be evaluated through the analysis of calibration standards, calibration blanks, and calibration verification standards. Initial calibrations will be performed prior to sample analysis.

Inductively Coupled Plasma Atomic Emission Spectrometry (ICP)

Initial standardization is performed daily, or more frequently as required, by analyzing a blank and four multiple element standards with a single concentration for each analytical wavelength. The calibration is immediately verified with the analysis of an initial calibration verification standard (ICV) obtained from a source independent from the IC standard.. The calibration will then be verified throughout the analytical sequence by analyzing a continuing calibration verification standard (CCV) after every 10 sample analyses. The calibration check standard values will be within ± 10% of the true value.

After initial calibration, a calibration blank (ICB) will be analyzed to check for baseline drift or carryover. The level of analyte in the calibration blank should be ±2 RL. Calibration blanks (CCB) will be analyzed immediately following each calibration verification standard analysis.

Following calibration verification a standard at the reporting limit (CRI) is analyzed for all elements. Warning limits have been set at ±1RL and any sample determined to have a concentration below this standard will be reported as undetected.

The upper limit of the calibration range, linear dynamic range, is established for each analytical wavelength using standards of increasing concentrations. These standards are analyzed against the normal calibration curve and must be within 10% of their true value to verify linearity. At a minimum this upper range will be

checked every six month or whenever major changes are made to the instrument. Any sample analyzed with a concentration above this linear dynamic range will be diluted and reanalyzed.

Also to verify the interelement correction equations, interelement correction standards (ICS) are analyzed both at the start and end of the analytic run. Both the major interfering and the interfered with elements are evaluated.

Atomic Absorption Spectroscopy (Graphite Furnace and Cold Vapor)

Atomic absorption instrumentation is initially calibrated using a minimum of three standards of varying concentrations and a calibration blank. Initial calibration is performed daily or more frequently if conditions warrant. The calibration is immediately verified with the analysis of an independent source initial calibration verification standard (ICV). The calibration will then be verified throughout the analytical sequence by analyzing a continuing calibration verification standard (CCV) after every 10 sample analyses. The initial calibration verification standard value will be within ± 10% of the true value whereas the CCV will be considered in control if it is within ±10% for Graphite Furnace analysis or ±20% for Cold Vapor analysis.

After initial calibration, a calibration blank (ICB) will be analyzed to check for baseline drift or carryover. The level of analyte detected in the calibration blank should be ±1 RL. Calibration blanks (CCB) will be analyzed immediately following each calibration verification standard analysis.

Following calibration verification a standard at the reporting limit (CRI) is analyzed for all elements. Warning limits have been set at ±1RL and any sample determined to have a concentration below this standard will be reported as undetected. Any sample determined to have a concentration above the high calibration standard will be diluted and reanalyzed.

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Initial standardization is performed daily, or more frequently as required, by analyzing a blank and four multiple element standards. The calibration is immediately verified with the analysis of an independent source initial calibration verification standard (ICV). The calibration will then be verified throughout the analytical sequence by analyzing a continuing calibration verification standard (CCV) after every 10 sample analyses. The calibration check standard values will be within ± 10% of the true value.

After initial calibration, a calibration blank (ICB) will be analyzed to check for baseline drift or carryover. The level of analyte in the calibration blank should be ±1 RL. Calibration blanks (CCB) will be analyzed immediately following each calibration verification standard analysis.

Following calibration verification a standard at the reporting limit (CRI) is analyzed for all elements. Warning limits have been set at ±1RL and any sample determined to have a concentration below this standard will be reported as undetected.

The upper limit of the calibration range, linear dynamic range, is established for each analytical wavelength using high level standards. These standards are analyzed daily, or as necessary, against the normal calibration curve and must be within 10% of their true value to verify linearity. Any sample analyzed with a concentration above this linear dynamic range will be diluted and reanalyzed.

Also to verify the interelement correction equations, interelement correction standards (ICS) are analyzed both at the start and end of the analytic run. Both the major interfering and the interfered with elements are evaluated.

Inorganic Analyses other than Metals (Conventional Analyses)

Instrumentation and equipment used in analyzing samples for conventional wet chemical parameters (predominantly inorganic anions and aggregate organic characteristics) will be evaluated through the analysis of either internally prepared primary standards or externally derived Standard Reference Materials.

Depending upon the analysis, calibration is based either upon direct stoichiometric relationships, regression analysis, or a combination of the two. Stoichiometry generally involves standardization of a titrant against a known primary standard and then the use of that titrant for determining the concentration of an unknown analyte (e.g. the use of sodium thiosulfate in the iodometric titration of dissolved oxygen). Regression analysis involves the determination of the mathematical relationship between analyte concentration and the response produced by the measurement being employed. Regression analysis is used for colorimetric determinations, ion specific electrode analysis and ion chromatography. The curve of response versus concentration is fit by the method of least squares using linear, polynomial or logarithmic regression dependant upon the pattern of response being measured.

Calibration is repeated for each analytical batch. Immediately following calibration, the standardized titrant or the calibration curve will be verified by the analysis of an Initial Calibration Verification standard (ICV) and Initial Calibration Verification Blank (ICB). The verification standard will be derived from a source other than that used for standardization or

development of the standard curve. The ICV must return a value within 10% of its known concentration. The ICB must be less than the Reporting Limit (RL) or the lowest point on the standard curve, whichever is less. Initial calibration verification must be successfully completed prior to the analysis of any samples.

Calibration verification will be repeated after every ten samples processed during an analytical run. This Continuing Calibration Verification (CCV) will validate the method performance through an analytical sequence. If the continuing calibration values for either the standard or blank are out-of-control, the analyst will verify the outlying condition and, if verified, the analysis will stop and the method will be re-calibrated. All samples run between the outlying CCV and the preceding in-control CCV will be re-analyzed. In-control verification standards and blanks must bracket all samples within an analytical run.

Initial calibration depending upon the analysis is based on either a direct stoichiometric relationship, a linear regression analysis or a combination of the two. Stoichiometry generally involves standardization of a titrant and use of that titrant for determining the concentration of an unknown analyte (e.g. the use of thiosulfate in iodometric determination of dissolved oxygen). Regression analysis involves the determination of the mathematical relationship between the analyte concentration and the response produced by the measurement being employed. The curve is fit by the method of least squares using a linear, polynomial or logarithmic regression depending on the response being measured. The regression coefficient will be greater than or equal to 0.995 for the calibration to be considered acceptable.

Initial calibration curve is verified throughout the analytical sequence by analyzing a calibration verification standard after every 10 sample analyses. The calibration verification standard value will be within ± 10% of the initial calibration.

After initial calibration, a calibration blank will be analyzed to determine target analyte concentration levels. The level of analyte detected in the calibration blank will be less than the lowest standard concentration in the initial calibration.

SECTION 10: DATA VALIDATION and REVIEW

One hundred percent (100%) of laboratory data generated at ARI are subjected to a four level validation (review) process prior to release from the laboratory. The four levels of review are:

1. Analyst review
2. Peer review
3. Supervisory review
4. Administrative review

The data review process is outlined below and detailed in SOPs 200S through 206S.

In addition, Quality Assurance Personnel review 10% or more of all completed data packages for technical accuracy, project compliance and completeness. The data validation outlined below is completed in addition to the initial project review explained in Section 7 and QA specific reviews outlined in Section 11. If it is determined at any point during the analysis, reporting, or review process that data are unacceptable, prompt and appropriate corrective action will be taken. The corrective action will be determined by the situation. It is the responsibility of all staff members involved in data reporting and review to be aware of the quality control requirements and to be able to identify occurrences that require corrective action.

Analyst review:

Each analyst is responsible for producing quality data that meets ARI's established requirements for precision and accuracy and is consistent with a client's expectation.

Prior to sample preparation or analysis an analyst will verify that:

1. Sample holding time has not expired.
2. The condition of the sample or extract is described accurately on the laboratory bench sheet.

3. Specified methods of analysis are appropriate and will meet project required Data Quality Objectives.

4. Equipment and Instrumentation are in proper operating condition.

5. Instrument calibration and/or calibration verification are in control.

During sample preparation or analysis an analyst will:

1. Verify that Method Blanks and Laboratory Control Samples are in control.

2. Verify that QC (replicate, matrix spike analyses, SRM, etc.) samples meet precision and accuracy requirements.

3. In addition to verifying that quality control requirements are met, the analyst will review each sample to determine if any compound of interest is present at levels above the calibrated range of the instrument.

5. Check for data translation or transcription errors

6. Record all details of the analysis in the appropriate bench sheet or logbook.

7. Note any unusual circumstances encountered.

Following the analysis or sample preparation an analyst will:

1. Examine each sample and blank to identify possible false positive or false negative results.

2. Determine whether any sample requires reanalysis due to unacceptable quality control.

3. Review data for any unusual observances that may compromise the quality of the data, such as matrix interference

4. Review and verify that data entry and calculations are accurate and no transcription errors have occurred.

5. Document anomalous results or other analytical concerns on the bench sheet, corrective action form or Analyst Notes for incorporation into the case narrative.

6. Note data with qualifying flags as necessary.

7. Enter reviewed data into LIMS as appropriate, incorporate all necessary sample and quality control information into the data package and forward it for further review.

Peer review:

A second analyst trained in the appropriate SOPs will complete a peer review. Peer review will include at a minimum:

1. Verification that all QA (holding times, calibrations, method blanks, LCS, spiked sample analyses, etc.) criteria are in control.
2. Examination the data for possible calculation and transcription errors.
3. Review bench sheets and analyst notes for completeness and clarity.
4. Approve the analytical results or recommend corrective action to the laboratory supervisor.

When a second trained analyst is not available a peer review is not completed.

Supervisory Review:

Following analyst and peer review the data is forwarded to the laboratory section supervisor for review. The supervisor will:

1. Review the data package for completeness and clarity.
2. Follow-up on the peer review recommendations.

Designated reviewers normally perform the peer and supervisory reviews for GC-MS data. The reviewers are identified on the organizational chart in Appendix A.

Administrative Review:

The results of all analyses are reviewed for compliance with quality control criteria and technical correctness before data is released to the Project Manager for distribution to clients. Designated reviewers in the Metals, Conventional and Organic laboratories perform

administrative reviews. Personnel responsible for administrative reviews are noted in the Organizational Chart in Appendix A to this LQAP.

Administrative review is the final data validation process. Personnel performing the administrative review are responsible for the final sign-off and release of the data. Following administrative review the data is released to Project Managers for incorporation into the final data deliverable package.

Administrative review will:

1. Verify that the analytical package submitted for reporting is complete and contains all necessary information and documentation.
2. Verify that appropriate and necessary data qualifying flags have been used.
3. Verify that method blank and LCS data are acceptable, quality control requirements were met for surrogates in all samples and blanks, and that all necessary re-analyses or dilutions were performed.
4. Check the technical validity (i.e. are total metal > dissolved metals, is the cation/anion balance correct, etc.) of the complete data set.
5. Verify that all necessary final data reports have been generated and that all necessary data and documentation are included in the package.
6. Approve data reports for release.

10.2 Quality Assurance Review

10% (1 out each 10) final data packages are reviewed by ARI's QA staff for compliance with ARI's QA Program. This review ensures that the final product is accurate and meets project specifications. This assessment includes, but is not limited to, review of the following areas:

1. Reporting and analysis requirements
2. Initial and continuing calibration records
3. Quality control sample results (method blank, LCS, spikes, replicates, reference materials)
4. Internal and surrogate standard results

5. Detection and reporting limits
6. Analyte identifications

Data review activities are summarized and documented by the reviewer. The review notes are filed with the associated raw data in the project file. Any QA-related deficiencies identified during the data review will be forwarded to the QAPM for corrective action.

SECTION 11: QUALITY CONTROL SAMPLE ANALYSIS AND EVALUATION

Routine analysis of quality control samples is necessary to validate the quality of data produced in the laboratory. For each control sample, an expected result has been defined or quantified. If quality control sample results meet specified criteria, the procedure is considered to be under control. Conversely, quality control sample results that do not meet the specified criteria indicate that the procedure may not be generating acceptable data.

11.1 Quality Control Samples

For every procedure, various control samples, each focusing on a specific aspect of quality control, will be analyzed. Selection of appropriate control samples will be based on method or project specific requirements and good laboratory practices. Control samples will be processed at a frequency sufficient to verify that the procedure is in control throughout the analytical sequence.

Sample Batch

Control samples will be associated with discrete sample batches. A sample batch is considered to be samples of similar matrix and level, processed together at the same time, for a specific parameter group. Each sample batch will contain a method blank and laboratory control sample (LCS), each of which will be given a unique LIMS identifier of sample type, method, and date. These control samples will be linked to all samples processed within a given batch. Batch size cannot exceed 20 samples. Sample matrix spikes and replicates will be processed at a 5% frequency, and may or may not be batch-specific. However, for specific clients, contracts and programs (e.g. Navy and CLP), batch-specific matrix spikes and replicates will be processed. Control samples will be evaluated and verified as acceptable prior to analyzing client samples.

Method Blank

A method blank is an aliquot of water or solid sample matrix that is processed as part of the sample batch. The method blank, considered to be analyte and interference-free, is used to verify that contaminants or compounds of interest have not been introduced into the samples

during processing. The presence of contaminants in the method blank at levels above the reporting limit may signal the need for evaluation of the analytical process. Common laboratory contaminants present in the method blank will be evaluated based on the level of the analyte present in the blank. The method blank, in conjunction with instrument blanks, can also identify instrument contamination.

A minimum of one method blank will be processed with each analytical batch for methods requiring sample preparation prior to analysis. For methods not requiring pre-analysis sample preparation, a minimum of one method blank will be analyzed immediately prior to sample analysis, periodically throughout the analytical sequence, and also near the end of the sequence. A maximum of twenty samples may be associated with one method blank.

Holding Blank

Holding blanks are organic-free water samples that are placed in volatile organic sample storage refrigerators to monitor for possible cross-contamination within the storage units. The holding blanks are analyzed weekly and results are forwarded to the QA Officer for review and archival.

Laboratory Control Sample

The Laboratory Control Sample (LCS) is an aliquot of water or solid matrix to which selected compounds are added in known quantities. The LCS, processed as part of the analytical batch, is used to determine method efficiency. If recovery values for the added compounds fall within specified limits, the analytical process is considered to be in control. Recovery values not within specified limits signal the need for procedure evaluation.

For all analyses, a minimum of one LCS will be prepared for each analytical batch. LCS analysis for those methods not requiring pre-analysis sample preparation will be performed after each continuing calibration. A maximum of twenty samples may be associated with one LCS. LCS results will be evaluated for acceptability prior to analyzing batch samples.

Replicates

A replicate is a sample that is processed in duplicate within an analytical batch. Replicate analyses are used to verify method precision. The calculated percent difference between replicates should be within specified limits. Percent differences exceeding the specified limit signal the need for procedure evaluation unless the excessive difference between the replicate samples is clearly matrix related.

For inorganic analyses, a minimum of one replicate set should be processed for each analytical batch. Replicate sample analyses are not routinely performed for organic parameters. Instead, analytical precision is evaluated through the analysis of replicate matrix spikes or LCSs. However, as an additional control, replicate sample analysis will be periodically performed for organic parameters. Field replicates submitted to the laboratory will be analyzed as discrete samples.

Matrix Spike

A matrix spike is an environmental sample to which known quantities of selected target analytes have been added. The matrix spike is processed as part of the analytical batch and is used to verify method accuracy. Analyzed in duplicate, matrix spikes verify both method accuracy and precision. If recovery values for the added compounds fall within specified limits, the analytical process is considered to be in control. Recovery values not within specified limits signal the need for procedure evaluation unless the unacceptable recoveries are clearly matrix related.

For inorganic analyses, a minimum of one matrix spike is prepared with each analytical batch or per twenty samples, depending on project and client requirements. Matrix spikes are prepared in duplicate for organic analyses. A maximum of twenty samples may be associated with a matrix spike or matrix spike set.

External Reference

An external reference sample contains known quantities of selected compounds. The external reference sample is used to verify that analytical instrumentation is properly calibrated and that calibration standards are accurate. External reference samples are analyzed after instrument

calibration and prior to sample analysis. Compound recovery values not within the specified limit signal the need to evaluate either the calibration standards or instrumentation.

A minimum of one external reference should be analyzed with each analytical sequence. If sufficient quantities are available, additional external references should be periodically analyzed. For parameters for which external reference samples are not available, calibration standards should be verified through the use of an additional standard prepared from a source other than that used to prepare the calibration standards.

Other Quality Indicators

In addition to analyzing quality control samples, various indicators are added to samples as means of verifying control. Internal standards will be added to metals digestates for ICP-MS analyses and to organic samples or extracts prior to analysis to verify instrument operation. Surrogate standards will be added to extractable organic samples prior to extraction to monitor extraction efficiency. Surrogate standards will also be added to volatile organic samples prior to analysis to monitor purging efficiency.

11.2 Control Limits

To provide a means for evaluating whether or not a process is in control, acceptance limits have been established. These are based on internal, historical data for organic analyses and method specified limits for inorganic analyses. Samples associated with a specific program or contract (such as the USEPA Contract Laboratory Program) will be evaluated against program/contract-specified criteria. Routine samples will be evaluated against internally generated control limits. Project specific control limits will be used as required provided they have been reviewed for feasibility and approved by laboratory management.

Quality control results are transferred from the LIMS to a control limit and chart generation program. The QA Officer coordinates control chart and control limit generation. Control limits will be generated for LCS compound recoveries, surrogate recoveries, and matrix spike compound recoveries, on a matrix specific basis. Advisory control limits will be utilized for analyses performed on an infrequent basis until a sufficient number of usable data points are collected. Control limits are updated at least annually, but may be updated more frequently if

method or instrument changes have been made. Laboratory control and acceptance limits are detailed in Appendix K.

Two levels of control limits are utilized in evaluating process control: warning limits and action limits. Limits are statistically determined from values obtained from LCSs or other control samples. Warning limits, within which 95% of all results should be expected to fall, are considered to be ± two standard deviations from the average result. Action limits, within which 99.7% of all results should be expected to fall, are considered to be ± three standard deviations from the average result. Mean values, warning limits, and action limits are necessary for thorough evaluation of process control.

11.3 Control Charts

Control charts, in conjunction with other control sample analyses, are useful in verifying that an analytical procedure is performing as expected. The control chart provides a pictorial representation of how closely control sample results approximate expected values, as well as showing analytical trends. Indicated on the control chart are the mean and upper and lower warning and action limits. The warning and action limits are used to determine whether or not an analytical process is in control. The mean is used to determine whether results obtained for a procedure are trending upward or downward, which may ultimately affect the accuracy of sample results.

The QA Officer will coordinate generation of control charts based on laboratory data at least semi-annually. These control charts will be distributed to and reviewed by section supervisors and managers. Any significant trends or variations in results will be identified, and the source of the trend corrected. Copies of control charts will remain on file in the QA section.

At the bench level, individual results from quality control samples are evaluated against the specified control limits.

11.4 Control Chart Evaluation

To ensure consistency in determining analytical control, the following guidelines have been established for use in evaluating quality control results. A process is no longer considered in control when:

A value is outside the upper or lower control limit

Two successive values are outside the upper or lowe r warning limit

Seven or more values in sequence are above or below the mean

Seven or more values in succession exhibit an increasing or decreasing pattern.

It is the responsibility of the analyst to consider these guidelines while evaluating analytical control. If any of these situations occur, the analyst must employ appropriate corrective actions until it can be verified that the process is once again in control. The following possibilities will be considered when evaluating trends:

An upward trend of data may be the result of standard deterioration or an increase in sample preparation efficiency.

A downward trend of data may be the result of evaporation and subsequent concentration of an analytical standard, decrease in sample preparation efficiency, or instrument malfunction.

An increase in overall data variability may be the result of several analysts performing the procedure, variability in instrument operation or sample preparation efficiency, or failure to consistently follow standard procedures.

A short period of data variability may result from a sample set of an unusual or difficult matrix, or sample processing by an analyst not fully experienced in performing the procedure.

An overall abrupt shift in data may be a result of incorrect standard preparation, incorrect instrument operation or sample preparation, or analyst error.

SECTION 12: CORRECTIVE ACTIONS AND REESTABLISHMENT OF CONTROL

To produce quality data, it is important that all aspects of the analytical process are under control and that all specified quality control criteria are met. On occasion, however, procedures, reagents, standards, and instrumentation can fail to meet specified criteria. Should any of those situations occur, the quality of data produced may be compromised. When procedures no longer appear to be in control, sample processing will be halted and appropriate actions will be taken to identify and rectify any instrument malfunctions or process-related issues. Prior to resuming sample analysis, verification of control will be made through the analysis of various control samples. Actions taken and observations made during reestablishment of control will be fully documented on the benchsheet or as an Analyst Note. Only when control has been regained and all actions documented will sample processing resume. This ensures that no results generated during the suspect period will be reported.

12.1 Responsibilities

It is the responsibility of all laboratory personnel involved with sample processing to be able to determine whether or not a procedure is in control and to verify that all data are produced under conditions that are “in control”. It is at the analytical level that unacceptable conditions are most easily detected and addressed. These personnel are also responsible for employing and documenting all necessary corrective actions taken to regain control of a procedure. Samples processed during suspect periods will be reprocessed, and suspect data will be appropriately annotated to indicate that it is of questionable quality. The analytical staff will verify that all data submitted for review has been generated under acceptable conditions. All anomalies will be documented on the Analyst Notes form and will include such information as: type and source of anomaly, reasons for the anomaly, and actions taken to correct the problem. All personnel involved with subsequent and final data review are responsible for verifying that data were generated under acceptable conditions. If suspect data are identified at the review level, responsible analysts should be contacted to determine whether additional actions (such as reanalysis) will be taken. In addition, reviewers will confirm that anomalies noted by the analyst were indeed addressed and that appropriate corrective actions were taken.

On occasion, it is not possible to generate data that meet all Quality Control Standards. This may be due to sample volume limitations or sample matrix effects. It is the responsibility of the analytical and data review staff to document these situations and to maintain communication with the Project Management staff. The Project Management staff, in turn, is responsible for notifying the client or specifying additional actions to be taken. Project Managers are further responsible for ensuring that clients fully understand which data are questionable and the reasons why acceptable results could not be generated.

It is the responsibility of the QA Officer to perform regular reviews of corrective action procedures to ensure that unacceptable conditions or suspect data will be identified prior to releasing results. Section managers and supervisors are responsible for ensuring that appropriate corrective action procedures are in place and that all staff members are trained to identify and act upon "out of control" situations.

12.2 Corrective Actions

There are various stages of the analytical process where the procedure may fall out of control and require corrective action. In general, all procedures and equipment will be monitored to verify that control is maintained during sample processing. The following details those stages as well as the actions taken to reestablish and verify control.

Sample Preparation

During sample preparation, all glassware associated with a specific sample will be clearly labeled to eliminate the possibility of sample mix-up or mislabeling. Laboratory staff will ensure that sample-identifying labels are accurately completed and that correct sample identification is maintained at all times. If a sample appears to have been misidentified or mixed with another sample during preparation, the suspect samples will be discarded and new aliquots taken. If there is insufficient sample for re-preparation, the situation will be documented on the bench sheet and the Project Manager will be immediately notified.

Addition of surrogate standards or matrix spiking solutions will be carefully monitored to ensure that all samples are accurately fortified. Volumes and standard solution numbers of all standards added to samples will be recorded on the bench sheet. If there is suspicion that a

sample has been mis-spiked a new sample aliquot should be prepared. If there is insufficient volume for re-preparation, the bench sheet will be annotated to indicate which samples may be inaccurately fortified.

If sample matrix hinders processing per standard procedures, the section supervisor or manager will be consulted for guidance on appropriate actions. Preparation of smaller sample aliquots or employment of different procedures may be necessary. Any deviations from normal protocols will be documented on the bench sheet.

If at any time during sample preparation sample integrity is compromised or a procedural error is noted, the sample will be discarded and re-prepared. If insufficient sample volume is available for re-preparation, the situation will be documented on the bench sheet and the Project Manager will be immediately notified.

Calibration and Tuning

Prior to sample analysis, all instrumentation will be calibrated and tuned to ensure that equipment meets all criteria necessary for production of quality data. Equipment must meet the calibration criteria specified in the section entitled “Calibrations”, per manufacturer specifications or per project/contract requirements. If these criteria are not met, corrective actions must be employed. Any corrective actions taken will be fully documented in the appropriate logbook, indicating the problem, the actions taken, and verification. Samples will not be analyzed until initial verification of system performance has been made. In the event that continuing calibration results do not meet criteria, sample analysis will not resume until corrective actions have been employed or the system has been re-calibrated.

GC/MS Analyses - Analysis of the instrument performance check solution (BFB or DFTPP) will meet the specified ion abundance criteria. Initial calibration standards at a minimum of five concentrations will meet specified response factor and percent relative standard deviation criteria. It criteria are not met for initial calibration, the system will be inspected for malfunction. The initial tuning and calibration will be repeated, with all necessary corrective actions taken, until calibration criteria are met.

A check of the calibration curve will be performed at a minimum of once every 12 hours. All response factor criteria will be met. Additionally, the percent difference between the initial and continuing calibrations will meet specified criteria. If criteria

are not met, the system will be inspected for malfunction. The initial tuning and calibration verification will be repeated, with all necessary corrective actions taken, until calibration criteria are met.

Internal standard responses and retention times for standards will meet specified criteria. Any sample not meeting internal standard criteria will be reanalyzed. If reanalysis yields the same response and the instrument is determined to be functioning correctly, the failure to meet criteria will be attributed to sample matrix interference. No further re-analyses will be required.

GC and HPLC Analyses - Organochlorine pesticide calibrations will be evaluated using either USEPA CLP or SW-846 guidelines. The Resolution Check standard will meet resolution criteria and Endrin and DDT breakdown in the Performance Evaluation standard will meet breakdown criteria. Initial calibrations will meet percent relative standard deviation criteria. If, during the initial calibration sequence, criteria are not met, the system will be inspected for malfunction and the initial calibration be reanalyzed. Samples will not be analyzed until all initial calibration criteria are met.

Continuing calibrations of either the mid-level calibration standard or Performance Evaluation standard will be analyzed every 12 hours. If continuing calibration criteria are not met, the system will be inspected for malfunction and corrective actions will be taken to bring the system back into compliance. If, after corrective actions, the system is still not in compliance, re-calibration will be performed. After the system has been successfully corrected or re-calibrated, all samples previously analyzed between the acceptable and unacceptable continuing calibration will be reanalyzed.

If, during the analytical sequence, retention time shifting occurs, the system will be inspected for malfunction and corrective actions will be taken to bring the system back into compliance. If, after corrective actions, the system is still not in compliance, re-calibration will be performed. After the system has been successfully corrected or re-calibrated, all samples with retention times outside the specified windows will be reanalyzed.

For all other analyses, initial calibration standards analyzed at a minimum of five concentrations will meet percent relative standard deviation criteria. If criteria are not met for initial calibration, the system will be inspected for malfunction. The calibration will be repeated, with all necessary corrective actions taken, until calibration criteria are met.

A check of the calibration curve will be performed after every 10 samples. All percent differences between the initial and continuing calibrations will meet specified criteria. If criteria are not met, the system will be inspected for malfunction and re-calibration will be performed. Samples analyzed between an acceptable and unacceptable calibration check will be reanalyzed.

Metals and Inorganic Analyses - Initial calibrations will be verified by analyzing a calibration check standard immediately after calibration. The percent differences between the initial calibration and calibration check standard will meet specified percent difference criteria. If criteria are not met, the system will be inspected for malfunction. The initial calibration and calibration check will be reanalyzed until acceptance criteria are met.

The calibration check standard analyzed after every 10 samples will meet percent difference criteria. If the calibration check standard is not acceptable, the system will be inspected for malfunction and re-calibration will be performed as necessary. Samples analyzed between acceptable and unacceptable calibration check standards will be reanalyzed.

Instrument Blanks

Prior to sample analysis, instrument and/or calibration blanks will be evaluated for the presence of target analytes. If analytes are detected, the concentrations must be below the reporting limits for those analytes. If analytes are detected at levels above the reporting limits, the system will be inspected for malfunctions and the source of contamination will be identified. Sample analysis will not commence until analyte levels in instrument and calibration blanks are below the reporting limits. Instrument and calibration blanks are analyzed for VOA analysis only if sample carryover is suspected.

Instrument and calibration blanks will also be analyzed throughout the analytical sequence. These will not contain target analytes at levels above the method detection limits for organic parameters or the reporting limit for inorganic parameters. If one or more analytes exceed the RL, an additional blank will be analyzed. If analyte levels are still above the method detection limits, the system will be inspected for malfunctions and the source of contamination will be identified. Sample analysis will not resume until instrument and calibration blank analyte levels are below the RL. Organic samples analyzed between acceptable and unacceptable blanks will be evaluated to determine the need for reanalysis per the following guidelines:

If no target analytes are detected in the samples, reanalysis will not be required.

If sample target analyte levels are above the method detection limits, samples will be reanalyzed at analyst discretion. Reanalysis will be dependent upon the analyte levels and whether or not there is likelihood that analytes detected are a direct result of system contamination.

If the analytes present at unacceptable levels in the instrument blank are not of interest or concern in the associated samples, reanalysis will not be required. This is often a consideration for ICP analyses where analytes of concern may be only a subset of the possible analytes.

Methods for the analysis of inorganic analytes require that all samples associated with an out of control blank be re-analyzed.

Method Blanks

Prior to sample analysis, method blanks will be evaluated for the presence of target analytes. Ideally, no target analytes should be present in the method blank. If analytes are detected at or above the, the method blank will be reanalyzed to verify that the contamination is not a result of instrument carryover or malfunction. If the presence of target analytes is confirmed, the concentrations must be below the RL for those analytes.

Several volatile and semi-volatile compounds and certain elements are considered to be common laboratory contaminants. Concentrations of these common laboratory contaminants may exceed the method detection limits, but may not be present at concentrations greater than five times the method reporting limits. Target analytes considered to be common laboratory contaminants are:

Volatile Organic Compounds

Methylene Chloride
Acetone
2-Butanone

Semi-volatile Compounds

Dimethylphthalate
Diethylphthalate
Di-n-butylphthalate
Butylbenzylphthalate
bis-(2-Ethylhexyl) phthalate
Di-n-octylphthalate

If target analyte concentrations in the method blank exceed the acceptable levels and instrument malfunction or contamination has been ruled out, the method blank and all associated samples will be re-prepared and reanalyzed. If there is insufficient sample volume remaining for reprocessing, the Project Manager will be notified. If it is necessary to report results associated with an unacceptable method blank, the results will be qualified to indicate blank (and possible sample) contamination.

In the event that the analyte levels detected in the samples greatly exceed the method blank levels, re-preparation and reanalysis will not be required. It will be assumed that the possible contribution from contamination seen in the method blank is insignificant and will not affect final quantified results.

Laboratory Control Samples

Prior to sample analysis, the laboratory control sample (LCS) will be evaluated to verify that recovery values for all spiked compounds are within the specified acceptance limits. If LCS recoveries are out of control, the system will be evaluated to confirm that all instrumentation is operating properly. Extraction documentation and bench sheets will be reviewed to verify that concentrations of spike solutions added are accurate and to determine if any additional dilutions or concentrations were performed. Bench sheets will also be reviewed for any explanatory notes about the sample.

If no system, documentation, or solution preparation errors are identified, the following considerations will be made:

> If the LCS recovery values are outside the acceptance limits, but a matrix spike processed as part of the sample batch meets recovery acceptance criteria, re-preparation and reanalysis is not required for organic analyses. It will be assumed that the error is related to the LCS only, not the analytical process. The entire batch of inorganic samples is re-prepared and re-analyzed if LCS recoveries are out of control.
>
> If the LCS recovery values are outside the acceptance limits and no matrix spikes were processed as part of the sample batch, it is not possible to determine whether the LCS alone is in question or if there is an error in the analytical process. All samples will be re-prepared and reanalyzed.

If both LCS and matrix spike recovery values are outside the acceptance limits, the sample batch will be re-prepared and reanalyzed. This indicates the possibility of a systematic error that may affect the accuracy of final results.

Internal Standards

For volatile and semi-volatile organic analyses, internal standard results will be evaluated after each analytical run to verify that the values are within acceptance limits. Internal standard values will be within -50% to +100% of the internal standard values in the continuing calibration. If any internal standard does not meet the criteria, the system will be evaluated to confirm that all instrumentation is operating properly. The sample will then be reanalyzed. If the reanalysis results do not meet acceptance criteria, it will be assumed that the sample matrix is affecting internal standard values. Further reanalysis will not be required.

Surrogate

Surrogate recovery values will be evaluated after each analytical run to verify that the values are within acceptance limits. If recovery values are outside acceptance limits, the system will be evaluated to confirm that all instrumentation is operating properly. Documentation and bench sheets will be reviewed to verify that the concentrations of surrogate spike solutions added are accurate. For extractable organic analysis, bench sheets will be reviewed to determine if any additional dilutions or concentrations were performed. Bench sheets will also be reviewed for any explanatory notes about the sample.

If no system documentation, solution preparation or spiking errors are identified, the following considerations will be made:

If a volatile organic surrogate recovery value is outside of acceptable limits, the sample will be reanalyzed. If the reanalysis results are within acceptance limits, it will be assumed that the initial analysis was in error. If the reanalysis results are not within acceptance limits, it will be assumed that sample matrix is affecting surrogate recovery. Further reanalysis will not be required.

For semi-volatile organic analysis, one acid and one base/neutral surrogate recovery may be outside acceptance limits, but if all recoveries are above 10%, no corrective action is required. If more than one acid or base surrogate standard is outside acceptance limits, or if any surrogate recovery value is less than 10%, the sample will be re-extracted and reanalyzed. If the reanalysis results are not within acceptance limits, it will be assumed that sample matrix is affecting surrogate

recovery. Further reanalysis will not be required. *Matrix spikes will not be re-extracted for unacceptable surrogate recovery values.*

For other extractable organic analysis, if a surrogate recovery value is outside of acceptance limits, the data will be reviewed to determine if the unacceptable surrogate is a result of matrix effect. If matrix interference affects surrogate recovery and re-extraction is not deemed useful, the data will be annotated to document the situation. If a surrogate recovery is very low, based on the opinion of the final QA Data Reviewer, the sample will be re-extracted and reanalyzed

Matrix Spikes

Matrix spikes will be evaluated to verify that recovery values for all spiked compounds are within the specified acceptance limits. If unacceptable results are obtained, the system will be evaluated to confirm that all instrumentation is operating properly. Documentation and bench sheets will be reviewed to verify that the concentrations of spike solutions added are accurate. Sample preparation bench sheets will be reviewed to determine if any additional dilutions or concentrations were performed. Bench sheets will also be reviewed for any explanatory notes about the sample.

If no system, documentation, solution preparation, or spiking errors are identified, the following considerations will be made:

If a matrix spike recovery value is outside the acceptance limits, but the LCS meets recovery acceptance criteria, re-extraction will not be required. It will be assumed that the unacceptable recovery value is a result of matrix effect.

If both LCS and matrix spike recovery values are outside the acceptance limits, the sample batch will be re-extracted and reanalyzed. This indicates the possibility of a systematic error that may affect the accuracy of final results.

For inorganic analyses, matrix spikes with unacceptable recovery values will be re-prepared and reanalyzed. If the reanalysis results are not within acceptance limits, it will be assumed that the sample matrix is affecting the recovery values. Further reanalysis will not be required.

A post-digestion spike analysis will be performed for all metals analyses processed following EPA-CLP guidelines.

Sample and Matrix Spike Replicates

Sample and matrix spike replicates will be evaluated to verify that percent differences between the replicates are within acceptable limits. Percent differences for metals and inorganic

sample replicates will be within ±20%. When percent difference criteria are not met, the system will be evaluated to confirm that all instrumentation is operating properly. Documentation and bench sheets will be reviewed to verify that the concentrations of spike solutions added are accurate. Sample preparation bench sheets will be reviewed to determine if any additional dilutions or concentrations were performed. Bench sheets will also be reviewed for any explanatory notes about the sample.

If no system, documentation, solution preparation, or spiking errors are identified, the following considerations will be made:

> If percent difference values between sample replicates for metals and inorganic analyses do not meet acceptance criteria the Project Manager in consultation with ARI's client will determine weather to re-analyze the samples or flag the analytical results. If the samples are reanalyzed and results are not within acceptance limits, it will be assumed that the sample is not homogeneous, causing the poor analytical precision. Further re-analyses will not be required.
>
> Replicate sample analyses are not routinely performed for organic parameters.
>
> If percent difference values between matrix spike replicates do not meet acceptance criteria, but spike recovery values are acceptable, no re-extraction or analysis will be required. It will be assumed that the sample is not homogeneous, causing the poor analytical precision.
>
> If percent difference values between matrix spike replicates do not meet acceptance criteria and recovery values in one or both replicates are not acceptable, the sample and associated matrix spike replicates will be re-prepared and reanalyzed. If the reanalysis results are not within acceptance limits, it will be assumed that the sample is not homogeneous, causing the poor analytical precision. Further re-analyses will not be required.

Samples

In addition to monitoring sample quality control indicators, samples will be evaluated to determine the need for reanalysis. The following conditions will be considered while evaluating samples:

> If a target analyte detected in a sample exceeds the upper limit of the instrument calibration range, the sample will be diluted and reanalyzed. Dilution and reanalysis will be performed until the analyte concentration falls within the linear range of calibration. If the sample requires dilution to such a level that surrogates are no longer detectable and analytical accuracy is questionable, the sample will be re-prepared using a smaller sample aliquot.

Samples will be evaluated for matrix interference that may affect analyte detection and quantification. Appropriate cleanup procedures will be employed to remove interference. Samples will be diluted and reanalyzed as required to minimize background interference. If it is not possible to remove all interference, reported results will be qualified as necessary.

If low-level analytes detected in a sample are suspected to be a result of instrument carryover, the sample will be reanalyzed. If analyte levels remain approximately the same the initial results will be considered valid. If analytes are not detected during reanalysis, it will be assumed that the initial detection was due to carryover, and the initial results will not be reported.

If an instrument malfunction or procedural error occurs during analysis, all affected samples will be reanalyzed. If the malfunction appears to be an isolated incident, it will not be necessary to inspect the analytical system. If the malfunction appears to be an ongoing problem, the system will be inspected and necessary maintenance/corrective actions will be taken prior to resuming analysis.

Sample Storage Temperatures

Every sample storage unit's temperature will be evaluated at the beginning of each day that the unit is opened. Temperatures will be between 2 and 6 °C for refrigerators and -15 to -20 °C for freezers. If a temperature is outside the specified range, the unit's temperature will be adjusted to bring the temperature back within limits. The Temperature Log will be annotated to document the adjustment.

If adjustment does not bring the temperature within range, or if adjustment is not possible, the Laboratory Supervisor will be notified and will take corrective action. The Temperature Log will be annotated to document the action. If the temperature fluctuation is chronic or extreme, the samples will be removed from the unit and placed in another storage unit until the malfunctioning unit is repaired or replaced.

Balance Calibrations

Balances are serviced once a year by a certified technician. The service includes preventative maintenance and calibration.

Balance accuracy will be verified prior to balance use. The recorded weight will be within the acceptance criteria specified on the Calibration Log. If the recorded weight is not within the acceptance limits, the QAPM will be notified. The Calibration Log will be annotated to

document the action. The balance will not be used until it can be verified that acceptance criteria can be met.

Water Supply System

The water supply for the volatile organic and inorganic laboratories will be monitored daily for the presence of contaminants through the analysis of method and/or instrument blanks. Organic contaminants, especially chloroform, are early indicators of the need for preventative maintenance. If organic or other contaminants are detected, the system filters will be changed. After filters have been changed, an additional aliquot of water will be analyzed to confirm that contaminants are no longer present.

The water supply for the metals laboratory will be monitored daily. When the resistivity falls below 18 megaohm, system maintenance will be performed.

SECTION 13: LABORATORY EVALUATION AND AUDITS

Routine evaluations of the laboratory ensure that all necessary quality control activities have been implemented and are being effectively utilized. It is the responsibility of the QAPM to ensure that quality control activities are periodically evaluated for compliance. Findings from these evaluations allow the laboratory to address and modify any procedures that are not in accordance with the laboratory Quality Assurance Program or accreditation program requirements.

A number of tools are available for monitoring laboratory performance. ARI evaluates the quality of laboratory performance through the use of

Internal QA Audits
Technical System Audits
Data Quality Reviews
Audits by Outside Agencies (External Audits)
Performance Evaluation Analyses

Each audit provides an objective evaluation of laboratory performance. All internal audits and reviews are conducted according to specified guidelines. In addition, a collective review of

audit findings provides an overall evaluation of the laboratory. Deficiencies noted during the course of an audit or performance evaluation will be addressed, a root cause analysis performed, and appropriate corrective actions will be taken. Follow-up audits will be conducted to verify that corrective actions have been satisfactorily implemented.

Internal QA Audits

The Quality Assurance Officer regularly evaluates quality control activities within the laboratory to verify accuracy and compliance. The QAPM or designee routinely audits the following activities:

Balance verification records
Sample storage cooler temperature records
Oven, incubator and water bath temperature records
Chain of Custody records
Standard preparation records

Checklists are utilized to ensure consistent and complete audits. The checklists are included in SOP 1005S. Internal QA audit results will be summarized and reported to both staff and management. Corrective actions will be initiated as necessary. A schedule of internal QA audits is provided in Appendix L.

Technical System Audits

An audit of technical systems within the laboratory will be conducted at least annually. The audit will focus on the quality control and data generation/collection systems. The QAPM will conduct the audit with assistance from section managers and data reviewers. This evaluation will address areas such as:

Calibration records
Maintenance records
Control charts
Computer vs. hard copy data
Adherence to SOPs and methods
Support system records (DI water, balances, pipettes, etc.)

In addition, audit results from the past year will be reviewed to verify that all necessary corrective actions have been addressed and implemented.

Audits by Outside Agencies (External Audits)

As a requirement for many accreditation programs, on-site review of laboratory facilities and operations are conducted by clients or other outside agencies. The laboratory may be periodically audited by the following agencies:

USEPA Contract Laboratory Program
State of Washington Department of Ecology
State of Washington Department of Health
US Naval Facilities Engineering Service Center (NFESC) (formerly known as NEESA)
Hazardous Waste Remedial Actions Program (HAZWRAP)
US Army Corps. of Engineers

External audits are beneficial in that they provide an independent evaluation of the laboratory without internal influence or bias. The laboratory will be available for evaluation at the convenience of the auditing agency. Laboratory personnel will be available during the audit to address questions or provide information regarding laboratory procedures. All comments, deficiencies, and areas of potential improvement noted by the auditor will be reviewed, and appropriate corrective actions will be taken to resolve the noted issues. A listing of laboratory accreditations is included as Appendix M.

Performance Evaluations

Performance Evaluation (PE) sample analysis is a means of evaluating individual performance as well as the overall analytical system. In addition to the external audit, PE sample (PES) analysis is a requirement of many certification and accreditation programs. The laboratory routinely participates in the following performance evaluation programs:

Analytical Standards, Inc.(ASI) Performance Evaluation Studies
USEPA Water Pollution (WP) Performance Evaluation Studies (Commercial Supplier)
USEPA Water Supply (WS) Performance Evaluation Studies (Commercial Supplier)
USEPA Contract Laboratory Program Quarterly Performance Evaluations (as required)

A PES is a sample containing specific analytes in concentrations unknown to analysts. Comparison of the laboratory result to the "true" value determines the accuracy of the reported result and indicates the laboratory's ability to perform a given analysis. These results are also used to verify individual analyst proficiency. The QA Officer will periodically submit internal "blind" performance evaluation samples to the laboratory sections for analysis. Values obtained by the laboratory will be compared to expected, or true values. Parameters with reported values outside of the specified acceptable ranges will be evaluated by the analytical staff to determine the source of error. All necessary corrective actions will then be documented and implemented.

Quality Assurance Reports to Management and Staff

To ensure that laboratory managers are kept apprised of quality related activities and laboratory performance, the QAPM will produce a quarterly "Quality Assurance Report to Management" to be distributed to ARI management personnel by the tenth working day of each quarter. The report will, at a minimum include:

1. Information concerning current and ongoing internal and external audits
2. Status and results of current or ongoing internal or external proficiency analyses
3. Identification of Quality Control problems in the laboratory
4. Information on all ongoing Corrective Actions
5. Current status of external certifications
6. Current status of the Staff Training Program
7. Outline of new and/or future Quality Assurance Program initiative.

The QA Officer is responsible for follow-up and resolution of any deficiencies discussed in the report. Unresolved issues will remain on subsequent reports until addressed. Information

such as performance evaluation results and audit reports will be distributed to the laboratory staff.

The application of these combined activities provides comprehensive monitoring and assessment of laboratory performance, and ensures that all data produced by ARI will be of the highest possible quality.

Section 14: APPENDICES

A. Laboratory Organization and Key Personnel Resumes
B. Training and Demonstration of proficiency
C. Laboratory Facilities
D. Laboratory Instrumentation
E. Standard Operating Procedures
F. Sample Collection Containers and Preservatives
G. Laboratory Workflow
H. Analytical Methods
I. Method Detection Limits and Reporting Limits
J. Tuning and Calibration Criteria, Volatile and Semi-volatile Organics
K. Quality Control Recovery Limits
L. Internal Audit Schedule
M. Laboratory Certification and Accreditation
N. Personal Conduct Statement
O. QA Policies
P. Modification to ARI's LQAP

Appendix A

Laboratory Organization Chart
and
Key Personnel Resumes

KEY PERSONNEL RESUMES

Mark Weidner

Laboratory Director

Profile

Mr. Weidner co-founded Analytical Resources, Inc., along with Brian Bebee, Sue Dunnihoo and David Mitchell. Prior to his co-founding of ARI in 1985, Mr. Weidner was the Head Mass Spectroscopist at Michigan State University and an instructor at the Finnigan Institute. As Laboratory Director, Mr. Weidner is responsible for overall laboratory performance, as well as facility expansion and major purchasing. Mr. Weidner is intimately familiar with all operational and analytical aspects of ARI and initiated many of the procedures currently in use.

Education:

M.S., Medicinal Chemistry, Purdue University, W. Lafayette, IN (1978).

B.S., BioChemistry, Michigan State University, E. Lansing, MI (1975).

Experience:

Laboratory Director/Co-founder, Analytical Resources, Inc., Seattle, WA (1985 to present).

Senior Chemist, City of Seattle, Seattle, WA (1981 to 1985).

Instructor, Finnigan Institute, Cincinnati, OH (1979 to 1981).

Mass Spectroscopist, Michigan State University (1978 to 1979).

Brian Bebee

Laboratory Manager

Administrative Services Manager

Profile:

Mr. Bebee co-founded Analytical Resources, Inc., along with Mark Weidner, Sue Dunnihoo, and David Mitchell. Prior to his co-founding of ARI, Mr. Bebee had gained extensive GC/MS experience as a GC/MS Chemist at the Municipality of Metropolitan Seattle, (METRO). When he co-founded ARI in 1985, Mr. Bebee became the Organics Division Manager until 1993, when he assumed the position of Laboratory Manager. As Laboratory Manager, Mr. Bebee is responsible for the day to day flow of all laboratory operations, including personnel, instrument, and procedural concerns. He is also responsible for the direct supervision of the Volatile and Semivolatile Laboratories.

Education:

A.A., Oceanography, Marine Biology, Biology, Shoreline Community College (1973).

Experience:

Laboratory Manager, Analytical Resources, Inc., Seattle, WA (1987 to present).

Organics Division Manager/Co-founder, Analytical Resources, Inc., Seattle, WA (1985 to 1987).

GC/MS/DS Operator, Municipality of Metropolitan Seattle, Seattle, WA (1980 to 1985).

Senior Water Quality Technician, Municipality of Metropolitan Seattle (METRO), Seattle, WA (1976 to 1980).

Water Quality Technician, Municipality of Metropolitan Seattle (METRO), Seattle, WA (1973 to 1976)

David Mitchell

Quality Assurance Program Manager

Profile:

Mr. Mitchell co-founded Analytical Resources, Inc., along with Mark Weidner, Sue Dunnihoo, and Brian Bebee. Prior to his co-founding of ARI, Mr. Mitchell had gained extensive experience in the environmental chemistry field as Senior Chemist and Trace Organics Laboratory Supervisor at the Municipality of Metropolitan Seattle (METRO). His responsibilities include the management of ARI's Quality Assurance/Quality Control Program.

Education:

Graduate Work in Chemistry (Organic/Biological), University of Wyoming, Laramie, WY (1970 to 1974).

B.S., Chemistry, Upper Iowa College, Fayette, IA (1970).

Experience:

Quality Assurance Manager, Analytical Resources Inc., Seattle, WA (1998 to Present)

Client Services Manager, Analytical resources Inc., Seattle WA (1987 to 1998)

Vice President/Co-founder of Analytical Resources, Inc., Seattle, WA (1985 to 1987).

Senior Chemist, METRO Trace Organics Laboratory, Seattle, WA (1979 to 1985).

Research Associate, Northwestern University Medical School (1974 to 1979).

Susan Dunnihoo

Computer Services Manager
Administrative Services Manager

Profile:

Ms. Dunnihoo co-founded Analytical Resources, Inc., along with Mark Weidner, Brian Bebee, and David Mitchell. Prior to her co-founding of ARI, Ms. Dunnihoo had gained extensive experience in the environmental chemistry field through her work at Laucks Testing Laboratories, the City of Tacoma, and the Municipality of Metropolitan Seattle (METRO). As Computer Services Manager, Ms. Dunnihoo is responsible for the supervision of the Computer Services Section. She is also responsible for LIMS administration, which includes testing the LIMS for data integrity, as well as ensuring that client deliverable requirements are met.

Education

Graduate work in Chemistry, University of Washington.

B.A., Chemistry, Augsburg College, Minneapolis, MN (1976).

Experience

Computer Services Manager/Secretary, Analytical Resources, Inc., Seattle, WA (1985 to present).

Chemist, Laucks Testing Laboratories, Seattle, WA (1983 to 1985).

Chemist, City of Tacoma, Plant II, Tacoma, WA (1982 to 1983).

GC/MS/DS Operator, METRO TPSS Lab, Seattle, WA (1980 to 1982).

Jay Kuhn

Inorganics Division Manager

Profile:

Mr. Kuhn oversees ARI's Inorganics Division, which includes the Metals Sample Preparation, Metals Analysis, and Conventional Wet Chemistry sections. He has extensive experience in the environmental chemistry field, with an emphasis in inorganic analyses. Mr. Kuhn is experienced with in-house and EPA standard methods and protocols, as well as the operation, maintenance, and repair of ICAP, AA, and Graphite Furnace instruments.

Education

Graduate work in Environmental Chemistry, University of Washington, Seattle, WA.

B.S., Chemistry, University of California at Santa Barbara (1980).

Experience

Inorganics Division Manager, Analytical Resources, Inc., Seattle, WA (1992 to present).

Metals Division Manager, Analytical Resources, Inc., Seattle, WA (1992 to present).

Research Technician III, UW College of Forest Resources Chemical Analysis Cost Center (1981 to 1990).

Appendix B

Training

Qualification Requirements

In addition to on-the-job training, ARI recommends a specific level of education and experience for the following positions:

GC/MS Laboratory Supervisor

A Bachelor's degree in chemistry or scientific/engineering discipline, three years experience operating GC/MS systems and one year supervisory experience.

GC Laboratory Supervisor

A Bachelor's degree in chemistry or scientific/engineering discipline, three years experience operating GC systems and one year supervisory experience.

Sample Preparation Laboratory Supervisor

A Bachelor's degree in chemistry or scientific/engineering discipline, three years experience in organic sample preparation and one year supervisory experience.

Data Systems/LIMS Manager

A Bachelor's degree with four or more computer-related courses and three years experience in systems management or programming. A minimum of one year experience with software utilized for laboratory report generation is also recommended.

Programmer Analyst

A Bachelor's degree with four or more computer-related courses and two years experience in systems or application programming. A minimum of one year experience with software utilized for laboratory report generation is also recommended.

Quality Assurance Officer

A Bachelor's degree in chemistry or a scientific/engineering discipline and three years of laboratory experience, including one year of applied experience with quality assurance.

Project Manager

A Bachelor's degree in chemistry or a scientific/engineering discipline and three years of laboratory experience, including one year of applied experience with quality assurance.

GC/MS Chemist

A Bachelor's degree in chemistry or a scientific/engineering discipline and at least one year experience operating a GC/MS system. Three years of GC/MS operations and spectral interpretation experience may be substituted in lieu of educational requirements.

Mass Spectral Interpretation Specialist

A Bachelor's degree in chemistry or a scientific/engineering discipline and participation in training course(s) in mass spectral interpretation. Also, at least two years of experience in mass spectral interpretation is recommended.

Purge and Trap Expert

A Bachelor's degree in chemistry or a scientific/engineering discipline and one year experience operating a purge and trap type liquid concentrator interfaced to a GC/MS system.

GC Chemist

A Bachelor's degree in chemistry or a scientific/engineering discipline and at least one year experience operating a GC system. Three years of GC operations and maintenance experience may be substituted in lieu of educational requirements.

Pesticide Analysis Expert

A Bachelor's degree in chemistry or a scientific/engineering discipline and at least one year experience operating a GC system. Three years of GC operations and spectral interpretation experience may be substituted in lieu of educational requirements.

ICP Spectroscopist

A Bachelor's degree in chemistry or a scientific/engineering discipline and Four years of applied experience with ICP analysis of environmental samples. Four years of ICP experience may be substituted in lieu of educational requirements.

ICP Operator

A Bachelor's degree in chemistry or a scientific/engineering discipline and one year of experience operating and maintaining ICP instrumentation. Three years of ICP experience may be substituted in lieu of educational requirements.

Atomic Absorption (AA) Operator

A Bachelor's degree in chemistry or a scientific/engineering discipline and one year of experience operating and maintaining graphite furnace and cold vapor AA instrumentation. Three years of AA experience may be substituted in lieu of educational requirements.

Conventionals (Classical Chemistry) Analyst

A Bachelor's degree in chemistry of a scientific/engineering discipline and one year of experience with classical chemistry procedures. Three years of classical chemistry experience may be substituted in lieu of educational requirements.

Sample Preparation Expert

A high school diploma and one college level course in chemistry. One year of experience in sample preparation is also recommended.

Appendix C

Laboratory Facilities

ANALYTICAL RESOURCES INC. occupies a total of 23,500 square feet of floor space located at 4611 S. 134th Place in Tukwila, Washington. The laboratory facility, constructed between September 2001 and June 2002, includes:

- State-of-the-art heating, ventilation and air conditioning (HVAC) systems to assure a clean comfortable working environment while maintaining air flow balance designed to minimize the possibility of sample cross contamination between laboratory areas.
- A central service area provides space for three walk-in coolers (356 sq. ft. total), two walk-in freezers (760 cubic ft.), eight reach-in freezers, and sample cooler storage.
- A data network linking all workstations to a centralized server room. All connections are made to managed switches and hubs and are protected by the latest firewall technology and uninterruptible power supplies.
- Distribution systems to deliver pressurized Air, Zero Grade Air, Argon, Helium, Hydrogen, Nitrogen & Argon/Hydrogen to the laboratory areas from a central location.
- A system to deliver ASTM Type 1 water directly to sinks in each laboratrory area. Water is purified by filtration, ion exchange and reverse osmosis and continuously recirculated through a filtration, ion exchange, uv polishing loop for delivery to the laboratories.
- An isolated and ventilated hazardous waste storage area.
- An electronic repair and storage room.
- Alarm monitored fire sprinkler and intrusion detection systems

The facilities are divided into four functionally-distinct sections as detailed below:

1) The Organics Division features three main laboratory areas as described below:
   - The Organics Extraction Laboratory (2400 sq. ft.) is utilized to isolate and concentrate organic compounds from various environmental sample matrices. The laboratory contains approximately 200 linear feet of bench space and nine fume hoods. It is equipped with two gel permeation chromatographs, an accelerated solvent extractor (ASE) and a gas chromatograph for extract screening purposes. The laboratory includes a separate area for extraction of aqueous samples, a glassware cleaning area and individual workstations for the laboratory supervisor and analyst.
   - The Semivolatile Organics Analysis Laboratory (3000 sq. ft) has 124 linear feet of instrument bench space plus personal workstations. The Laboratory is equipped with seven Gas Chromatographs (GCs) with six GC-MS instruments, one High Performance Liquid Chromatograph (HPLC) and a fume hood for preparation of standard solutions and dilution of samples. Each gas chromatograph is individually vented to the outside for removal of heat and potentially contaminated GC exhaust gases.
   - The Volatile Organics Analysis (VOA) Laboratory (2500 sq. ft) houses seven GC-MS and two GC-PID instruments dedicated to volatile organics analysis. Each instrument is vented to the outside. The laboratory area includes two fume hoods, a sample/standards preparation area, a TCLP preparation/tumbler room and sample holding refrigerators. The HVAC systems maintains a positive air pressure in the laboratory using filtered air from outside of the building. This eliminates the possibility of cross contamination of samples with solvents from other areas of the laboratory.

2) The Inorganics Division includes a Trace Metals Laboratory and the Conventional Analyses Laboratory:
   - Trace Metals Laboratory (3000 square feet)
     - The Metals Preparation Laboratory (1200 sq. ft) contains five fume hoods including two 8-foot polypropylene. An additional eight foot polypropylene laminar flow fume hood is housed in a separate class 1000 clean room. The lab is equipped with tumblers, hot-plates, digestion blocks, facilities for glassware cleaning, and a spectrophotometer for cold vapor analysis of mercury, a TCLP tumbler room, and storage areas.
     - The Metals Instrument Laboratory (1300 sq. ft) features two atomic absorption spectrometers for graphite furnace analyses, two inductively coupled argon plasma spectrometers (ICP) for simultaneous analysis of metals species, and an ICP-mass spectrometer for analysis of metals species at low detection levels.
     - A 500 sq. ft. Office provides desk area for Trace Metals laboratory personnel.
   - The Conventional Analyses (Wet Chemistry) Laboratory (2500 sq. ft.) contains approximately 200 linear feet of bench space, eight fume hoods and includes a separate microbiology room. Instruments in this lab include two Rapid-Flow Analyzers, two TOC analyzers, an ion chromatograph, two uv/visible spectro- photometers, and various other equipment necessary for the evaluation of inorganic parameters.

3) The Sample Receiving Facility, consists of an area to accept and log-in samples to ARIs Laboratory Information Management System (LIMS) and an area to prepare and ship sampling supplies.
   - The Sample Receiving Facility (1000 sq. ft.) is equipped with two fume hoods, and 70 feet of bench space. Four computer terminals are available to log samples into ARI's LIMS.
   - The Sampling Containers Facility (500 sq. ft.) is used to prepare sampling containers for shipment to ARI's client designated locations.

4) Administrative Areas (8600 sq. ft.) include:
   - The Quality Assurance Section
   - Executive Offices
   - Project Management Section
   - The Human Resources Section
   - The Computer Services Section
   - Two Conference Rooms
   - A Lunch Room
   - Several Storage Areas

Appendix D

Instrumentation and Computers

INSTRUMENTATION and COMPUTER SYSTEMS

Organic Extractions Equipment

(ASE 1) Accelerated Solvent Extractor (1998) – Dionex ASE 200

(GPC 1) Gel Permeation Chromatograph (1985) – Fluid Metering Inc. pump and ISCO UA-5 UV detector equipped with a 16 position autosampler used for clean-up of samples prior to final analysis.

(GPC 2) Gel Permeation Chromatograph (2003) – Fluid Metering Inc. pump and ISCO UA-5 UV detector equipped with a 16 position autosampler used for clean-up of samples prior to final analysis.

Gas Chromatograph - Mass Spectrometers (GC/MS)

(FINN I) Finnigan MAT Incos 50 (1993) - networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. Varian 3400 GC with solid probe and Tekmar LSC 2000 Purge and Trap and a Delta Perspective PTA-30 autosampler for water or soil samples.

(FINN III) Finnigan MAT Incos 50 (1987) - networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. Varian 3400 GC with a Tekmar LSC 2000 Purge & Trap with Delta perspective (PTA-30) water vial autosampler.

(FINN IV) Finnigan MAT Incos 50 (1988) - networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. HP 5890 GC with split/splitless capillary injector and 7673A autosampler.

(FINN V) Finnigan MAT Incos 50 (1989) - networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. Varian 3400 GC with a Tekmar LSC 2000 Purge & Trap, and a Delta Perspective PTA-30 autosampler for water or soil samples.

(FINN VII) Finnigan MAT Incos 50 (1995) - with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. Varian 3400 GC, OI 4560 Sample Concentrator and a Delta Perspective PTA-30 autosampler for aqueous samples.

(FINN VIII) Finnigan MAT Incos 50 (1991) - with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software. HP 5890 GC with split/splitless capillary injector and 7673A autosampler.

Gas Chromatograph - Mass Spectrometers (GC/MS) (continued)

(NT I) Hewlett Packard (1994) - 5890 Series II Plus with HP 5972A MSD, HP 7673 autosampler and an APEX Prosep 800 large volume injector. The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

(NT2) Hewlett Packard (1999) – HP 5973 MSD with HP 6890 GC and HP 7683 autosampler. This MSD is equipped with an APEX Prosep 800 large volume injector. The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

(NT3) Hewlett Packard (1999) – HP 5973 MSD with HP 6890 plus GC Tekmar LSC 2000 Purge/Trap with Dynatech Precision Sampling (PTA30) autosampler. The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

(NT4) Hewlett Packard (2001) – HP 5973 MSD with HP 6890-Plus GC and HP 7683 autosampler. This MSD is equipped with an APEX Prosep 800 large volume injector. The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

(NT5) Hewlett Packard (2002) – HP 5973 MSD with HP 6890N GC and HP 7683 autosampler. This MSD is equipped with a Varian Archon autosampler and Tekmar 3000 Purge and Trap sampler. . The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

(NT6) Hewlett Packard (2002) – HP 5973 MSD with HP 6890 Plus GC and HP 7683 autosampler. The GC-MS is networked with a Hewlett Packard Unix Server running Thruput Target 3.4 data analysis software.

Gas Chromatographs

Hewlett Packard 5880A (1985) - FID/ECD detectors. Packed and capillary injectors, autosampler and integrator. Used for screening samples before full extraction.

Hewlett Packard 5890 – ECD 1 (1986) - Dual ECD detectors with HP 7673A autosampler and ChromPerfect data system. Both packed and capillary injectors are installed.

Hewlett Packard 5890 – ECD 2 (1988) - Dual ECD detectors with both packed and capillary injectors and 7673A autosampler and ChromPerfect data system.

Hewlett Packard 5890 – ECD 3 (1991) - Dual ECD detectors with packed and capillary injectors. HP 7673 autosampler and Chromperfect data system.

Gas Chromatographs (cont.)

Hewlett Packard 5890 – ECD 4 (1994) - Dual ECD detectors with split/splitless capillary injectors. 7673 autosampler and Chromperfect data system.

Hewlett Packard 5890 – FID 2 (1987) - Single FID detector and ChromPerfect data system. Single capillary injector and HP 7673A autosampler.

Hewlett Packard 6890 – FID 3 A, B (1996) - Dual FID detectors with dual capillary injectors. Dual tower HP 6890 autosampler, and an HP Chemstation data system.

Hewlett Packard 6890 – FID 4 A, B (1996) - Dual FID/ECD detectors with dual capillary injectors. Single tower HP 6890 autosampler and an HP Chemstation data system.

Hewlett Packard 5890 – PID 1 (1988) - Gas Chromatograph with FID and PID detectors in series. OI Analytical autosampler and OI Analytical Sample Concentrator. Dynamic Solutions "Maxima" data system.

Hewlett Packard 5890 – PID 2 (1991) - Dual PID detectors, one in series with an FID. OI Analytical 4551 autosampler and OI Analytical 4560 sample concentrator. Dynamic Solutions "Maxima" data system.

Hewlett Packard 6890 Plus Micro – ECD 5 (2002) - Dual ECD detectors with an APEX Prosep 800 large volume injector dual tower HP 7683 autosampler and an HP Chemstation data system.

Liquid Chromatographs

Hewlett Packard 1050 (1991) - Modular HPLC with autosampler, gradient pumping system, variable wavelength UV detector, programmable fluorescence detector, and Windows-based data system.

Inorganic Instrumentation

Perkin-Elmer SCIEX ELAN 6000 ICP-MS (1996) - A completely automated ICP-Mass Spectrometer with autosampler and multitasking software. Computer controlled using ELAN NT Windows based software.

Perkin-Elmer Optima 4300 ICP (2001) - A completely automated dual view simultaneous ICP with auto-sampler and multitasking software.

Varian 300Z (1992) - A single channel atomic absorption graphite furnace instrument equipped with Zeeman background correction, and an auto-sampler.

Inorganic Instrumentation (continued)

Varian 300Z (1991) - A single channel atomic absorption graphite furnace instrument with Zeeman background correction, equipped with an auto-sampler.

CETAC M-6000A Mercury Analyzer (2000) – A fully automated high sensitivity cold vapor atomic absorption instrument dedicated to trace and ultratrace Mercury analysis. System is computer controlled with windows base software and an auto-sampler.

Dionex Ion Chromatography DX 500 (1997) - Fully automated system with an auto-sampler for quantitative anions analyses. The system is computer controlled using Peaknet software.

Hitachi U2000 (1989) - UV-VIS Spectrophotometer for quantitative conventionals analysis.

Milton Roy 401 (1991) - UV-VIS Spectrophotometer.

Alpkem RFA/2 Autoanalyzer (1990) - with Alpkem soft pac data acquisition for nutrient analysis. Standard Tech 386 PC and a dot matrix printer.

Alpkem Flow Solution Autoanalyzer (1992) - with Alpkem soft pac data acquisition for nutrient analysis. IBM PS2 386 computer and a dot matrix printer.

Dohrmann Apollo 9000 (2001) - Total Organic Carbon (TOC) Analyzer. Includes an autosampler for water analysis.

Kontes Midi-Vap Cyanide Distillation Systems (1995) – Each of the two systems is capable of simultaneously distilling up to 10 samples for cyanide analysis using small sample aliquots.

Miscellaneous Equipment

Centrifuge (1987) - Beckman Model GP with swinging bucket rotor and inserts for 250 ml bottles and scintillation vials.

Labconco 25 Place Block Digestion Unit.

Environmental Express Hot Block digestion blocks (8 ea) (1999-2002) for digestion of samples prior to trace metals analysis.

Hach COD Digestion Blocks (2).

Hach Ratio Nephelometer.

Incubators: Lab-Line Ambi Hi-Lo Chamber and **Thermolyne 41900.**

Network Servers

ARI's central laboratory computer is a Dell PC Server running the Windows NT operating platform. This system is home to ARI's Laboratory Information Management System (LIMS) database developed by Northwest Analytical of Portland, OR. The LIMS receives electronic data from all lab sections and produces hardcopy and electronic deliverables. In addition, the LIMS stores all sample demographics and provides a common tracking mechanism for all laboratory information.

The LIMS is connected to two sub-networks. Data is transferred electronically from the instrument data systems to the LIMS database. This key process enhances data integrity by eliminating manual entry and manipulation of instrument output.

The metals section uses an Intel PC Server with the Windows 2000 Server operating system. This system runs as a file server dBASE IV and MS Access 97 database applications. Once data is collected by the metals instrument computers, dBASE is used to process the data and transfer it to the LIMS database. The MS Access software has been customized by ARI's metals data supervisor to generate metals CLP forms and other internal reports.

The organics section uses an HP Unix Server with HP-UX 10.20 operating system. This system runs Target 3.4 data analysis software. All GC/MS and other GC instruments are networked to this system. In addition to providing one common platform for organics data processing, the Target software produces CLP forms for organics data packages.

The conventional analysis laboratory uses PC Workstations with MS Excel for data reduction. Data is manually entered into the LIMS systems using customized worklists.

Instrument data systems have been optimized with the latest software enhancements to reduce data processing time. Advances in processing have allowed ARI to meet the increasingly shorter turnaround requirements of our clients.

Note: Extensive in-house replacement parts are available for lab instruments and computers, including spare circuit boards. A majority of all service maintenance is performed by ARI employees.

Appendix E

ARI Active SOPs

SOP	Section	
		Sample Receiving
001S	CSSR	Sample Receiving
		Project Management
003S	CSPM	Project Tracking
004S	CSPM	Data Storage, Archival and Retrieval
005S	CSPM	Project Management
		Computer Services
101S	CO	Software Quality Assurance (Draft)
		Data Reporting
201S	DS	Pesticides/Other GC-Data Reporting and Review
202S	DS	Semivolatile Organics-Data Reporting and Review
203S	DS	Volatile Organics - Data Reporting and Review
204S	DS	GC BETX-Data Reporting and Review
205S	DS	Conventionals-Data Reporting and Review
206S	DS	Metals-Data Reporting and Review
		Organic Extractions
300S	E	Sonicator Function Testing
301S	E	Organics Glassware Preparation
304S	E	TPH - soil - micro-tip
305S	E	BAN – water – separatory funnel
306S	E	Old GPC Clean-up
307S	E	HPLC PNA – water – separatory funnel
308S	E	TPH-D-water-separatory funnel
309S	E	HPLC PNA – soil – macro-tip
311S	E	Pesticide – water - separatory funnel
315S	E	BTS (butyl tin) - soil/sediment – macro-tip
316S	E	BTS (butyl tin) - water (Separatory Funnel)
324S	E	Herbicides - water
325S	E	Herbicides – soil by macro-tip
328S	E	PCP 8040 - water
332S	E	PCB Wipe
333S	E	PCB - medium level
334S	E	Sulfur Cleanup using Mercury
335S	E	Sulfuric Acid Cleanup - PCB
336S	E	PCB - low level water - Manchester
340S	E	8270 BAN - Tissue - Tissuemizer
341S	E	PAH (8270) Liquid Liquid
342S	E	medium level soil HCID/TPH-D by Vortex
344S	E	Continuous Liquid-Liquid 8270 BAN
345S	E	Florisil Cleanup - Pesticides/PCBs
347S	E	Pest/PCB – soil – micro-tip

SOP	Section	
348S	E	8274 BAN - ORBO Filter
349S	E	Paint Filter Liquids Test
350S	E	PCB/Pesticide - PSEP/PSDDA
355S	E	PNA/PAH 8270 – separatory funnel
357S	E	Soil Extraction by Micro-tip PNA/PAH 8270
359S	E	Sample Screening by GC
360S	E	Daily Startup/Shutdown
366S	E	Pesticde/PCB – Soils ASE
367S	E	Soil Ext. by Micro-tip Chlorophenolics (PCP 8040)
373S	E	ORBO Filter Ext. - PNA/PAH
374S	E	BAN-PSEP/PSDDA Sediment by macro-tip
377S	E	Soil Extraction by Micro-tip - Skydrol
381S	E	TPH-D – Soil ASE
383S	E	PNA (8270) – Soils ASE
398S	E	EPH Soil Macro-tip
399S	E	EPH Water – Separatory Funnel
		Gas Chromatography
400S	GC	GC Analysis and Operations (8000)
403S	GC	PCBs
404S	GC	Gasoline in Soil and Water by GC (WTPH-G)
405S	GC	Herbicides (8151)
406S	GC	Sulfur Clean-up, ARI Method
407S	GC	Total Diesel Hydrocarbon by GC (WTPH-D)
409S	GC	Total Hydrocarbon Identification (TPH-HCID)
410S	GC	Aromatic Volatile Organics by GC (8020)
411S	GC	PNAs by HPLC (8310)
412S	GC	Phenols (8040)
419S	GC	Wisc GRO/BETX by GC
420S	GC	Diesel Range Organics – Wisconsin Method
421S	GC	Diesel Range Organics (AK102-2/92)
422S	GC	Gasoline Range Organics (AK101-2/92)
423S	GC	Pesticides/PCBs by GC-ECD (8081/8082)
424S	GC	Extractable petroleum Hydrocarbon
426S	GC	Ethylene/Propylene Glycol in Water (Dir. Inj.)
		Metals Sample Preparation and Analyses
500S	MP	Metals Glassware Prep.
502S	MI	Varian 300Z Graphite Furnace Analysis
505S	MP	Metals Sample Prep. Method 3020A (TWN)
506S	MP	Metals Sample Prep. Methods 7060A/7740 (RMA)
507S	MP	Metals Sample Prep. Method 3050B (SWC)
508S	MP	Metals Sample Prep. Method 3005A (RWC)
509S	MP	Metals Sample Prep. Method 3050B (SWN)

SOP	Section	
510S	MP	Metals Sample Prep. Method 3010A (TWC)
511S	MP	Metals Sample Prep. Method 7471 (SMM)
513S	MP	Mercury CVAA (7470/7471)
515S	MP	Metals Sample Prep. CLP Method 3050-M (SCC)
516S	MP	Metals Sample Prep. CLP Method 3050-M (SCN)
517S	MP	Metals Sample Prep. CLP Method 245.5-M (SCM)
522S	MP	Metals Sample Prep. CLP Method 3005-M (RCN)
525S	MP	Metals Sample Prep. CLP Method 3005-M (RCC)
526S	MI	Metals Standards Prep. and Maintenance
527S	MI	Metals Spiking
528S	MP	Metals Sample Prep. Total Acid Digestion (SZF)
529S	MP	Percent Solids Determination
530S	MP	Metals Sample Prep. CLP Method 245.1-M (TCM)
531S	MP	TCLP Extraction: Orgs. and Inorgs. Method 1311
532S	MP	Metals Sample Prep. Method 7471A (SWM)
533S	MP	Metals Sample Prep. Method 7470A (TWM)
535S	MP	Metals Sample Prep. Method 200.8 (REC)
536S	MP	Metals Sample Prep. Method 200.8 (REN)
537S	MP	Metals Sample Prep. Method 200.8 (RHN)
538S	MI	Elan 6000 ICP-MS
539S	MI	Cetac Mercury Cold Vapor Analysis
540S	MI	ICP Analysis
		Wet Chemistry (Conventional) Analyses
600S	CV	Ferrous Iron
601S	CV	Cyanide
602S	CV	TOC
603S	CV	Acidity
604S	CV	Alkalinity
605S	CV	Biochemical Oxygen demand
606S	CV	Bromide
607S	CV	Cation Exchange Capacity
608S	CV	Chlorophyll a
609S	CV	Chemical Oxygen Demand
610S	CV	Color (Visual Comparision)
611S	CV	Conductivity
612S	CV	Chloride (Automated)
614S	CV	Hexavalent Chromium
615S	CV	Ammonia (Automated)
616S	CV	Ammonia (ISE)
617S	CV	Nitrate&Nitrite+Nitrate
618S	CV	pH
620S	CV	Standards Preparation

SOP	Section	
621S	CV	Ion Chromatography
622S	CV	UV Absorbance
623S	CV	Fluoride
624S	CV	FOG
625S	CV	Formaldehyde
628S	CV	Microbiology (Coliform)
631S	CV	Phosphate
632S	CV	Dissolved Oxygen
633S	CV	Phenol
634S	CV	Oxidation/Reduction Potential
635S	CV	Salinity
637S	CV	Sulfate (Automated)
639S	CV	Solids
640S	CV	Sulfide
641S	CV	Sulfite
642S	CV	Total Kjeldahl Nitrogen
643S	CV	Turbidity
645S	CV	Glassware Cleaning
648S	CV	HEM EPA Method 1664
649S	CV	TOC-Aqueous
		Volatile Organic Analyses
700S	VOA	Volatiles by ARI In House Method (CLP/8260)
702S	VOA	GC/MS Volatiles - Autosampler Operation
703S	VOA	Vinyl Chloride & 1,1-Dichloroethene by GC/MS SIM
704S	VOA	Volatile Organic Standard Preparation
707S	VOA	TCLP/ZHE Extraction for VOA
708S	VOA	Volatiles by Method 8260B
709S	VOA	Volatile Organics GC-MS-SIM
710S	VOA	SIM BTEX & AK GRO by Mass Specroscopy
		Semi-Volatile Organic Analyses
800S	SVOA	Semivolatile Organics by GC/MS (8270)
801S	SVOA	PNA by GC/MS SIM
802S	SVOA	Butyl Tin Species (GC-MS-SIM)
803S	SVOA	Butyl Tin Species in Porewater (GC-MS-SIM)
804S	SVOA	Semivolatile Organics by GC/MS (8270C)
		Quality Assurance Procedures
1000S	QA	TCLP Extractor RPM Monitoring
1001S	QA	Refrigerator and Freezer Temperature Monitoring
1003S	QA	Balance Monitoring
1004S	QA	Document Control – Lab. Forms and Logbooks
1005S	QA	Internal Audits and Corrective Actions
1006S	QA	Document Control - Laboratory SOPs

SOP	Section	
1007S	QA	Internal Chain of Custody-Conventionals
1008S	QA	Internal Chain of Custody-Metals
1009S	QA	Internal Chain of Custody-GC
1010S	QA	Internal Chain of Custody-Volatiles
1011S	QA	Internal Chain of Custody-Semivolatiles
1012S	QA	Standard Preparation - GC and Semivolatiles
1013S	QA	Chemical Receiving
1015S	QA	Pipette Verification
1016S	QA	Control Limits and Charts
1017S	QA	Training and Demonstration of Proficiency
1018S	QA	Method and Instrument Detection Limits
1019S	QA	Chain of Custody, Archival & Disposal-Org. Ext.
1020S	QA	Thermometer Verififcation
1021S	QA	Manual Integration of Chromatographic Peaks

Appendix F

Sample Containers, Preservation and Holding Times

		Container			Holding Time	
Parameter	**Method Reference**	**Water**	**Soil/Sediment**	**Preser-vation**	**Water**	**Soil**
Acidity	305.1	500 ml HDPE	NA		14 days	NA
Alkalinity	310.1	500 ml HDPE*	4 oz. WMG		14 days	NA
Ammonia	350.1	500 ml HDPE	4 oz. WMG	2 mL (a)	28 days	7 days
BETX	8020	40 ml vial (2)*	2oz. WMG/Septa*	(b)	14 days 7 days (g)	14 days
Biological Oxygen Demand (BOD)	405.1	1 Liter HDPE	NA		48 Hours	NA
Bromide	320.1	500 ml HDPE	NA		28 Days	NA
Butyl Tin Species	GC/MS(SIM)	1 Liter AG	8 oz. WMG		7 days	14 days
Cation Exchange Capacity	9080	N/A	4 oz. WMG		NA	6 Months
Chemical Oxygen Demand (COD)	410	250 ml AG	4 oz. WMG	1 ml (a)	28 Days	28 Days
Chloride	325.2	500 ml HDPE	4 oz. WMG		28 Days	28 Days
Chlorinated Hydrocarbons	8120	1 Liter AG	8 oz. WMG		7 days	14 days
Chlorophyll a	SM10200H	1 Liter AHDPE	NA		24 Hours	NA
Coliform, Fecal	SM9222D	Corning 4 oz.	4 oz. WMG	(d)	24 hrs.	24 hrs.
Coliform, Total	9222B	Corning 4 oz.	4 oz. WMG	(d)	24 hrs.	24 hrs.
Color	110.2	500 ml HDPE	NA		48 Hours	NA
Conductivity	120.1	500 ml HDPE	4 oz. WMG		28 Days	28 Days
Corrosivity	SM2330	500 ml HDPE	NA		7 days	N/A
Cyanide, Total	335.2	1 Liter HDPE	4 oz. WMG	2 ml (c)	14 Days	14 Days
Cyanide, Amenable	335.1	1 Liter HDPE	4 oz. WMG		48 Hours	14 Days
Cyanide, WAD	SM4500 CN I	1 Liter HDPE	4 oz. WMG	2 ml (c)	14 Days 48 hr (g)	14 Days
Dissolved Oxygen	360.2	BOD bottle	N/A	fixed in field	8 Hours	N/A
Ethylene Glycol	GC/FID	40 ml vial	4 oz. WMG		7 Days	14 Days
FOG (Fats/Oils/Grease)	SM5520F 413.1	1 Liter AG	4 oz. WMG	5 ml (a)	28 Days	28 Days
Fecal Streptococci	SM9230C	Corning 4 oz.	4 oz. WMG	(d)	24 hrs.	24 hrs.
Fluoride	340.2	500 ml	4 oz. WMG		28 Days	28 Days

		Container			Holding Time	
Parameter	**Method Reference**	**Water**	**Soil/Sediment**	**Preser-vation**	**Water**	**Soil**
		HDPE				
Formaldehyde	ASTM	500 ml HDPE	4 oz. WMG		48 Hours	28 Days
Herbicides	8150	1 Liter AG	8 oz. WMG		7 Days	14 Days
Hardness	6010/Calc.	500 ml HDPE	4 oz. WMG		6 Months	N/A
Hexavalent Chromium (Cr+6)	7196	500 ml HDPE	4 oz. WMG		24 Hours	28 Days
Metals	6010/7000 series	1 Liter HDPE	4 oz. WMG	5 ml (f)†	6 Months	6 Months
Mercury	7470/7471	500 ml HDPE	4 oz. WMG	2.5 ml (f)	28 Days	28 Days
Nitrate	353.2	500 ml HDPE	4 oz. WMG		48 Hours	7 Days
Nitrate + Nitrite	353.2	500 ml HDPE	4 oz. WMG		48 Hours	7 Days
Oil & Grease (See FOG)						
Organophosphorous Pesticides	8140	1 Liter AG	8 oz. WMG		7 Days	14 Days
Pentachlorophenol	8040	1 Liter AG	8 oz. WMG		7 Days	14 Days
Pesticides/PCBs	8080	1 Liter AG	8 oz. WMG		7 Days	14 Days
Petroleum Hydrocarbons – TPH-D		1 Liter AG				
Petroleum Hydrocarbon ID (HCID)	8015	1 Liter AG	8 oz. WMG		7 Days	14 Days
IR Scan	418.1	1 Liter AG	8 oz. WMG	5 ml HCl	7 Days	14 Days
WTPH-gasoline	8015	40 ml vial (2)*	2oz. WMG/Septa*	(b)	14 Days 7 Days (g)	14 Days
WTPH-diesel	8015	1 Liter AG	8 oz. WMG		7 Days	14 Days
pH	150.1	250 ml AG	4 oz. WMG		24 Hours	14 Days
Phenols, GC/FID	8040	1 Liter AG	8 oz. WMG		7 Days	14 Days
Phenols, Total	420.1	500 ml HDPE	4 oz. WMG	2 ml (a)	28 Days	28 Days
Phosphorous, Total	365.2	500 ml HDPE	4 oz. WMG	2 ml (a)	28 Days	28 Days
Phosphorous, Ortho	365.2	500 ml HDPE	4 oz. WMG		48 Hours	28 Days
Polynuclear Aromatic Hydrocarbons	8100/8310/ 8270	1 Liter AG	8 oz. WMG		7 Days	14 Days
Radiochemicals	Various	1 Gal. Cube	16 oz. wmg		Various	Various
Salinity	SM2520	500 ml HDPE	4 oz. WMG		28 Days	N/A
Semivolatile Organics	8270/1625	1 Liter AG	8 oz. WMG		7 Days	14 Days
Silicate	370.1	500 ml HDPE	4 oz. WMG		28 Days	N/A
Solids, Total Solids	160.3	1 Liter HDPE	4 oz. WMG		7 Days	7 Days
Solids, Total Suspended Solids	160.2	1 Liter	N/A		7 Days	N/A

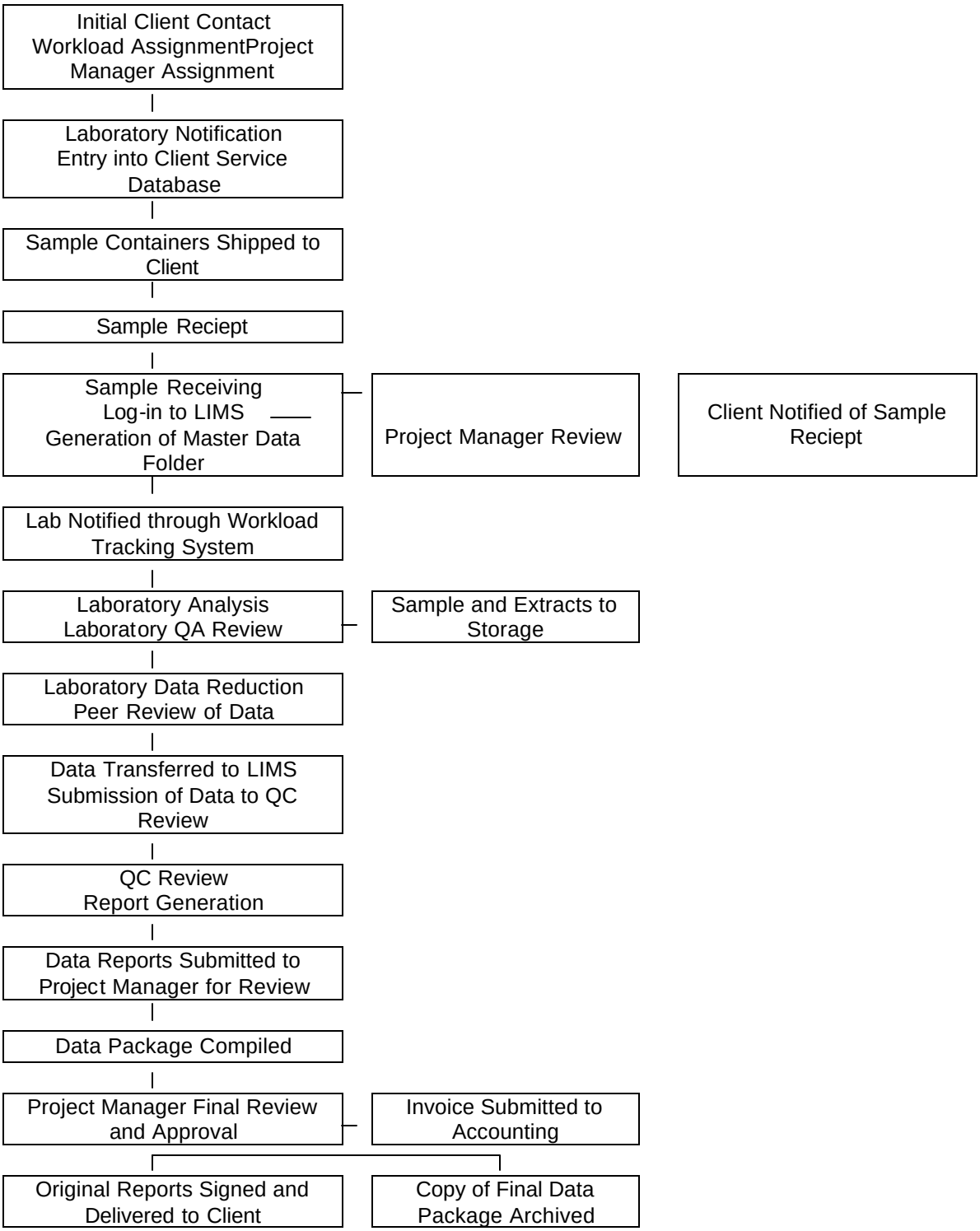
		Container			Holding Time	
Parameter	**Method Reference**	**Water**	**Soil/Sediment**	**Preser-vation**	**Water**	**Soil**
		HDPE				
Solids, Total Dissolved Solids	160.1	1 Liter HDPE	N/A		7 Days	N/A
Solids, Total Volatile Solids	160.4	1 Liter HDPE	4 oz. WMG		7 Days	7 Days
Settleable Solids	160.5	1 Liter HDPE	N/A		48 Hours	N/A
Sulfate	375.2	500 ml HDPE	4 oz. WMG		28 Days	28 Days
Sulfide Acid Volatile (AVS)	376.2	500 ml HDPE*	2oz. WMG/Septa*		N/A	14 Days
Sulfide	376.2	500 ml HDPE*	2oz. WMG/Septa*	2 ml (e)	7 Days	7 Days
Sulfite	377.1	500 ml HDPE	N/A		24 Hours	N/A
Total Kjeldahl Nitrogen (TKN)	351.4	500 ml HDPE	4 oz. WMG	2 ml (a)	28 Days	28 Days
Total Organic Halides (TOX)	9020A	500 ml AG	N/A	2 ml (a)	28 Days	N/A
Total Organic Carbon (TOC)	415.1/5310 B	250 ml AG	4 oz. WMG	1 ml (a)	28 Days	30 Days
Turbidity	180.1	500 ml HDPE	N/A		48 Hours	N/A
Volatile Organics	524.2/624/ 8260	40 ml vial (3)*	2oz. WMG/Septa*	(b)	14 Days 7 Days (g)	14 Days

Containers: AGB = Amber Glass Boston Round Bottle; WMG = Wide Mouth Glass Jar; HPDE = High Density Polypropylene; AHPDE = Amber HPDE
Preservation: (a) = 9N H_2SO_4; (b) = HCl to pH<2.0; (c) = 10N NaOH; (d) = $Na_2S_2O_3$ Tablet; (e) = 2N ZnOAc; (f) = 1:1 HNO_3; (g) = Unpreserved

* = No Headspace † = Total/field filtered only

Appendix G

Laboratory Workflow


Initial Client Contact
Workload AssignmentProject
Manager Assignment
Laboratory Notification
Entry into Client Service
Database
Sample Containers Shipped to
Client
Sample Reciept
Sample Receiving
Log-in to LIMS
Generation of Master Data
Folder
Project Manager Review
Client Notified of Sample
Reciept
Lab Notified through Workload
Tracking System
Laboratory Analysis
Laboratory QA Review
Sample and Extracts to
Storage
Laboratory Data Reduction
Peer Review of Data
Data Transferred to LIMS
Submission of Data to QC
Review
QC Review
Report Generation
Data Reports Submitted to
Project Manager for Review
Data Package Compiled
Project Manager Final Review
and Approval
Invoice Submitted to
Accounting
Original Reports Signed and
Delivered to Client
Copy of Final Data
Package Archived

Appendix H

Analytical Methods

ORGANIC ANALYSES

Method/ Parameter	Water/Soil	Technique
Volatiles (GC/MS)	524.2/624/8260B	GC/MS
	Low Level Vinyl Chloride, 1,1 – Dichloroethene	GC-MS-SIM
Volatiles (GC)		
Volatile Aromatics	602/8021B	GC/PID
Semivolatiles (GC/MS)		
Semivolatile Organics	625/8270C	GC/MS
Polynuclear Aromatic Hydrocarbons (PNA/PAH)	625/8270C	GC/MS (SIM)
Isotope Dilution Semivolatiles	1625	GC/MS
Butyl Tin Species	Krone (1988)	GC/MS-SIM
Pesticides/GC Analyses		
Chlorinated Pesticides	608/8081A	GC/ECD
Aroclors/PCBs	608/8082	GC/ECD
PCB Congeners	ARI Method	GC/ECD
Phenols	604/8041	GC/FID
Chlorinated Phenols	8041 (mod)	GC/ECD
Pentachlorophenol	8151A (mod)	GC/ECD
Organophosphorous Pesticides		614/8141A GC/NPD
Polynuclear Aromatic Hydrocarbons (PNA/PAH)	610/8100	GC/FID
Chlorinated Hydrocarbons	612/8121	GC/ECD
Herbicides	615/8151A	GC/ECD
Glycols	ARI Method(SOP 426S R2)	GC/FID
Hydrocarbon ID	NWTPH-HCID	GC/FID
Gasoline Range Hydrocarbons		(N)WTPH-G/AK101/WI-GRO
	GC/FID	
Diesel Range Hydrocarbons	(N)WTPH-D/AK102/WI-DRO	GC/FID
Extractable Petroleum Hydrocarbons	ARI Method	GC/FID
Volatile Petroleum Hydrocarbons	ARI Method	GC/PID

HPLC Analyses

Polynuclear Aromatic Hydrocarbons (PNA/PAH)	8310	HPLC
Ordnance Compounds	8330	HPLC

Organic Sample Preparation and Clean Up

TCLP Extraction		1311
SPLP Extraction		1312
Sonication		3550B
Soxhlet		3540C
Accelerated Solvent Extraction (ASE)		3545B
Separatory Funnel		3510C
Continuous Liquid-Liquid		3520C
Alumina Clean-up		3610B
Florisil Clean-up		3620B
Gel Permeation (GPC)		3640A
Silica Gel		3630C
Sulfur Clean-up	Mercury shake-out	3660B
Sulfuric Acid Clean-up		3665A

INORGANIC ANALYSES

Method Parameter	Std.Methods/ EPA	Technique
Wet Chemistry		
Acidity	2310/305.1	Titrimetric
Alkalinity	2320/310.1	Titrimetric
Ammonia	4500NH_3H/350.1	Automated Phenate/ISE
Biological Oxygen Demand-BOD Titration		5210.B/405.1 5-day Winkler
Carbonaceous - BOD		
Bromide	4500Br.B	Phenol Red Colorimetric
Anions	300.0	Ion Chromatograp
Cation Exchange Capacity	9080	Neutral Ammonium Acetate
Chemical Oxygen Demand	5220.D/410.4	Closed Reflux, Colorimetric
Chromium Hexavalent (Cr6+)	7196A	Diphenylcarbazide
Chloride	4500CI.E/325.2	Automated Ferricyanide
Chlorophyll a	10200.H	Spectrophotometric
Coliform, Total / Fecal	9222.B/D	Membrane Filtration
Color	2120.B/110.2	Visual Comparison

Conductivity	2510/120.1	Electrometric
Corrosivity (CaCO3 Saturation)		2330 Calc. (pH, Alk, TDS, Ca)
Cyanide, Total	4500CN.C/335.2/9010	PBA, Colorometric
Cyanide, Amenable	4500CN.G/335.1	Alkaline Chlorination
Cyanide, WAD	4500CN.I	Weak Acid Distillation
Dissolved Oxygen	4500-O.C/360.2	Winkler Titration
Fats/Oils/Grease	5520.B/413.1/9070A	Gravimetric
Fluoride	4500F.C/340.2	Ion Specific Electrode
	300.0	Ion Chromatography
Formaldehyde	ASTM D-19 P216	Colorimetric
Hardness, Calculation	2340.B/6010B	Ca, Mg Calculation
Heterotrophic Plate Count	9215.D	Membrane Filtration
Iron (II) ferrous	3500Fe.D	Phenanthrolene
Nitrate + Nitrite	4500NO_3F/353.2	Automated Cd Reduction
Nitrate	4500NO_3F/353.2	Calculated
	300.0	Ion Chromatography
Nitrite	4500NO_3.F/353.2mod	Automated Colorimetric 300.0
	Ion Chromatography	
Oil & Grease, Solids	5520.D/9071	Gravimetric
Oil & Grease, Polar/Non Polar	5520.F	Gravimetric
PH	150.1	Electrometric
Phenols	5530.D/420.1/9065	4-AAP w/ Distillation
Phosphorous, Total	4500P.B/365.2	Colorimetric w/ digestion
Phosphorous, Ortho (SRP)	4500P.B/365.2	Colorimetric
	300.0	Ion Chromatography
Salinity	2520	Conductimetric
Silicate	4500Si.E/370.1	Heteropoly Blue
Total Kjeldahl Nitrogen (TKN)	4500N.org/351.4	Block Digest/ISE
Total Solids	2540.B/160.3	Gravimetric, 104°C
Total Suspended Solids (TSS)	2540.D.160.2	Gravimetric, 104°C
Total Dissolved Solids (TDS)	2540.C/160.1	Gravimetric, 180°C
Total Volatile Solids (TVS)	2540.E/160.4	Gravimetric, 550°C
Settlable Solids	2540.F	Volumetric
Streptococcus, Fecal	9230.C	Membrane Filtration
Sulfide	4500S^2.E/376.1/9034	Iodometric
Sulfide, Low Level	4500S^2.D/376.2	Methylene Blue
Sulfide, Acid Volatile	4500S^2.D/376.2	Methylene Blue
Sulfate	4500SO_4^2.F/375.2/9036	Auto. Methylthymol Blue
	300.0	Ion Chromatography
Sulfite	4500SO_3^2.B.377.1	Iodometric
Total Organic Carbon (TOC)	5310.B415.1/PSEP	Combustion NDIR
Turbidity	2130.B/180.1	Nephelometric
Total Lipids in Tissue	Bligh & Dyer (mod)	Gravimetric

Trace Metals Analyses

Inductively Coupled Plasma (ICP):

Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Th, Ti, Tl, V, Zn	200.7 / 6010B	ICP
(Li, Th, U, W - special request only)		

Graphite Furnace (GFAA):

Ag, As, Cd, Sb, Pb, Se, Tl	200 Series / 7000 Series	GFAA

Cold Vapor (CVAA):

Hg	7470A/7471A	CVAA

Inductively Coupled Plasma/Mass Spectroscopy (ICP-MS):

Ag, Al, As, Ba, Be, Ca,Cd, Co, Cr, Cu, Fe, K,Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Th, Tl, U, V, Zn	200.8/ 6020 Mod.	ICP/MS

Trace Metals Sample Preparation

Toxicity Characteristic Leaching Procedure	1311	
Synthetic Precipitation Leaching Procedure	1312	
Digestion for Total Recoverable or Dissolved Metals	3005A	
Digestion of Aqueous Samples for Total Metals by ICP	3010A	
Digestion of Aqueous Samples for Total Metals by GFAA		3020A
Digestion of Sediment, Sludges and Soil	3050B	

Appendix I

Method Detection Limits
Reporting Limits

MDL/RL Summary for Conventional Analyses
Effective 2/17/03

				Water	Water	Soil
	ARI	MDL	Spike	MDL	RL	RL
Analyte	**SOP**	**MDL Date**	**Level**	**mg/L**	**mg/L**	**mg/kg**
Acidity	603S			NA	1.0	NA
Alkalinity	604S	5/16/02	2.40	0.423	1.0	NA
Ammonia (Auto. Phenate)	615S	5/13/02	0.040	0.008	0.010	0.1
Ammonia (ISE)	616S	5/14/02	0.050	0.006	0.050	0.5
BOD	605S			NA	1.000	NA
Cation Exchange Capacity	607S			NA	NA	1 meq/100g
Chloride	612S	4/15/02	1.50	0.31	1.0	10.0
Chlorophyll a	608S			NA	1.0	NA
Chromium, Hexavalent	614S	7/26/02	0.025	0.002	0.01	0.2
COD	609S	5/9/02	5.00	1.41	5.0	NA
Coliform (total, fecal)	628S			NA	1 CFU/100 mL	NA
Color	610S			NA	5 Pt-Co Units	NA
Conductivity - Orion Meter	611S	7/22/02	3.69µS	0.46 µS	1.0 µS	1.0 µS
Cyanide	601S	5/13/02	0.020	0.005	0.005	0.1
Dissolved Oxygen	632S			NA	0.1	NA
Fluoride	623S	5/13/02	0.10	0.015	0.1	1.0
Formaldehyde	625S			NA	0.1	1.0
Hardness	626S			NA	1.0	NA
Iron (II), Ferrous	600S	7/8/02	0.050	0.011	0.04	NA
Nitrate	617S			NA	0.01	0.3
Nitrite	617S	5/10/02	0.030	0.004	0.01	0.1
Nitrate+Nitrite	617S	4/23/02	0.050	0.007	0.01	0.3
Oil & Grease (FOG)	624S	7/24/02	2.50	0.257	1.0	100.0
pH	618S			NA	0.01 Units	0.05 Units
Phenols	633S	6/7/02	0.10	0.015	0.04	0.4
Phosphorous (Total)	631S	5/30/02	0.05	0.006	0.008	0.2
Phosphorous (Ortho)	631S	5/7/02	0.005	0.002	0.004	0.04
Salinity	635S			NA	0.1 g/Kg	NA
Sulfide (w/o distilliation)	640S	7/30/02	0.25	0.006	0.05	5.0

				Water	Water	Soil
	ARI	MDL	Spike	MDL	RL	RL
Analyte	**SOP**	**MDL Date**	**Level**	**mg/L**	**mg/L**	**mg/kg**
Sulfide (distilled)	640S	6/10/02	0.25	0.047	0.05	5.0
Sulfide (Acid Volatile)	640S			NA	0.05	5.0
Sulfate	637S	5/14/02	5.00	1.20	2.5	25.0
Sulfite	641S			NA	2.0	NA
TKN	642S	7/23/02	0.250	0.083	0.1	0.5
TOC - Aqueous	602S	5/10/02	1.000	0.606	1.5	NA
TOC - Solid	602S	11/23/03	(1)	181	NA	200
Total Solids	639S			NA	10.0	0.01%
Total Suspended Solids	639S			NA	1.0	NA
Total Dissolved Solids	639S			NA	10.0	NA
Total Volatile Solids	639S			NA	10.0	5.0
Total Settleable Solids	639S			NA	0.5	NA
Turbidity	643S			NA	0.05 NTU	NA

(1) TOC MDL study performed using muffled (500°C/ 1 hr), un-spiked sand.
Method Detection Limit (MDL) studies are performed in accordance with 40 CFR Part 136, Appendix B using six degrees of freedom.
MDLs are statistically derived values that measure of short term precision. Detection at the MDL may not be achievable for all analytes.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

RL/MDL Summary Ion Chromatography* Effective 8/15/02			
	Method Reference	**EPA 300.0**	
	Sample Matrix	**Water**	
	ARI SOP	**647S**	**Reporting**
	Instrument ID	**IC-1**	**Limit**
	Reporting Limits	**mg/L**	**mg/L**
Analyte	**Spike Level**	**MDL**	**RL**
Fluoride	0.300	0.079	**0.10**
Chloride	0.300	0.086	**0.10**
Nitrite-N	0.150	0.015	**0.10**
Bromide	0.300	0.043	**0.10**
Nitrate-N	0.150	0.024	**0.10**
Phosphate-P	0.300	0.066	**0.10**
Sulfate	0.300	0.094	**0.10**

*MDL analysis completed between 5/21/2002 and 7/24/2002

Method Detection Limit (MDL) studies are performed in accordance with 40 CFR Part 136, Appendix B using six degrees of freedom.
IDL is a statistically derived value that indicates the smallest signal above background that the instrument can reliably detect.
MDLs are statistically derived values that measure of short term precision. Detection at the MDL may not be achievable for all analytes.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for Pesticide Analysis of Water
EPA Method SW-846-8081 – Sep. Funnel Extraction

Method Reference	8081	8081	8081	8081	
Sample Matrix	Water	Water	Water	Water	
Spike Level	0.5 µg/L	0.5 µg/L	0.5 µg/L	0.5 µg/L	
Sample Weight/Volume	500 mL	500 mL	500 mL	500 mL	
Extract Final Volume	5.0 mL	5.0 mL	5.0 mL	5.0 mL	
Extraction Method	Sep Funnel	Sep Funnel	Sep Funnel	Sep Funnel	
ARI Extraction SOP	311S	311S	311S	311S	
ARI Analytical SOP	423S	423S	423S	423S	
Instrument ID	ECD 3	ECD 3	ECD 4	ECD 4	Water
Column ID	DB-5	DB-608	DB-5	DB-608	Reporting
Date Analyzed	6/3/02	6/3/02	6/20/02	6/20/02	Limit
Reporting Units	µg/L	µg/L	µg/L	µg/L	mg/L
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	0.007	0.014	0.0010	0.0012	**0.05**
Beta-BHC	0.032	0.014	0.0052	0.0017	**0.05**
Gamma-BHC (Lindane)	0.007	0.008	0.0014	0.0012	**0.05**
Delta-BHC	0.087	0.006	0.0026	0.0010	**0.05**
Heptachlor	0.364	0.007	0.0140	0.0011	**0.05**
Aldrin	0.006	0.008	0.0027	0.0012	**0.05**
Heptachlor Epoxide	0.008	0.073	0.0016	0.0124	**0.05**
Gamma chlordane	0.009	0.013	0.0030	0.0031	**0.05**
Alpha chlordane	0.130	0.024	0.0146	0.0018	**0.05**
Endosulfan I	0.009	0.019	0.0017	0.0018	**0.05**
DDE	0.012	0.009	0.0039	0.0023	**0.10**
Dieldrin	0.024	0.009	0.0034	0.0024	**0.10**
Endrin	0.011	0.022	0.0034	0.0030	**0.10**
Endosulfan II	0.022	0.025	0.0028	0.0025	**0.10**
DDD	0.015	0.145	0.0021	0.0021	**0.10**
Endrin Aldehyde	0.021	0.015	0.0022	0.0037	**0.10**
DDT	--	0.015	0.0043	0.0030	**0.10**
Endosulfan Sulfate	--	0.072	0.0081	0.0035	**0.10**
Endrin Ketone	0.049	0.082	0.0060	0.0051	**0.10**
Methoxychlor	0.109	--	0.0241	--	**0.50**
Hexchlorobutadiene	0.006	0.014	0.0018	0.0019	**0.10**
Hexachlorobenzene	0.013	0.014	0.0016	0.0017	**0.10**
Toxaphene (6/15/02)	0.140	0.220	0.47	0.27	**5.00**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analyte.

MDL/RL Summary for Pesticide Analysis of Water
EPA Method SW-846-8081 – Sep. Funnel Extraction
MCTA Level Analysis

Method Reference	**8081**	**8081**	
Sample Matrix	**Water**	**Water**	
Spike Level	**1.67 ng/L**	**1.67 ng/L**	
Sample Weight/Volume	**3000 mL**	**3000 mL**	
Extract Final Volume	**0.5 mL**	**0.5 mL**	
Extraction Method	**Stir Bar**	**Stir Bar**	
ARI Extraction SOP	**336S**	**336S**	
ARI Analytical SOP	**423S**	**423S**	**Water**
Instrument ID	**ECD 4**	**ECD 4**	**Reporting**
Column ID	**DB-5**	**DB-608**	**Limit**
Date Analyzed	**6/12/02**	**6/12/02**	**ppt**
Reporting Units	**ng/L**	**ng/L**	**ng/L**
Analyte	**MDL**	**MDL**	**RL**
Alpha-BHC	.0098	.0096	**0.5**
Beta-BHC	.0092	.0098	**0.5**
Gamma-BHC (Lindane)	.0099	.0109	**0.5**
Delta-BHC	.0107	.0106	**0.5**
Heptachlor	.0407	.0080	**0.5**
Aldrin	.0069	.0072	**0.5**
Heptachlor Epoxide	.0093	.0102	**0.5**
Gamma chlordane	.0086	.0092	**0.5**
Alpha chlordane	.0091	.0093	**0.5**
Endosulfan I	.0088	.0094	**0.5**
DDE	.0221	.0223	**1.0**
Dieldrin	.0198	.0208	**1.0**
Endrin	.0206	.0229	**1.0**
Endosulfan II	.0192	.0193	**1.0**
DDD	.0242	.0242	**1.0**
Endrin Aldehyde	.0165	.0177	**1.0**
DDT	.0200	.0271	**1.0**
Endosulfan Sulfate	.0191	.0202	**1.0**
Endrin Ketone	.0192	.0212	**1.0**
Methoxychlor	.1314	.2431	**8.0**
Hexchlorobutadiene	.0067	.0072	**1.0**
Hexachlorobenzene	.0083	.0088	**1.0**
Toxaphene	--	--	**50.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for Pesticide Analysis of Water
EPA Method SW-846-8081 – Manchester Extraction

Method Reference	8081	8081	8081	8081	
Sample Matrix	Water	Water	Water	Water	
Spike Level	1.67 ng/L	1.67 ng/L	1.67 ng/L	1.67 ng/L	
Sample Weight/Volume	3000 mL	3000 mL	3000 mL	3000 mL	
Extract Final Volume	0.5 mL	0.5 mL	0.5 mL	0.5 mL	
Extraction Method	Stir Bar	Stir Bar	Stir Bar	Stir Bar	
ARI Extraction SOP	336S	336S	336S	336S	
ARI Analytical SOP	423S	423S	423S	423S	Water
Instrument ID	ECD 3	ECD 3	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Date Analyzed	8/17/02	8/17/02			ppt
Reporting Units	ng/L	ng/L	ng/L	ng/L	ng/L
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	0.136	0.151			**1.0**
Beta-BHC	0.867	1.048			**1.0**
Gamma-BHC (Lindane)	0.141	0.167			**1.0**
Delta-BHC	0.707	0.282			**1.0**
Heptachlor	0.115	0.380			**1.0**
Aldrin	0.122	0.837			**1.0**
Heptachlor Epoxide	0.191	0.471			**1.0**
Gamma chlordane	0.160	0.192			**1.0**
Alpha chlordane	1.107	0.161			**1.0**
Endosulfan I	0.183	0.247			**1.0**
DDE	0.291	0.297			**2.0**
Dieldrin	0.310	0.350			**2.0**
Endrin	0.388	0.447			**2.0**
Endosulfan II	0.331	0.397			**2.0**
DDD	0.286	0.356			**2.0**
Endrin Aldehyde	0.349	0.314			**2.0**
DDT	0.461	0.446			**2.0**
Endosulfan Sulfate	0.526	0.284			**2.0**
Endrin Ketone	0.349	0.319			**2.0**
Methoxychlor	2.000	14.188			**15.0**
Hexchlorobutadiene	0.302	0.243			**2.0**
Hexachlorobenzene	0.171	0.188			**2.0**
Toxaphene (8/12/02)	30.00	30.00	54.984	79.159	**100.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for Pesticide Analysis of Soil
EPA Method SW-846-8081 – Micro Tip Sonication

Method Reference	**8081**	**8081**	**8081**	**8081**	
Sample Matrix	**Soil**	**Soil**	**Soil**	**Soil**	
Spike Level	**0.63 µg/Kg**	**0.63 µg/Kg**	**0.63 µg/Kg**	**0.63 µg/Kg**	
Sample Weight/Volume	**12 g**	**12 g**	**12 g**	**12 g**	
Extract Final Volume	**4.0 mL**	**4.0 mL**	**4.0 mL**	**4.0 mL**	
Extraction Method	**Micro Sonic**	**Micro Sonic**	**Micro Sonic**	**Micro Sonic**	
ARI Extraction SOP	**312S**	**312S**	**312S**	**312S**	
ARI Analytical SOP	**423S**	**423S**	**423S**	**423S**	**Micro Sonic**
Instrument ID	**ECD 3**	**ECD 3**	**ECD 4**	**ECD 4**	**Reporting**
Column ID	**DB-5**	**DB-608**	**DB-5**	**DB-608**	**Limits**
Date Analyzed	**6/4/02**	**6/4/02**	**6/21/02**	**6/21/02**	**Soil**
Reporting Units	**µg/Kg**	**µg/Kg**	**µg/Kg**	**µg/Kg**	**µg/Kg**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	0.03	0.05	0.03	0.05	**1.7**
Beta-BHC	0.16	0.04	0.05	0.06	**1.7**
Gamma-BHC (Lindane)	0.04	0.01	0.03	0.02	**1.7**
Delta-BHC	0.04	0.03	0.03	0.03	**1.7**
Heptachlor	0.32	0.03	0.03	0.04	**1.7**
Aldrin	0.03	0.03	0.03	0.05	**1.7**
Heptachlor Epoxide	0.05	0.10	0.05	0.23	**1.7**
Gamma chlordane	0.04	0.15	0.03	0.10	**1.7**
Alpha chlordane	0.40	0.21	0.35	0.08	**1.7**
Endosulfan I	0.10	0.15	0.06	0.04	**1.7**
DDE	0.16	0.06	0.13	0.06	**3.3**
Dieldrin	0.11	0.09	0.09	0.08	**3.3**
Endrin	0.11	0.09	0.13	0.18	**3.3**
Endosulfan II	0.13	0.09	0.12	0.13	**3.3**
DDD	0.07	0.06	0.07	0.08	**3.3**
Endrin Aldehyde	0.15	0.14	0.16	0.15	**3.3**
DDT	2.58	0.10	0.21	0.07	**3.3**
Endosulfan Sulfate	0.15	0.39	0.25	0.19	**3.3**
Endrin Ketone	0.17	0.14	0.17	0.16	**3.3**
Methoxychlor	0.83	0.80	0.81	1.07	**17**
Hexchlorobutadiene	0.22	0.09	0.20	0.06	**1.7**
Hexachlorobenzene	0.04	0.04	0.05	0.05	**1.7**
Toxaphene (6/22/02)	5.05	3.18	14.86	11.56	**170**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom. Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.

Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for Pesticide Analysis of Soil
EPA Method SW-846-8081 – Medium Level Extraction

Method Reference	8081	8081	8081	8081	
Sample Matrix	Soil	Soil	Soil	Soil	
Spike Level					
Sample Weight/Volume	5 g	5 g	5 g	5 g	
Extract Final Volume	10 mL	10 mL	10 mL	10 mL	
Extraction Method	Vortex	Vortex	Vortex	Vortex	
ARI Extraction SOP	312S	312S	312S	312S	Medium
ARI Analytical SOP	423S	423S	423S	423S	Level
Instrument ID	ECD 3	ECD 3	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limits
Date Analyzed	5/4/1999	5/4/1999	4/23/1999	4/23/1999	Soil
Reporting Units	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	7.1	7.8	2.5	2.8	**34**
Beta-BHC	7.4	7.5	3.1	3.9	**34**
Gamma-BHC (Lindane)	7.7	7.5	3.1	3.5	**34**
Delta-BHC	7.1	6.4	4.0	4.5	**34**
Heptachlor	7.1	7.7	3.1	2.8	**34**
Aldrin	6.9	13.1	3.1	2.8	**34**
Heptachlor Epoxide	7.9	8.2	3.7	3.5	**34**
Gamma chlordane	7.4	7.8	3.7	4.1	**34**
Alpha chlordane	11.3	35.6	3.5	3.7	**34**
Endosulfan I	--	20.5	4.0	3.7	**34**
DDE	15.5	17.0	6.1	6.1	**66**
Dieldrin	16.0	15.5	7.3	7.4	**66**
Endrin	16.7	18.7	10.1	7.7	**66**
Endosulfan II	18.2	17.8	11.3	12.1	**66**
DDD	15.0	16.4	7.5	7.3	**66**
Endrin Aldehyde	17.1	17.2	10.9	10.0	**66**
DDT	--	17.4	8.0	6.6	**66**
Endosulfan Sulfate	32.6	17.3	--	15.0	**66**
Endrin Ketone	20.5	16.3	14.4	15.3	**66**
Methoxychlor	99.8	96.1	57.3	53.8	**340**
Hexchlorobutadiene	7.1	8.1	3.1	4.7	**34**
Hexachlorobenzene	7.1	7.2	2.3	3.0	**34**
Toxaphene (5/5/99)	815.6	568.8	892.4	546.5	**3400**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for Pesticide Analysis of Soil
EPA Method SW-846-8081 – ASE Extraction

Method Reference	8081	8081	8081	8081	
Sample Matrix	Soil	Soil	Soil	Soil	
Spike Level					
Sample Weight/Volume	12 g	12 g	12 g	12 g	
Extract Final Volume	1.0 mL	1.0 mL	4.0 mL	1.0 mL	
Extraction Method	ASE	ASE	ASE	ASE	
ARI Extraction SOP	312S	312S	312S	312S	
ARI Analytical SOP	423S	423S	423S	423S	ASE
Instrument ID	ECD 3	ECD 3	ECD 4	ECD 4	Reporting
Column ID	CLP-1	CLP-2	CLP-1	CLP-2	Limits
Date Analyzed	6/08/02	6/08/02	6/22/02	6/22/02	Soil
Reporting Units	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	0.521	0.250	0.246	0.128	**1.7**
Beta-BHC	--	0.154	1.575	0.144	**1.7**
Gamma-BHC (Lindane)	0.447	0.339	0.387	0.385	**1.7**
Delta-BHC	0.139	0.078	0.133	0.103	**1.7**
Heptachlor	8.946	0.100	5.605	0.176	**1.7**
Aldrin	0.101	0.192	0.071	0.127	**1.7**
Heptachlor Epoxide	0.289	0.147	0.150	0.105	**1.7**
Gamma chlordane	0.096	0.088	0.124	0.155	**1.7**
Alpha chlordane	0.159	0.158	0.450	0.115	**1.7**
Endosulfan I	0.073	0.148	0.188	0.110	**1.7**
DDE	0.132	0.205	0.300	0.205	**3.3**
Dieldrin	0.195	0.188	0.193	0.191	**3.3**
Endrin	0.175	0.189	0.233	0.214	**3.3**
Endosulfan II	0.193	0.189	0.198	0.211	**3.3**
DDD	0.186	0.189	0.200	0.218	**3.3**
Endrin Aldehyde	0.176	0.184	0.215	0.206	**3.3**
DDT	2.639	0.195	0.262	0.225	**3.3**
Endosulfan Sulfate	0.250	0.236	0.233	0.269	**3.3**
Endrin Ketone	0.194	0.231	0.261	0.224	**3.3**
Methoxychlor	1.184	3.468	1.655	8.632	**17**
Hexchlorobutadiene	1.175	0.294	1.053	0.208	**1.7**
Hexachlorobenzene	0.228	0.106	0.159	0.106	**1.7**
Toxaphene (6/15/02)	6.88	1.55	16.34	8.99	**170**

Method Detection Limit (MDL) studies performed following with 40 CFR Part 136, Appendix B. Method Detection Limits are statistical measures of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-ECD Analysis of Pesticides Sediment
PSEP Protocol Macrotip Ultrasonic Extraction
Effective 8/21/02

Method Reference	8081	8081	8081	8081	
Spike Level	0.2 µg/Kg	0.2 µg/Kg	0.2 µg/Kg	0.2 µg/Kg	
Sample Weight/Volume	25 g (dry)	25 g (dry)	25 g (dry)	25 g (dry)	
Extract Final Volume	5.0 mL	5.0 mL	5.0 mL	5.0 mL	
Extraction Method	Sonication	Sonication	Sonication	Sonication	
ARI Extraction SOP	350S	350S	350S	350S	
ARI Analytical SOP	423S	423S	423S	423S	PSDDA
Instrument ID	ECD 3	ECD 3	ECD 4	ECD 4	Reporting
Column ID	CLP1	CLP2	DB-5	DB-608	Limits
Date Analyzed	8/18/02	8/18/02	2/21/1999	2/21/1999	Sediment
Reporting Units	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Alpha-BHC	0.214	0.068	0.030	0.040	**1**
Beta-BHC	0.045	0.033	0.050	0.470	**1**
Gamma-BHC (Lindane)	0.029	0.141	0.040	0.140	**1**
Delta-BHC	0.049	0.051	0.110	0.070	**1**
Heptachlor	0.037	0.027	0.140	0.050	**1**
Aldrin	0.033	0.054	0.040	0.040	**1**
Heptachlor Epoxide	0.025	0.122	0.030	0.060	**1**
Gamma chlordane	0.026	0.054	0.040	0.070	**1**
Alpha chlordane	0.144	0.039	0.050	0.090	**1**
Endosulfan I	0.035	0.129	--	--	**1**
DDE	0.166	0.041	0.070	0.110	**2**
Dieldrin	0.049	0.049	0.070	0.140	**2**
Endrin	0.049	0.050	0.100	0.110	**2**
Endosulfan II	0.070	0.097	0.090	0.090	**2**
DDD	0.054	0.320	0.120	0.130	**2**
Endrin Aldehyde	0.107	0.124	0.130	0.090	**2**
DDT	0.282	0.060	--	0.100	**2**
Endosulfan Sulfate	0.088	0.078	0.180	0.110	**2**
Endrin Ketone	0.066	0.068	0.110	0.100	**2**
Methoxychlor	0.406	9.592	0.420	0.430	**10**
Hexchlorobutadiene	0.369	0.297	0.350	0.660	**1**
Hexachlorobenzene	0.034	0.040	0.080	0.080	**1**
Toxaphene (8/17/02)	2.970		1.560	2.410	**100**
Toxaphene					**100**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-ECD Analysis of Pesticides in Tissue EPA Method SW-846-8081 – Tissuemizer Extraction			
Method Reference	**8081**	**8081**	
Sample Matrix	**Soil**	**Soil**	
Spike Level			
Sample Weight/Volume	**20 g**	**20 g**	
Extract Final Volume	**10 mL**	**10 mL**	
Extraction Method	**Tissuemizer**	**Tissuemizer**	**Reporting**
ARI Extraction SOP	**340S**	**340S**	**Limits**
ARI Analytical SOP	**423S**	**423S**	**Tissue**
Instrument ID	**ECD3**	**ECD3**	**Tissuemizer**
Column ID	**DB-5**	**DB-608**	
Date Analyzed	**6/16/1999**	**6/16/1999**	**µg/Kg**
Reporting Units	**µg/Kg**	**µg/Kg**	**Wet Weight**
Analyte	**MDL**	**MDL**	**RL**
Alpha-BHC	9.96	1.70	**10**
Beta-BHC	0.94	0.61	**10**
Gamma-BHC (Lindane)	2.79	5.15	**10**
Delta-BHC	1.34	0.43	**10**
Heptachlor	1.75	3.36	**10**
Aldrin	4.29	0.42	**10**
Heptachlor Epoxide	1.43	0.29	**10**
Gamma chlordane	1.13	1.34	**10**
Alpha chlordane	0.77	0.41	**10**
Endosulfan I		0.32	**10**
DDE	1.44	1.00	**30**
Dieldrin	1.33	0.88	**30**
Endrin	1.12	1.08	**30**
Endosulfan II	1.00	0.89	**30**
DDD	1.30	3.21	**30**
Endrin Aldehyde	1.02	1.34	**30**
DDT	1.48	1.35	**30**
Endosulfan Sulfate		0.57	**30**
Endrin Ketone	1.01	1.10	**30**
Methoxychlor	70.59	71.10	**200**
Hexchlorobutadiene	2.35	5.50	**10**
Hexachlorobenzene	0.75	19.16	**10**
Toxaphene (5/5/99)	30.040	77.87	**1000**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B. Method Detection Limits (MDLs) are statistical measures of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Sediment[1]
EPA Method SW-846-8082 – Macro-Tip Extraction
Extraction SOP = 350S -- Analysis SOP = 403S
Effective 11/11/02

Sample Volume	25 g	25 g	25 g	25 g	
Extract Final Volume	2 mL	2 mL	2 mL	2 mL	
Spike Level	20 µg/kg	20 µg/kg	20 µg/kg	20 µg/kg	Sediment
Instrument ID	ECD 1	ECD 1	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL[2]**
Aroclor 1016	1.78	2.61	2.64	1.17	**20**
Aroclor 1221	10.03	12.27	10.82	3.70	**40**
Aroclor 1232	--	--	--	--	**20**
Aroclor 1242					**20**
Aroclor 1248	3.25	3.20	1.42	1.07	**20**
Aroclor 1254	--	--	--	--	**20**
Aroclor 1260	1.07	1.51	0.84	4.52	**20**
Aroclor 1262	--	--	--	--	**20**
Aroclor 1268	--	--	--	--	**20**

Sample Volume	25 g	25 g	
Extract Final Volume	5 mL	5 mL	
Spike Level	20 µg/kg	20 µg/kg	Sediment
Instrument ID	ECD 3	ECD 3	Reporting
Column ID	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	0.96	2.66	**20**
Aroclor 1221	10.14	7.38	**40**
Aroclor 1232	1.92	1.05	**20**
Aroclor 1242	1.06	1.92	**20**
Aroclor 1248	3.16	3.47	**20**
Aroclor 1254	0.44	0.37	**20**
Aroclor 1260	1.29	0.94	**20**
Aroclor 1262	--	--	**20**
Aroclor 1268	--	--	**20**

[1] MDL analyses completed between 6/14/02 and 7/18/02. [2] Requires GPC Clean-up of sample extracts.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Water
EPA Method SW-846-8082 – Sep. Funnel Extraction*
Extraction SOP = 311S -- Analysis SOP = 403S

Sample Volume	**500 mL**	**500 mL**	**500 mL**	**500 mL**	
Extract Final Volume	**5.0 mL**	**5.0 mL**	**5.0 mL**	**5.0 mL**	
Spike Level	**1.0 mg/L**	**1.0 mg/L**	**1.0 mg/L**	**1.0 mg/L**	**Water**
Instrument ID	**ECD 1**	**ECD 1**	**ECD 3**	**ECD 3**	**Reporting**
Column ID	**DB-5**	**DB-608**	**DB-5**	**DB-608**	**Limit**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**mg/L**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Aroclor 1016	0.155	0.186	0.093	0.093	**1.0**
Aroclor 1221	0.134	0.119	0.122	0.093	**2.0**
Aroclor 1232	0.104	0.192	0.119	0.090	**1.0**
Aroclor 1242	0.146	0.161	0.100	0.098	**1.0**
Aroclor 1248	0.132	0.161	0.113	0.129	**1.0**
Aroclor 1254	0.131	0.085	0.114	0.089	**1.0**
Aroclor 1260	0.158	0.170	0.079	0.082	**1.0**
Aroclor 1262	--	--	--	--	**1.0**
Aroclor 1268	--	--	--	--	**1.0**

Sample Volume	**500 mL**	**500 mL**	
Extract Final Volume	**5.0 mL**	**5.0 mL**	
Spike Level	**1.0 mg/L**	**1.0 mg/L**	**Water**
Instrument ID	**ECD 4**	**ECD 4**	**Reporting**
Column ID	**DB-5**	**DB-608**	**Limit**
Reporting Units	**µg/L**	**µg/L**	**mg/L**
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	0.127	0.132	**1.0**
Aroclor 1221	0.078	0.174	**2.0**
Aroclor 1232	0.074	0.080	**1.0**
Aroclor 1242	0.096	0.084	**1.0**
Aroclor 1248	0.146	0.130	**1.0**
Aroclor 1254	0.115	0.115	**1.0**
Aroclor 1260	0.105	0.123	**1.0**
Aroclor 1262	--	--	**1.0**
Aroclor 1268	--	--	**1.0**

* MDL analyses performed between 5/13/02 and 7/7/16/02

Method Detection Limit studies are performed following 40 CFR Part 136, Appendix B. Method Detection Limits (MDLs) are statistical measures of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Water (MTCA Level)
EPA Method SW-846-8082 – Sep. Funnel Extraction*
Extraction SOP = 311S -- Analysis SOP = 403S

Sample Volume	500 mL	500 mL	500 mL	500 mL	
Extract Final Volume	0.5 mL	0.5 mL	0.5 mL	0.5 mL	
Spike Level	0.1 mg/L	0.1 mg/L	0.1 mg/L	0.1 mg/L	Water
Instrument ID	ECD 1	ECD 1	ECD 3	ECD 3	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Reporting Units	µg/L	µg/L	µg/L	µg/L	mg/L
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Aroclor 1016	0.0350	0.0327	0.0412	0.0412	**0.10**
Aroclor 1221	0.0361	0.0367	0.0229	0.0173	**0.20**
Aroclor 1232			0.0328	0.0299	**0.10**
Aroclor 1242	0.0745	0.0710	0.0504	0.0580	**0.10**
Aroclor 1248	0.0394	0.0408	0.0194	0.0180	**0.10**
Aroclor 1254			0.0370	0.0348	**0.10**
Aroclor 1260	0.0358	0.0376	0.0360	0.0357	**0.10**
Aroclor 1262	--	--	--	--	**0.10**
Aroclor 1268	--	--	--	--	**0.10**

Sample Volume	500 mL	500 mL	
Extract Final Volume	0.5 mL	0.5 mL	
Spike Level	0.1 mg/L	0.1 mg/L	Water
Instrument ID	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	Limit
Reporting Units	µg/L	µg/L	mg/L
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	0.0307	0.0294	**0.10**
Aroclor 1221	0.0386	0.0153	**0.20**
Aroclor 1232	0.0068	0.0091	**0.10**
Aroclor 1242			**0.10**
Aroclor 1248	0.0141	0.0151	**0.10**
Aroclor 1254	0.0111	0.0183	**0.10**
Aroclor 1260	0.0273	0.0283	**0.10**
Aroclor 1262	--	--	**0.10**
Aroclor 1268	--	--	**0.10**

*MDL Studies analyzed between 5/14/02 and 7/19/02.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Water (Low Level)
EPA Method SW-846-8082 – Large Volume Injection*
Extraction SOP = 336S -- Analysis SOP = 403S

Sample Volume	**1000 mL**	**1000 mL**	
Extract Final Volume	**1.0 mL**	**1.0 mL**	
GC Injection Volume	**10 µ/L**	**10 µ/L**	
Spike Level	**0.02 mg/L**	**0.02 mg/L**	**Water**
Instrument ID	**ECD 5**	**ECD 5**	**Reporting**
Column ID	**CLP-1**	**CLP-2**	**Limit**
Reporting Units	**µg/L**	**µg/L**	**mg/L**
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	0.0095	0.0022	**0.017**
Aroclor 1221			**0.035**
Aroclor 1232			**0.017**
Aroclor 1242	0.0062	0.0023	**0.017**
Aroclor 1248			**0.017**
Aroclor 1254			**0.017**
Aroclor 1260	0.0036	0.0016	**0.017**
Aroclor 1262	--	--	**0.017**
Aroclor 1268	--	--	**0.017**

*MDL Studies performed between 2/27/03 and 3/10/03.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RLis based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Soil
EPA Method SW-846-8082 – ASE Extraction*
Extraction SOP = 366S -- Analysis SOP = 403S

Sample Weight	12 g	12 g	12 g	12 g	
Extract Final Volume	4.0 mL	4.0 mL	4.0 mL	4.0 mL	
Spike Level	16.7 µg/kg	16.7 µg/kg	16.7 µg/kg	16.7 µg/kg	Soil
Instrument ID	ECD 1	ECD 1	ECD 3	ECD 3	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Aroclor 1016	5.53	6.25			**33.0**
Aroclor 1221	3.76	3.70	4.31	4.95	**66.0**
Aroclor 1232	3.89	4.79	3.62	3.37	**33.0**
Aroclor 1242			4.43	5.04	**33.0**
Aroclor 1248	7.32	6.62	6.86	6.58	**33.0**
Aroclor 1254	4.79	6.44	3.77	3.63	**33.0**
Aroclor 1260	6.96	6.62			**33.0**
Aroclor 1262	--	--	--	--	**33.0**
Aroclor 1268	--	--	--	--	**33.0**

Sample Volume	12 g	12 g	
Extract Final Volume	4.0 mL	4.0 mL	
Spike Level	16.7 µg/kg	16.7 µg/kg	Soil
Instrument ID	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	5.42	5.49	**33.0**
Aroclor 1221	5.23	4.78	**66.0**
Aroclor 1232	3.84	3.87	**33.0**
Aroclor 1242			**33.0**
Aroclor 1248	7.69	7.32	**33.0**
Aroclor 1254	5.17	4.91	**33.0**
Aroclor 1260	4.85	5.21	**33.0**
Aroclor 1262	--	--	**33.0**
Aroclor 1268	--	--	**33.0**

* MDL analyses performed between 5/15/02 and 7/18/02.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Soil
EPA Method SW-846-8082 – Micro-Tip Extraction*
Extraction SOP = 345S -- Analysis SOP = 403S

Sample Volume	12 g	12 g	12 g	12 g	
Extract Final Volume	4.0 mL	4.0 mL	4.0 mL	4.0 mL	
Spike Level	16.7 µg/kg	16.7 µg/kg	16.7 µg/kg	16.7 µg/kg	Soil
Instrument ID	ECD 1	ECD 1	ECD 3	ECD 3	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Aroclor 1016	1.807	2.586	2.617	1.907	**33.0**
Aroclor 1221	0.916	1.846	3.580	2.120	**66.0**
Aroclor 1232	6.061	7.292	4.746	4.626	**33.0**
Aroclor 1242			5.672	3.397	**33.0**
Aroclor 1248	2.711	1.684	2.270	1.550	**33.0**
Aroclor 1254	4.101	4.321	4.746	2.231	**33.0**
Aroclor 1260	2.849	2.266	2.198	2.250	**33.0**
Aroclor 1262	--	--	--	--	**33.0**
Aroclor 1268	--	--	--	--	**33.0**

Sample Volume	12 g	12 g	
Extract Final Volume	4.0 mL	4.0 mL	
Spike Level	16.7 µg/kg	16.7 µg/kg	Soil
Instrument ID	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016	3.057	2.374	**33.0**
Aroclor 1221	2.947	1.850	**66.0**
Aroclor 1232	3.333	4.966	**33.0**
Aroclor 1242			**33.0**
Aroclor 1248	1.684	1.457	**33.0**
Aroclor 1254	2.166	2.995	**33.0**
Aroclor 1260	2.558	2.389	**33.0**
Aroclor 1262	--	--	**33.0**
Aroclor 1268	--	--	**33.0**

*MDL analyses completed between 5/15/02 and 7/14/02.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded).The RL may exceed the MDL for certain analytes.

MDL/RL Summary for PCB Analysis of Soil
EPA Method SW-846-8082 – Medium Level Extraction*
Extraction SOP = 333S -- Analysis SOP = 403S

Sample Volume	5.0 g	5.0 g	5.0 g	5.0 g	
Extract Final Volume	40 mL	40 mL	40 mL	40 mL	Medium
Spike Level	200 µg/kg	200 µg/kg	200 µg/kg	200 µg/kg	Soil
Instrument ID	ECD 1	ECD 1	ECD 3	ECD 3	Reporting
Column ID	DB-5	DB-608	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Aroclor 1016	21.97	161.14	40.32	40.54	**200**
Aroclor 1221	21.26	12.82	26.57	16.02	**400**
Aroclor 1232	40.91	26.29	50.87	50.88	**200**
Aroclor 1242			18.31	8.480	**200**
Aroclor 1248	16.96	29.89	27.47	21.20	**200**
Aroclor 1254	33.92	65.05	57.24	50.88	**200**
Aroclor 1260	33.77	18.13	75.76	37.92	**200**
Aroclor 1262	--	--	--	--	**200**
Aroclor 1268	--	--	--	--	**200**

Sample Volume	5.0 g	5.0 g	
Extract Final Volume	40 mL	40 mL	Medium
Spike Level	200 µg/kg	200 µg/kg	Soil
Instrument ID	ECD 4	ECD 4	Reporting
Column ID	DB-5	DB-608	Limit
Reporting Units	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**
Aroclor 1016			**200**
Aroclor 1221	68.36	47.97	**400**
Aroclor 1232	22.21	16.96	**200**
Aroclor 1242			**200**
Aroclor 1248	16.96	17.84	**200**
Aroclor 1254	49.65	34.96	**200**
Aroclor 1260			**200**
Aroclor 1262	--	--	**200**
Aroclor 1268	--	--	**200**

*MDL analyses completed between 6/1/02 and 7/17/02

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.

Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.

Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes

MDL and RL Summary GC-ECD Analysis of Herbicides
EPA Method SW-846-8151
Effective 7/15/02

Method Reference	8151	8151		8151	8151	
Sample Matrix	Water	Water		Soil	Soil	
Spike Level*	0.5 µg/L	0.5 µg/L		16.7 µg/kg	16.7 µg/kg	
Sample Weight/Volume	500 mL	500 mL		15 g	15 g	
Extract Final Volume	50 mL	50 mL		50 mL	50 mL	
Extraction Method	S. Funnel	S. Funnel		Macro	Macro	
ARI Extraction SOP	324S	324S		325S	325S	
ARI Analytical SOP	405S	405S		405S	405S	
Instrument ID	ECD2	ECD2	Reporting	ECD2	ECD2	Reporting
Column ID	DB5	DB608	Limit	DB5	DB608	Limit
Date Analyzed	2/14/00	2/14/00	Water	4/6/00	4/6/00	Soil
Reporting Units	µg/L	µg/L	µg/L	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**	**MDL**	**MDL**	**RL**
Dalapon	0.62	0.08	**2.0**	23.85	47.09	**83**
Dicamba	0.07	0.09	**0.5**	1.66	1.77	**17**
MCPA	34.37	41.79	**500**	1242.12	1332.81	**17000**
Dichlorprop	0.15	0.20	**1.0**	4.28	3.39	**33**
2,4-D	0.16	0.16	**1.0**	3.36	3.30	**33**
Silvex	0.04	0.03	**0.25**	1.08	0.98	**8.3**
2,4,5-T	0.04	0.05	**0.25**	0.85	1.19	**8.3**
2,4-DB	0.76	0.67	**5.0**	18.68	17.17	**170**
Dinoseb	0.11	0.05	**1.0**	2.06	3.22	**17**

*spike level higher for selected analytes.

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-ECD Analysis of Chlorinated Phenols
EPA Method SW-846-8041
Effective 7/15/02

Method Reference	8041	8041		8041	8041	
Sample Matrix	Water	Water		Soil	Soil	
Spike Level	0.5 ppb	0.5 ppb		12.5 ppb	12.5 ppb	
Sample Weight/Volume	500 mL	500 mL		10 g	10 g	
Extract Final Volume	50 mL	50 mL		25 mL	25 mL	
Extraction Method	S. Funnel	S. Funnel		Micro	Micro	
ARI Extraction SOP	329S	329S		367S	367S	
ARI Analytical SOP	412S	412S		412S	412S	
Instrument ID	ECD1	ECD1	Reporting	ECD1	ECD1	Reporting
Column ID	DB5	DB608	Limit	DB5	DB608	Limit
Date Analyzed	5/24/02	5/24/02	Water	5/24/02	5/24/02	Soil
Reporting Units	µg/L	µg/L	µg/L	µg/kg	µg/kg	µg/kg
Analyte	**MDL**	**MDL**	**RL**	**MDL**	**MDL**	**RL**
2,4,6-Trichlorophenol	0.057	0.057	**0.25**	2.502	2.562	**7.0**
2,3,6-Trichlorophenol	0.064	0.050	**0.25**	1.980	8.393	**10.0**
2,4,5-Trichlorophenol	0.223	0.050	**0.25**	5.644	2.686	**7.0**
2,3,4-Trichlorophenol	0.073	0.059	**0.25**	1.898	2.435	**7.0**
2,3,5,6-Tetrachlorophenol	0.050	0.055	**0.25**	2.155	2.082	**7.0**
2,3,4,5-Tetrachlorophenol	0.081	0.066	**0.25**	3.399	2.502	**7.0**
Pentachlorophenol	0.051	0.055	**0.25**	2.362	2.174	**7.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary for Total Petroleum Hydrocarbon (HCID) Analyses Method NWTPH-HCID Effective 6/4/02

A – Analysis of Water

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/L	MDL Date	RL mg/L
Gasoline	Separatory Funnel	0.10 mg/L	500 mL 1.0 mL	FID3A	0.035	5/24/02	**0.25**
				FID3B	0.057	5/24/02	
				FID4A	0.043	5/21/02	
				FID4B	--	--	
Diesel	Separatory Funnel	0.10 mg/L	500 mL 1.0 mL	FID3A	0.027	5/24/02	**0.50**
				FID3B	0.031	5/24/02	
				FID4A	0.011	5/9/02	
				FID4B	--	--	
Motor Oil	Separatory Funnel	0.40 mg/L	500 mL 1.0 mL	FID3A	0.114	5/24/02	**0.50**
				FID3B	0.058	5/24/02	
				FID4A	0.061	5/21/02	
				FID4B	--	--	

B – Analysis of Soil

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/L	MDL Date	RL mg/L
Gasoline	Vortex	25 mg/kg	10 g 10 mL	FID3A	6.94	5/31/02	**20**
				FID3B	9.90	5/31/02	
				FID4A	9.86	6/4/02	
				FID4B	16.7	6/4/02	
Diesel	Vortex	50 mg/kg	10 g 10 mL	FID3A	2.47	5/31/02	**50**
				FID3B	5.21	5/31/02	
				FID4A	4.49	6/4/02	
				FID4B	16.7	6/4/02	
Motor Oil	Vortex	50 mg/kg	10 g 10 mL	FID3A	10.9	5/31/02	**100**
				FID3B	13.5	5/31/02	
				FID4A	7.48	6/4/02	
				FID4B	5.86	6/4/02	

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Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary for Total Petroleum Analyses of Water
Effective 6/4/02

A - Diesel Range Organics

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/L	MDL Date	RL mg/L
NW-TPH-D C_{12}-C_{24}	Separatory Funnel	0.20 mg/L	500 mL 1.0mL	FID3A	0.013	5/14/02	**0.25**
				FID3B	0.014	5/14/02	
				FID4A	0.011	5/9/02	
				FID4B	0.016	5/8/02	
OR-TPH-D C_{10}-C_{28}	Separatory Funnel	0.20 mg/L	500 mL 1.0mL	FID3A	0.020	5/14/02	**0.25**
				FID3B	0.021	5/14/02	
				FID4A	0.022	5/9/02	
				FID4B	0.027	5/8/02	
AK102 C_{10}-C_{25}	Separatory Funnel	0.20 mg/L	500 mL 1.0mL	FID3A	0.020	5/24/02	**0.25**
				FID3B	0.018	5/24/02	
				FID4A	0.022	5/21/02	
				FID4B	**	**	

B - Residual Range Organics

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/L	MDL Date	RL mg/L
NW-TPH-Dext C_{24}-C_{38}	Separatory Funnel	0.20 mg/L	500 mL 2.5mL	FID3A	0.028	5/14/02	**0.50**
				FID3B	0.031	5/14/02	
				FID4A	0.030	5/9/02	
				FID4B	0.027	5/8/02	
OR-TPH-D C_{28}-C_{40}	Separatory Funnel	0.20 mg/L	500 mL 1.0mL	FID3A	0.021	5/14/02	**0.50**
				FID3B	0.029	5/14/02	
				FID4A	0.022	5/9/02	
				FID4B	0.020	5/8/02	
AK103 C_{25}-C_{38}	Separatory Funnel	0.20 mg/L	500 mL 2.5mL	FID3A	0.040	5/24/02	**0.50**
				FID3B	0.028	5/24/02	
				FID4A	0.034	5/21/02	
				FID4B	**	**	

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.

Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.

Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

** Water Samples for AK102 and/or AK103 analyses will not be analyzed on instrument FID4B.

MDL and RL Summary for Total Petroleum Analyses of Soil
Effective 6/04/02

A - Diesel Range Organics

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/kg	MDL Date	RL mg/kg
NW-TPH-D C_{12}-C_{24}	MicroTip	5.0 mg/kg	10 g / 1.0 mL	FID3A	1.56	5/14/02	**5.0**
				FID3B	0.80	5/14/02	
				FID4A	0.63	5/8/02	
				FID4B	0.95	5/8/02	
OR-TPH-D C_{10}-C_{28}	MicroTip	5.0 mg/kg	10 g / 1.0 mL	FID3A	1.71	5/14/02	**5.0**
				FID3B	1.04	5/14/02	
				FID4A	0.95	5/8/02	
				FID4B	1.13	5/8/02	
AK102 C_{10}-C_{25}	MicroTip	5.0 mg/kg	10 g / 1.0 mL	FID3A	1.10	5/24/02	**5.0**
				FID3B	0.54	5/16/02	
				FID4A	1.43	5/24/02	
				FID4B	0.38	5/16/02	
NW-TPH-D C_{12}-C_{24}	ASE	5.0 mg/kg	10 g / 1.0 mL	FID3A	1.37	5/14/02	**5.0**
				FID3B	0.99	5/14/02	
				FID4A	0.88	5/16/02	
				FID4B	1.03	5/16/02	
OR-TPH-D C_{10}-C_{28}	ASE	5.0 mg/kg	10 g / 1.0 mL	FID3A	1.04	5/14/02	**5.0**
				FID3B	1.19	5/14/02	
				FID4A	0.82	5/16/02	
				FID4B	0.83	5/16/02	
AK102 C_{10}-C_{25}	ASE	5.0 mg/kg	10 g / 1.0 mL	FID3A	2.64	5/24/02	**5.0**
				FID3B	3.00	5/24/02	
				FID4A	2.52	5/21/02	
				FID4B	1.78	5/21/02	

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary for Total Petroleum Analyses of Soil
Effective 6/04/02

B - Residual Range Organics

Method	Extraction Method	MDL Spike Level	Sample Amt/FEV	Instrument ID	MDL mg/kg	MDL Date	RL mg/kg
NW-TPH-Dext C_{24}-C_{38}	MicroTip	10.0 mg/kg	10 g / 1.0 mL	FID3A	1.36	5/14/02	**10.0**
				FID3B	1.10	5/14/02	
				FID4A	0.98	5/8/02	
				FID4B	1.01	5/8/02	
OR-TPH-D C_{28}-C_{40}	MicroTip	10.0 mg/kg	10 g / 1.0 mL	FID3A	1.31	5/14/02	**10.0**
				FID3B	1.12	5/14/02	
				FID4A	0.92	5/8/02	
				FID4B	1.19	5/8/02	
AK103 C_{25}-C_{38}	MicroTip	10 mg/kg	10 g / 1.0 mL	FID3A	2.44	5/24/02	**10.0**
				FID3B	2.26	5/24/02	
				FID4A	0.92	5/16/02	
				FID4B	0.58	5/16/02	
NW-TPH-Dext C_{24}-C_{38}	ASE	10 mg/kg	10 g / 1.0 mL	FID3A	0.82	5/14/02	**10.0**
				FID3B	0.58	5/14/02	
				FID4A	0.62	5/16/02	
				FID4B	0.75	5/16/02	
OR-TPH-D C_{28}-C_{40}	ASE	10.0 mg/kg	10 g / 1.0 mL	FID3A	0.98	5/14/02	**10.0**
				FID3B	0.45	5/14/02	
				FID4A	0.62	5/16/02	
				FID4B	1.15	5/16/02	
AK103 C_{25}-C_{38}	ASE	10 mg/kg	10 g / 1.0 mL	FID3A	1.06	5/24/02	**10.0**
				FID3B	2.66	5/24/02	
				FID4A	0.92	5/21/02	
				FID4B	0.86	5/21/02	

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
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Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary for Gasoline Range Organics
Effective 4/22/03

A. Water – Direct Purge & Trap

Method	Extraction Method	Sample Volume	MDL Spike Level	Instrument ID	MDL mg/L	MDL Date	RL mg/L
NWTPH-G (Toluene – Napthlene)	Direct Purge & Trap	5.0 mL	.10 mg/L	PID1	1.86	1/22/03	**0.25**
			.25 mg/L	PID2	5.36	1/13/03	
8015B (2-Methlpentane - 1,2,4-Trimethylbenzene)	Direct Purge & Trap	5.0 mL	.10 mg/L	PID1	2.92	1/22/03	**0.25**
			.25 mg/L	PID2	5.21	1/13/03	
WA-TPH-G (Toluene – nC_{12})	Direct Purge & Trap	5.0 mL	.10 mg/L	PID1	2.65	1/22/03	**0.25**
			.25 mg/L	PID2	2.66	1/13/03	
AK101 (nC_6 – nC_{12})	Direct Purge & Trap	5.0 mL	.10 mg/L	PID1	1.97	1/22/03	**0.25**
			.25 mg/L	PID2	5.32	1/13/03	

B. Soil – Methanol Extraction Purge & Trap

Method	Extraction Method	Sample Prep	MDL Spike Level	Instrument ID	MDL mg/kg	MDL Date	RL mg/kg
NWTPH-G (Toluene – Napthlene)	MeOH Extraction – P&T	10g in 5 mL 500 mL FEV	5 mg/kg	PID1	3.67	4/18/03	**5**
				PID2	2.79	4/18/03	
8015B (2-Methlpentane – 1,2,4-Trimethylbenzene)	MeOH Extraction – P&T	10g in 5 mL 500 mL FEV	5 mg/kg	PID1	2.05	4/18/03	**5**
				PID2	1.83	4/18/03	
WA-TPH-G (Toluene – nC_{12})	MeOH Extraction – P&T	10g in 5 mL 500 mL FEV	5 mg/kg	PID1	2.82	4/18/03	**5**
				PID2	2.71	4/18/03	
AK101 (nC_6 – nC_{12})	MeOH* Extraction – P&T	10g in 5 mL 500 mL FEV	5 mg/kg	PID1	2.49	4/18/03	**5**
				PID2	1.84	4/18/03	

* Samples for AK101 analysis are preserved with Methanol in the field.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-PID Analysis of BTEX in Soil
EPA Method SW-846-8021B
Effective 4/22/03

Method Reference	8021B	8021B	
Sample Matrix	Soil	Soil	
Sample Weight/Volume	10 g	10 g	
Spike Level	12.5 µg/Kg	12.5 µg/Kg	Reporting
ARI Analytical SOP	703S	703S	Limit
Instrument	PID1	PID2	Soil
Date Analyzed	4/17/03	4/17/03	GC-PID
Reporting Units	µg/kg (ppb)	µg/kg (ppb)	µg/kg (ppb)
Analyte	**MDL**	**MDL**	**RL**
Benzene	1.0	1.9	**25**
Toluene	4.1	3.4	**25**
Ethylbenzene	4.4	3.9	**25**
m/p-Xylene	10.1	6.8	**50**
o-Xylene	6.5	2.9	**25**
Methyl *tert*-Butyl Ether (MTBE)	4.5	--	**50**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-PID Analysis of BTEX in Water
EPA Method SW-846-8021B
Effective 2/10/03

Method Reference	8021B	8021B	
Sample Matrix	Water	Water	
Sample Weight/Volume	5 mL	5 mL	
Spike Level	0.5 µg/L	1 µg/L	Reporting
ARI Analytical SOP	410S-R6	410S-R6	Limit
Instrument	PID1	PID2	Water
Date Analyzed	5/16/02	5/15/02	GC-PID
Reporting Units	µg/L (ppb)	µg/L (ppb)	µg/L (ppb)
Analyte	**MDL**	**MDL**	**RL**
Benzene	0.107	0.069	**1.0**
Toluene	0.114	0.056	**1.0**
Ethylbenzene	0.125	0.065	**1.0**
m/p-Xylene	0.243	0.082	**1.0**
o-Xylene	0.134	0.041	**1.0**
Chlorobenzene	0.134	0.048	**1.0**
1,3-Dichlorobenzene	0.060	0.019	**1.0**
1,4-Dichlorobenzene	0.073	0.022	**1.0**
1,2-Dichlorobenzene	0.050	0.042	**1.0**
Methyl *tert*-Butyl Ether (MTBE)	0.185	0.047	**1.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary HPLC Analysis of Polycyclic Aromatic Hydrocarbons (PAH or PNA) EPA Method SW-8310 Effective 11/01/02

Method Reference	**8310**	**8310**		**8310**	**8310**	
Sample Matrix	**Water**	**Water**		**Soil**	**Soil**	
Spike Level	**0.5 µg/L**	**0.5 µg/L**		**12.5 ppb**	**12.5 ppb**	
Sample Weight/Volume	**1.0 L**	**1.0 L**		**30 g**	**30 g**	
Extract Final Volume	**1.0 mL**	**1.0 mL**		**2.0 mL**	**2.0 mL**	
Extraction Method	**S. Funnel**	**S. Funnel**		**Macro**	**Macro**	
ARI Extraction SOP	**363S**	**363S**		**309S**	**309S**	
ARI Analytical SOP	**411S**	**411S**		**411S**	**411S**	
Instrument ID	**HPLC1**	**HPLC1**	**Reporting**	**HPLC1**	**HPLC1**	**Reporting**
Detector	**Fluor**	**uv**	**Limit**	**Fluor**	**uv**	**Limit**
Date Analyzed	**5/15/01**	**5/15/01**	**Water**	**4/5/00**	**4/5/00**	**Soil**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/kg**	**µg/kg**	**µg/kg**
Analyte	**MDL**	**MDL**	**RL**	**MDL**	**MDL**	**RL**
Naphthalene	--	0.31	**2.50**	82.13	43.36	**90**
Acenapthylene	--	0.31	**5.30**	--	92.25	**150**
Acenaphthene	--	0.48	**1.80**	42.75	38.02	**90**
Fluorene	--	0.04	**0.46**	7.45	6.06	**13**
Phenanthrene	0.06	0.02	**0.64**	4.42	2.84	**6.7**
Anthracene	0.04	0.02	**0.66**	4.58	2.78	**6.7**
Fluoranthene	0.03	0.04	**0.49**	6.68	30.68	**13**
Pyrene	0.08	0.04	**0.27**	5.07	16.27	**6.7**
Benzo(a)anthracene	0.06	0.08	**0.05**	4.73	4.85	**6.7**
Chrysene	0.04	0.24	**0.15**	3.45	11.99	**6.7**
Benzo(b)fluoranthene	0.02	0.14	**0.10**	5.43	7.79	**6.7**
Benzo(k)fluoranthene	0.02	0.11	**0.06**	2.36	12.79	**6.7**
Benzo(a)pyrene	0.03	0.03	**0.07**	9.38	8.60	**13**
Dibenzo(a,h)anthracene	0.05	0.06	**0.10**	9.22	10.11	**13**
Benzo(g,h,i)perylene	0.07	0.09	**0.11**	8.90	8.39	**13**
Indeno(1,2,3-cd)pyrene	0.08	0.05	**0.07**	3.85	4.77	**6.7**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-FID Analysis of Polar Semi-Volatile Compounds
EPA Method SW-846-8015
Effective 3/10/03

Method Reference	8015		8015	
Sample Matrix	Water		Soil	
Sample Weight/Volume	Direct Inject		5g to 5mL	
Spike Level	5.0-25.0 mg/L	**Reporting**	5.0-25.0 mg/kg	**Reporting**
ARI Analytical SOP	427SS	**Limit**	427SS	**Limit**
Instrument	FID2	**Water**	FID2	**Soil**
Date Analyzed	1/28/03	**GC-FID**	3/10/03	**GC-FID**
Reporting Units	mg/L (ppm)	**mg/L (ppm)**	mg/kg (ppm)	**mg/kg (ppm)**
Analyte	**MDL**	**RL**	**MDL**	**RL**
Ethanol	2.75	**10**	6.72	**10**
Ethyl Acetate	11.3	**10**	8.98	**10**
Isopropyl Alcohol	2.21	**25**	1.59	**25**
Butyl Ether	11.8	**25**	17.9	**25**
2-Pentanone	0.43	**5**	1.34	**5**
n-Propyl alcohol	2.03	**10**	2.29	**10**
n-Butyl Acetate	2.98	**5**	0.60	**5**
1-Methoxy-2-Propanol	2.82	**10**	3.39	**10**
n-Butyl Alcohol	1.68	**5**	1.55	**5**
Propylene Glycol Methyl Ether Acetate	1.33	**5**	0.80	**5**
2-Methoxyethyl Acetate	1.48	**5**	1.37	**5**
2-Ethoxyethyl Acetate	2.47	**5**	1.43	**5**
Propargyl Alcohol	1.40	**5**	0.58	**5**
Isobutyl Acetate	1.00	**10**	0.72	**10**
Ethylene Glycol	8.82	**10**	9.06	**10**
2-(2-Butoxyethoxy) Ethanol	2.93	**5**	1.43	**5**
2-Ethoxyethanol	2.84	**25**	3.38	**25**
2,2,4,4-Tetramethyl-3-Pentanone	2.38	**10**	3.97	**10**
2,6-Dimethyl-4-Heptanone	2.98	**10**	3.73	**10**
2-Heptanone	0.57	**5**	0.44	**5**
2,4-Pentandione	8.06	**200**	9.09	**200**
2-Butoxyethanol	--	**10**	--	**10**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

IDL/MDL and RL Summary Metals Analysis using ICP-OES
Perkin Elmer Optima 4300
Effective 9/1/02

Method Reference		**ILM04.0**	**EPA 6010B**			
Sample Matrix		**Water**	**Water**			
Sample Weight/Volume		**NA**	**50 mL**			
ARI Preparation SOP		**NA**	**510S**			
ARI Analytical SOP		**NA**	**504S**	**Reporting**	**Reporting**	**Reporting**
Instrument ID		**Optima**	**Optima**	**Limit**	**Limit**	**Limit**
Date Analyzed		**8/5-14/02**	**8/5/02**	**Water**	**Soil(1)**	**Tissue(2)**
Reporting Units		**mg/L**	**mg/L**	**mg/L**	**mg/kg**	**mg/kg**
Analyte	**MDL Spike µg/L**	**IDL**	**MDL**	**RL**	**RL**	**RL**
Aluminum	0.06	0.0172	0.0264	0.050	5.0	1.00
Antimony	0.02	0.0052	0.0049	0.050	5.0	1.00
Arsenic	0.02	0.0068	0.0063	0.050	5.0	1.00
Barium	0.002	0.0015	0.0015	0.003	0.3	0.06
Beryllium	0.0005	0.0001	0.0001	0.001	0.1	0.02
Boron	0.02	0.0032	0.0046	0.020	2.0	0.40
Cadmium	0.004	0.0015	0.0014	0.002	0.2	0.04
Calcium	0.02	0.0028	0.0061	0.050	5.0	1.00
Chromium	0.01	0.0015	0.0018	0.005	0.5	0.10
Cobalt	0.01	0.0003	0.0008	0.003	0.3	0.06
Copper	0.002	0.0004	0.0006	0.002	0.2	0.04
Iron	0.02	0.0047	0.0044	0.050	5.0	1.00
Lead	0.004	0.0016	0.0015	0.020	2.0	0.40
Magnesium	0.06	0.0081	0.0120	0.050	5.0	1.00
Manganese	0.0005	0.0004	0.0004	0.001	0.1	0.02
Molybdenum	0.01	0.0006	0.0006	0.005	0.5	0.10
Nickel	0.01	0.0033	0.0037	0.010	1.0	0.20
Potassium	0.20	0.0533	0.1177	0.500	50	10.00
Selenium	0.02	0.0057	0.0047	0.050	5.0	1.00
Silicon	0.06	0.0072	0.0144	0.060	6.0	1.20
Silver	0.004	0.0005	0.0004	0.003	0.3	0.06
Sodium	0.04	0.0141	0.0134	0.50	50	10
Strontium	0.0005	0.0002	0.0002	0.001	0.1	0.02
Thallium	0.01	0.0063	0.0024	0.050	5.0	1.00
Tin	0.04	0.0029	0.0023	0.010	1.0	0.20
Titanium	0.01	0.0022	0.0026	0.005	0.5	0.10
Vanadium	0.004	0.0003	0.0007	0.003	0.3	0.06
Zinc	0.004	0.0017	0.0029	0.006	0.6	0.12

Instrument Detection Limit (IDL) calculated following with EPA CLP ILM04.0. Method Detection Limit (MDL) studies calculated in accordance with 40 CFR Part 136, Appendix B. MDLs are statistical measures of short term precision. Detection at the MDL may not be achievable for all analytes. IDL is a statistical value indicating the smallest signal above background an instrument can reliably detect. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes

.(1) Soil and sediment reported on a dry weight basis. (2) Tissue reported on an “as received” wet weight basis.

IDL/MDL and RL Summary ICP-MS Analysis for Trace Metals (Effective 8/7/02)

			6020/200.8	6020/200.8		
			NA	M-02-01-01		
		Method Reference	Water	Water		
		IDL/MDL Study ID	NA	100mL		
		Sample Matrix	NA	536S	Reporting	Reporting
		Sample Volume	NA	538S	Limit	Limit
		ARI Preparation SOP	ELAN 6000	ELAN 6000	Water	Soil
		ARI Analytical SOP	8/2/02	8/1/02		
		Instrument ID	µg/L	µg/L	µg/L	mg/kg
		Date of Analysis				
		Reporting Units				
Analyte	**Spike µg/L**	**Mass**	**IDL**	**MDL**	**RL**	**RL**
Aluminum	20.0	27	0.066	2.146	20.0	20.0
Antimony	0.1	121	0.024	0.011	0.2	0.2
		123	0.024	0.009	0.2	0.2
Arsenic #1	0.2	75	0.030	0.031	0.2	0.2
Arsenic #2		75	0.085	0.101	0.5	0.5
Barium	0.2	135	0.003	0.044	0.5	0.5
		137	0.002	0.050	0.5	0.5
Beryllium	0.2	9	0.005	0.016	0.2	0.2
Boron	0.5	--	--	--	NA	NA
Cadmium	0.1	111	0.011	0.012	0.2	0.2
		114	0.002	0.011	0.2	0.2
Calcium	20.0	43	0.805	3.395	50.0	50.0
Chromium	1.0	52	0.023	0.063	0.5	0.5
		53	0.025	0.073	0.5	0.5
Cobalt	0.2	59	0.002	0.007	0.2	0.2
Copper	0.2	63	0.007	0.460	0.5	0.5
		65	0.007	0.459	0.5	0.5
Iron	20.0	54	1.396	3.844	20.0	20.0
		57	3.312	3.385	20.0	20.0
Lead	0.1	208	0.016	0.534	1.0	1.0
Magnesium	20.0	24	0.034	0.211	20.0	20.0
Manganese	0.4	55	0.004	0.039	0.5	0.5

			6020/200.8	6020/200.8		
			NA	M-02-01-01		
			Water	Water		
			NA	100mL		
			NA	536S	Reporting	Reporting
			NA	538S	Limit	Limit
			ELAN 6000	ELAN 6000	Water	Soil
			8/2/02	8/1/02		
			µg/L	µg/L	µg/L	mg/kg
Analyte	**Spike µg/L**	**Mass**	**IDL**	**MDL**	**RL**	**RL**
Molybdenum	0.1	98	0.006	0.017	0.2	0.2
Nickel	0.4	60	0.027	0.077	0.5	0.5
		62	0.054	0.120	0.5	0.5
Potassium	20.0	39	2.126	2.398	20.0	20.0
Selenium	1.0	82	0.104	0.131	0.5	0.5
		78	0.346	0.399	2.0	2.0
Silicon	0.5	--	--	--	NA	NA
Silver	0.1	107	0.003	0.007	0.5	0.5
Sodium	20.0	23	2.835	3.995	100.0	100.0
Strontium	0.5	--	--	--	NA	NA
Thorium	0.1	232	0.018	0.018	0.2	0.2
Thallium	0.1	205	0.001	0.003	0.2	0.2
Tin	0.5	--	--	--	NA	NA
Titanium	0.5	--	--	--	NA	NA
Uranium	0.1	238	0.003	0.003	0.2	0.2
Vanadium	0.3	51	0.011	0.020	0.2	0.2
Zinc	1.0	66	0.047	0.501	4.0	4.0
		67	0.076	0.418	4.0	4.0
		68	0.049	0.487	4.0	4.0

Instrument Detection Limit (IDL) studies calculated following EPA CLP ILM04.0. Method Detection Limit (MDL) studies calculated in accordance with 40 CFR Part 136, Appendix B. IDL is a statistical value that indicates the smallest signal above background an instrument can reliably detect. MDLs are statistical measures of short term precision. Detection at the MDL may not be achievable for all analytes. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary Metals Analysis by GFA & CVAA
Effective 8/20/02

		Sample Matrix	**Water**	**Water**			
		Sample Volume	**50 mL**	**50 mL**			
		Digestate Final Volume	**50 mL**	**50 mL**			
		ARI Preparation SOP	**505S**	**505S**			
		ARI Analytical SOP	**502S**	**502S**	**Reporting**	**Reporting**	**Reporting**
		Instrument ID	**Varian 1**	**Varian 2**	**Limit**	**Limit**	**Limit**
		Date of Analysis	**7/27/02(1)**	**8/1/02(2)**	**Water(3)**	**Soil(4)**	**Tissue(5)**
		Reporting Units	**µg/L**	**µg/L**	**µg/L**	**mg/kg**	**mg/kg**
Analyte	**Method**	**Spike µg/L**	**MDL**	**MDL**	**RL**	**RL**	**RL**
Silver	7761	0.1	0.072	0.031	**0.2**	**0.02**	**0.004**
Arsenic	7060A	2.0	0.601	0.735	**1.0**	**0.10**	**0.020**
Cadmium	7131A	0.1	0.083	0.050	**0.2**	**0.02**	**0.004**
Lead	7421	4.0	0.585	0.869	**1.0**	**0.10**	**0.020**
Antimony	7041	4.0	1.016	1.642	**2.0**	**0.20**	**0.040**
Selenium	7740	4.0	0.699	0.719	**2.0**	**0.20**	**0.040**
Thallium	7841	4.0	0.967	0.557	**1.0**	**0.10**	**0.020**
		Sample Matrix	**Water**				
		Sample Volume	**100 mL**				
		Digestate Final Volume	**100 mL**				
		ARI Preparation SOP	**512S**				
		ARI Analytical SOP	**513S**		**Reporting**	**Reporting**	**Reporting**
		Instrument ID	**CETAC**		**Limit**	**Limit**	**Limit**
		Date of Analysis	**7/29/02**		**Water(3)**	**Soil(4)**	**Tissue(5)**
		Reporting Units	**µg/L**		**µg/L**	**mg/kg**	**mg/kg**
Analyte	**Method**	**Spike µg/L**	**MDL**		**RL**	**RL**	**RL**
Mercury	7470A	0.05	0.0168		**0.1**	**0.05**	**0.01**

Method Detection Limit (MDL) studies are performed in accordance with 40 CFR Part 136, Appendix B using six degrees of freedom. MDLs are statistically derived values that measure of short term precision. Detection at the MDL may not be achievable for all analytes.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.
(1) Analyses performed 7/27/02 through 8/14/02. (2) Analyses performed 8/1/02 through 8/13/02.
(3) Based on 50 mL (100 mL for Mercury) initial sample volume with 50 mL (100 mL for Mercury) final digestate volume.
(4) Based on 1.0 g (0.2 g for Mercury) initial sample wet weight with a 100 mL final digestate volume. Soil and sediment reported on a dry weight basis.
(5) Based on 5.0 g (2.0 g for Mercury) initial sample wet weight with a 100 mL final digestate volume. Tissue reported on an “as received” wet weight basis.

MDL and RL Summary GC-MS – SVOA Analysis of Water
EPA Method SW-846-8270 - Liquid/Liquid Extraction

Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500 mL**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**NT6**	**Finn 4**	**NT1**	**Finn 8**	**Limit**
Date Analyzed	**3/6/03**	**3/10/03**	**3/17/03**	**3/10/03**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Azobenzene	--	--	0.56	--	**2.0**
1-Methylnaphthalene (1 µg/L)	--	--	0.32	--	**1.0**
Phenol	0.25	0.37	0.47	0.30	**2.0**
Bis-(2-chloroethyl) ether	0.34	0.34	0.75	0.30	**2.0**
2-Chlorophenol	0.32	0.39	0.54	0.28	**1.0**
1,3-Dichlorobenzene	0.24	0.24	0.63	0.28	**1.0**
1,4-Dichlorobenzene	0.24	0.28	0.44	0.29	**1.0**
Benzyl Alcohol	0.24	0.15	0.31	0.15	**5.0**
1,2-Dichlorobenzene	0.25	0.28	0.56	0.25	**1.0**
2-Methylphenol	0.29	0.23	0.82	0.18	**1.0**
2,2'-oxybis(1-chloropropane)	0.31	0.39	0.65	0.34	**1.0**
4-Methylphenol	0.22	0.33	0.80	0.23	**1.0**
N-Nitroso-di-n-propylamine	0.33	0.26	0.70	0.22	**2.0**
Hexachloroethane	0.39	0.30	0.58	0.36	**2.0**
Nitrobenzene	0.31	0.45	0.61	0.39	**1.0**
Isophorone	0.23	0.21	0.46	0.21	**1.0**
2-Nitrophenol	0.28	0.26	0.47	0.22	**5.0**
2,4-Dimethylphenol	0.25	0.44	1.27	0.33	**3.0**
Bis-(2-chloroethoxy) methane	0.25	0.31	0.40	0.27	**1.0**
Benzoic Acid (50 µg/L)	1.77	2.49	4.96	0.93	**10.0**
2,4-Dichlorophenol	0.21	0.23	0.27	0.26	**3.0**
1,2,4-Trichlorobenzene	0.36	0.26	0.41	0.28	**1.0**
Naphthalene	0.31	0.34	0.37	0.28	**1.0**
4-Chloroaniline (5 µg/L)	0.62	0.47	1.29	0.43	**3.0**
Hexachlorobutadiene	0.35	0.27	0.54	0.25	**2.0**
4-Chloro-3-methylphenol	0.25	0.23	0.47	0.19	**2.0**
2-Methylnaphthalene	0.17	0.24	0.37	0.21	**1.0**
Hexachlorocyclopentadiene (5 µg/L)	0.57	0.52	1.30	0.65	**5.0**
2,4,6-Trichlorophenol	0.29	0.23	0.51	0.26	**5.0**
2,4,5-Trichlorophenol	0.24	0.20	0.46	0.21	**5.0**
2-Chloronaphthalene	0.34	0.25	0.49	0.29	**1.0**

Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500 mL**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**NT6**	**Finn 4**	**NT1**	**Finn 8**	**Limit**
Date Analyzed	**3/6/03**	**3/10/03**	**3/17/03**	**3/10/03**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
2-Nitroaniline (5 µg/L)	0.58	0.82	1.12	0.27	**5.0**
Dimethylphthalate	0.27	0.20	0.55	0.24	**1.0**
Acenaphthylene	0.25	0.17	0.50	0.22	**1.0**
2,6-Dinitrotoluene	0.29	0.20	0.73	0.24	**5.0**
3-Nitroaniline (5 µg/L)	0.79	0.89	1.32	0.44	**5.0**
Acenaphthene	0.25	0.30	0.52	0.28	**1.0**
2,4-Dinitrophenol (25 µg/L)	4.03	3.57	9.63	2.80	**10.0**
Dibenzofuran	0.17	0.16	0.37	0.23	**1.0**
4-Nitrophenol (3 µg/L)	2.12	1.36	2.97	1.42	**5.0**
2,4-Dinitrotoluene	0.34	0.23	0.66	0.27	**5.0**
Fluorene	0.24	0.25	0.46	0.31	**1.0**
Diethylphthlalate	1.05	0.85	1.24	0.98	**1.0**
4-Chlorophenyl-phenyl ether	0.29	0.22	0.44	0.34	**1.0**
4-Nitroaniline (5 µg/L)	1.02	0.89	0.97	0.94	**5.0**
4,6-Dinitro-2-Methylphenol (25 µg/L)	3.21	1.42	5.92	2.32	**10.0**
N-Nitrosodiphenylamine	0.28	0.11	0.63	0.23	**1.0**
4-bromophenyl-phenyl ether	0.20	0.29	0.57	0.24	**1.0**
Hexachlorobenzene	0.30	0.25	0.43	0.34	**1.0**
Pentachlorophenol	1.36	1.11	1.97	0.97	**5.0**
Phenanthrene	0.27	0.25	0.51	0.28	**1.0**
Anthracene	0.24	0.27	0.64	0.20	**1.0**
Carbazole	0.32	0.25	0.70	0.27	**1.0**
Di-n-butylphthalate	0.26	0.21	0.48	0.17	**1.0**
Fluoranthene	0.22	0.27	0.65	0.29	**1.0**
Pyrene	0.24	0.27	0.66	0.41	**1.0**
Butylbenzylphthalate	0.24	0.35	0.68	0.32	**1.0**
Benzo(a)Anthracene	0.26	0.13	0.57	0.28	**1.0**
3,3'-Dichlorobenzidine	0.72	1.21	3.87	0.66	**5.0**
Chrysene	0.24	0.35	0.57	0.69	**1.0**
bis(2-Ethylhexyl) phthalate	1.35	1.71	2.54	1.52	**3.0**
Di-n-octylphthalate	0.32	0.32	0.82	0.76	**1.0**
Benzo(b)Fluoranthene	0.19	0.29	0.34	0.28	**1.0**
Benzo(k)Fluoranthene	0.30	0.48	0.42	0.51	**1.0**

Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500 mL**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**NT6**	**Finn 4**	**NT1**	**Finn 8**	**Limit**
Date Analyzed	**3/6/03**	**3/10/03**	**3/17/03**	**3/10/03**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Benzo(a)Pyrene	0.18	0.16	0.51	0.19	**1.0**
Indeno(1,2,3-cd)Pyrene	0.24	0.22	0.66	0.31	**1.0**
Dibenzo(a,h)anthracene	0.29	0.25	0.48	0.27	**1.0**
Benzo(g,h,i)perylene	0.28	0.29	0.34	0.26	**1.0**
N-Nitrosodimethylamine	--	--	0.75	--	**5.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using six or seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Soil
EPA Method SW-846-8270 – Macrotip Sonication

Method Reference	**8270**	**8270**	**8270**	
Sample Matrix	**Soil**	**Soil**	**Soil**	
Sample Weight/Volume	**30 g**	**30 g**	**30 g**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
Extraction Method	**Macro Sonic**	**Macro Sonic**	**Macro Sonic**	
ARI Extraction SOP	**310S**	**310S**	**310S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/04/00**	**02/23/00**	**02/07/00**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
Biphenyl (67 µg/kg)	12.17	7.47	10.11	**67**
Azobenzene	7.65	12.48	13.89	**67**
1-Methylnaphthalene (67 µg/kg)	11.40	5.00	5.58	**67**
Phenol	16.55	15.66	16.99	**130**
Bis-(2-chloroethyl) ether	14.65	14.70	17.37	**130**
2-Chlorophenol	11.30	12.25	14.80	**67**
1,3-Dichlorobenzene	15.45	11.69	11.11	**67**
1,4-Dichlorobenzene	12.28	12.09	16.63	**67**
Benzyl Alcohol	20.21	11.53	10.91	**330**
1,2-Dichlorobenzene	17.37	13.31	15.09	**67**
2-Methylphenol	14.40	12.76	11.40	**67**
2,2'-oxybis(1-chloropropane)	19.60	13.71	14.67	**67**
4-Methylphenol	14.04	15.79	10.42	**67**
N-Nitroso-di-n-propylamine	24.08	14.92	13.32	**130**
Hexachloroethane	25.43	10.93	16.68	**130**
Nitrobenzene	14.60	12.04	12.53	**67**
Isophorone	15.60	17.60	17.57	**67**
2-Nitrophenol	13.30	10.09	16.71	**330**
2,4-Dimethyphenol	12.42	23.75	32.26	**200**
Bis-(2-chloroethoxy) methane	10.64	7.64	14.42	**67**
Benzoic Acid (3325 µg/kg)	437.99	465.14	398.77	**670**
2,4-Dichlorophenol	11.91	11.93	14.02	**200**
1,2,4-Trichlorobenzene	10.67	13.31	12.37	**67**
Naphthalene	15.38	11.42	11.21	**67**
4-Chloroaniline (333 µg/kg)	46.93	47.66	38.20	**200**
2-Chloronaphthalene	19.30	10.47	11.48	**67**
2-Nitroaniline (333 µg/kg)	40.80	39.68	33.11	**330**
Dimethylphthalate	12.47	12.66	11.27	**67**

Method Reference	**8270**	**8270**	**8270**	
Sample Matrix	**Soil**	**Soil**	**Soil**	
Sample Weight/Volume	**30 g**	**30 g**	**30 g**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
Extraction Method	**Macro Sonic**	**Macro Sonic**	**Macro Sonic**	
ARI Extraction SOP	**310S**	**310S**	**310S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/04/00**	**02/23/00**	**02/07/00**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
Acenaphthylene	15.63	10.00	11.39	**67**
2,6-Dinitrotoluene	10.39	16.86	6.99	**330**
3-Nitroaniline (333 µg/kg)	33.44	31.47	20.41	**400**
Acenaphthene	16.38	7.24	9.41	**67**
2,4-Dinitrophenol (1666 µg/kg)	153.79	166.98	151.64	**670**
Dibenzofuran	14.34	5.57	11.00	**67**
4-Nitrophenol (200 µg/kg)	61.19	41.14	40.83	**330**
2,4-Dinitrotoluene	17.97	8.98	8.27	**330**
Fluorene	10.67	11.63	9.02	**67**
Diethylphthlalate	14.34	14.41	11.55	**67**
4-Chlorophenyl-phenyl ether	15.45	12.63	13.93	**67**
4-Nitroaniline (333 µg/kg)	20.49	24.07	43.37	**330**
4,6-Dinitro-2-Methylphenol (1666 µg/kg)	247.94	108.90	184.68	**670**
N-Nitrosodiphenylamine	23.78	10.22	14.34	**67**
4-bromophenyl-phenyl ether	20.37	11.28	14.59	**67**
Hexachlorobenzene	18.94	9.70	17.41	**67**
Pentachlorophenol	59.53	57.31	55.26	**330**
Phenanthrene	14.24	10.88	10.49	**67**
Anthracene	9.02	8.93	13.74	**67**
Carbazole	9.05	9.56	11.23	**67**
Di-n-butylphthalate	19.66	17.13	18.70	**67**
Fluoranthene	10.86	12.21	11.80	**67**
Pyrene	11.98	17.78	12.68	**67**
Butylbenzylphthalate	7.63	9.57	15.25	**67**
Benzo(a)Anthracene	7.96	11.26	12.74	**67**
3,3'-Dichlorbenzidine	64.18	116.02	78.90	**330**
Chrysene	10.11	8.91	20.58	**67**
bis(2-Ethylhexyl) phthalate	9.46	63.49	31.15	**67**
Di-n-octylphthalate	6.16	14.53	10.42	**67**
Benzo(b)Fluoranthene	12.85	16.23	27.31	**67**
Benzo(k)Fluoranthene	9.48	28.68	22.51	**67**

Method Reference	**8270**	**8270**	**8270**	
Sample Matrix	**Soil**	**Soil**	**Soil**	
Sample Weight/Volume	**30 g**	**30 g**	**30 g**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
Extraction Method	**Macro Sonic**	**Macro Sonic**	**Macro Sonic**	
ARI Extraction SOP	**310S**	**310S**	**310S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/04/00**	**02/23/00**	**02/07/00**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
Benzo(a)Pyrene	7.67	13.31	13.02	**67**
Indeno(1,2,3-cd)Pyrene	7.28	12.43	12.62	**67**
Dibenz(a,h)Anthracene	6.90	6.37	9.62	**67**
Benzo(ghi)Perylene	7.94	12.65	12.50	**67**
Tributyl Phosphate (67 µg/kg)	7.82	6.46	10.44	**67**
Dibutyl Phenyl phosphate (67 µg/kg)	5.68	6.02	8.78	**130**
Butyl diphenyl phosphate (200 µg/kg)	22.28	13.46	27.85	**330**
Triphenyl phosphate (333 µg/kg)	21.80	26.04	33.68	**330**
N-Nitrosodimethylamine (333 µg/kg)	125.84	135.99	79.84	**330**
Aniline	17.72	15.62	15.96	**67**

* Selected compoundsspiked at higher levels as indicated by concentrations given in parentheses after the compound name.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Water
EPA Method SW-846-8270 – Separatory Funnel Extraction

Method Reference	**8270**	**8270**	**8270**	**8270**	
Sample Matrix	**Water**	**Water**	**Water**	**Water**	
Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
Extraction Method	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**NT-1**	**Limit**
Date Analyzed	**02/04/00**	**6/23/02**	**02/04/00**	**8/9/01**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Diphenyl Oxide (1 µg/L)	0.08	--	0.09	NA	**1.0**
Biphenyl (1 µg/L)	0.07	--	0.06	NA	**1.0**
Azobenzene	0.23	0.11	0.19	NA	**2.0**
1-Methylnaphthalene (1 µg/L)	0.11	0.22	0.09	NA	**1.0**
Phenol	0.18	0.19	0.17	NA	**2.0**
Bis-(2-chloroethyl) ether	0.22	0.25	0.23	NA	**2.0**
2-Chlorophenol	0.22	0.24	0.33	NA	**1.0**
1,3-Dichlorobenzene	0.08	0.20	0.15	NA	**1.0**
1,4-Dichlorobenzene	0.18	0.22	0.22	NA	**1.0**
Benzyl Alcohol	0.16	0.77	0.20	NA	**5.0**
1,2-Dichlorobenzene	0.17	0.22	0.13	NA	**1.0**
2-Methylphenol	0.31	0.14	0.23	NA	**1.0**
2,2'-oxybis(1-chloropropane)	0.26	0.25	0.22	NA	**1.0**
4-Methylphenol	0.34	0.13	0.18	NA	**1.0**
N-Nitroso-di-n-propylamine	0.19	0.29	0.12	NA	**2.0**
Hexachloroethane	0.15	0.26	0.11	NA	**2.0**
Nitrobenzene	0.16	0.20	0.14	NA	**1.0**
Isophorone	0.12	0.21	0.14	NA	**1.0**
2-Nitrophenol	0.17	0.18	0.20	NA	**5.0**
2,4-Dimethylphenol	0.81	0.31	0.41	NA	**3.0**
Bis-(2-chloroethoxy) methane	0.12	0.26	0.18	NA	**1.0**
Benzoic Acid (50 µg/L)	31.60	3.00	27.97	NA	**10.0**
2,4-Dichlorophenol	0.25	0.24	0.22	NA	**3.0**
1,2,4-Trichlorobenzene	0.14	0.20	0.16	NA	**1.0**
Naphthalene	0.13	0.26	0.08	NA	**1.0**
4-Chloroaniline (5 µg/L)	0.80	0.73	0.50	NA	**3.0**
Hexachlorobutadiene	0.13	0.19	0.21	NA	**2.0**
4-Chloro-3-methylphenol	0.75	0.19	0.17	NA	**2.0**
2-Methylnaphthalene	0.15	0.25	0.13	NA	**1.0**

Method Reference	**8270**	**8270**	**8270**	**8270**	
Sample Matrix	**Water**	**Water**	**Water**	**Water**	
Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
Extraction Method	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**NT-1**	**Limit**
Date Analyzed	**02/04/00**	**6/23/02**	**02/04/00**	**8/9/01**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Hexachlorocyclopentadiene (5 µg/L)	0.54	0.49	0.39	NA	**5.0**
2,4,6-trichlorophenol	0.16	0.29	0.25	NA	**5.0**
2,4,5-trichlorophenol	0.28	0.25	0.20	NA	**5.0**
2-Chloronaphthalene	0.19	0.22	0.14	NA	**1.0**
2-Nitroaniline (5 µg/L)	0.32	0.57	0.30	NA	**5.0**
Dimethylphthalate	0.11	0.10	0.07	NA	**1.0**
Acenaphthylene	0.11	0.18	0.08	NA	**1.0**
2,6-Dinitrotoluene	0.16	0.23	0.22	NA	**5.0**
3-Nitroaniline (5 µg/L)	0.31	0.32	0.48	NA	**5.0**
Acenaphthene	0.12	0.19	0.09	NA	**1.0**
2,4-Dinitrophenol (25 µg/L)	7.77	1.89	11.52	NA	**10.0**
Dibenzofuran	0.16	0.20	0.09	NA	**1.0**
4-Nitrophenol (3 µg/L)	0.92	0.66	0.33	NA	**5.0**
2,4-Dinitrotoluene	0.26	0.08	0.18	NA	**5.0**
Fluorene	0.15	0.14	0.12	NA	**1.0**
Diethylphthlalate	0.14	0.11	0.09	NA	**1.0**
4-Chlorophenyl-phenyl ether	0.20	0.14	0.17	NA	**1.0**
4-Nitroaniline (5 µg/L)	0.27	0.69	0.42	NA	**5.0**
4,6-Dinitro-2-Methylphenol (25 µg/L)	4.45	1.72	8.19	NA	**10.0**
N-Nitrosodiphenylamine	0.20	0.18	0.14	NA	**1.0**
4-bromophenyl-phenyl ether	0.22	0.20	0.16	NA	**1.0**
Hexachlorobenzene	0.12	0.22	0.14	NA	**1.0**
Pentachlorophenol	3.02	0.86	2.94	NA	**5.0**
Phenanthrene	0.16	0.09	0.17	NA	**1.0**
Anthracene	0.22	0.08	0.24	NA	**1.0**
Carbazole	0.15	0.12	0.20	NA	**1.0**
Di-n-butylphthalate	0.14	0.15	0.19	NA	**1.0**
Fluoranthene	0.14	0.11	0.18	NA	**1.0**
Pyrene	0.19	0.10	0.23	NA	**1.0**
Butylbenzylphthalate	0.23	0.10	0.26	NA	**1.0**
Benzo(a)Anthracene	0.14	0.12	0.17	NA	**1.0**

Method Reference	**8270**	**8270**	**8270**	**8270**	
Sample Matrix	**Water**	**Water**	**Water**	**Water**	
Sample Weight/Volume	**500 mL**	**500 mL**	**500 mL**	**500mL**	
Spike Level*	**2 µg/L**	**2 µg/L**	**2 µg/L**	**2 µg/L**	
Extraction Method	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	**Sep. Fun**	
ARI Extraction SOP	**344S**	**344S**	**344S**	**344S**	**Water**
ARI Analytical SOP	**801S**	**801S**	**801S**	**801S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**NT-1**	**Limit**
Date Analyzed	**02/04/00**	**6/23/02**	**02/04/00**	**8/9/01**	**mg/L**
Reporting Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
3,3'-Dichlorbenzidine	1.10	1.43	0.81	NA	**5.0**
Chrysene	0.13	0.13	0.23	NA	**1.0**
bis(2-Ethylhexyl) phthalate	0.20		0.25	NA	**3.0**
Di-n-octylphthalate	0.14	0.05	0.24	NA	**1.0**
Benzo(b)Fluoranthene	0.17	0.11	0.45	NA	**1.0**
Benzo(k)Fluoranthene	0.21	0.14	0.33	NA	**1.0**
Benzo(a)Pyrene	0.07	0.09	0.18	NA	**1.0**
Indeno(1,2,3-cd)Pyrene	0.15	0.13	0.28	NA	**1.0**
Dibenz(a,h)Anthracene	0.15	0.12	0.16	NA	**1.0**
Benzo(ghi)Perylene	0.18	0.09	0.24	NA	**1.0**
Tributyl Phosphate (1 µg/L)	0.09	--	0.09	0.04	**1.0**
Dibutylphenyl Phosphate (1 µg/L)	0.06	--	0.09	0.03	**2.0**
Butyldiphenyl phosphate (3 µg/L)	0.54	--	0.33	0.08	**5.0**
Triphenyl phosphate (5 µg/L)	0.38	--	0.58	0.07	**5.0**
Butylated Hydroxy Toluene	NA	--	NA	0.02	**1.0**
N-Nitrosodimethylamine (5 µg/L)	1.03	0.66	3.73	NA	**5.0**
Aniline	0.86	0.29	0.80	NA	**1.0**
Butyrated Hydroxytoluene (BHT) GC-MS-SIM - 8/8/01	--	--	--	.019	**0.25**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.

Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.

Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Soil
EPA Method SW-846-8270 – Microtip Sonication
Effective 8/12/02

Sample Weight/Volume	**7.5 g**	**7.5 g**	**7.5 g**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
ARI Extraction SOP	**347S**	**347S**	**347S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/03/00**	**02/23/00**	**7/15/02**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
Azobenzene	24.82	18.10	23.44	**67**
1-Methylnaphthalene (67 µg/kg)	8.51	8.24	21.81	**67**
Phenol	18.55	22.24	24.84	**130**
Bis-(2-chloroethyl) ether	9.87	16.54	19.58	**130**
2-Chlorophenol	12.63	18.28	25.73	**67**
1,3-Dichlorobenzene	12.74	10.68	22.53	**67**
1,4-Dichlorobenzene	10.57	11.78	23.59	**67**
Benzyl Alcohol	46.98	43.71	--	**330**
1,2-Dichlorobenzene	11.27	11.44	26.25	**67**
2-Methylphenol	21.04	20.58	23.24	**67**
2,2'-oxybis(1-chloropropane)	18.20	15.72	26.12	**67**
4-Methylphenol	14.53	17.62	21.62	**67**
N-Nitroso-di-n-propylamine	17.73	16.43	22.35	**130**
Hexachloroethane	24.54	8.41	22.83	**130**
Nitrobenzene	15.86	20.20	22.49	**67**
Isophorone	13.99	21.15	17.84	**67**
2-Nitrophenol	19.91	33.08	9.80	**330**
2,4-Dimethyphenol	25.48	25.83	17.49	**200**
Bis-(2-chloroethoxy) methane	10.66	15.86	20.57	**67**
Benzoic Acid (3325 µg/kg)	433.34	552.61	264.02	**670**
2,4-Dichlorophenol	14.04	33.38	21.80	**200**
1,2,4-Trichlorobenzene	14.66	13.47	21.30	**67**
Naphthalene	13.80	17.35	8.22	**67**
4-Chloroaniline (333 µg/kg)	44.10	44.16	13.29	**200**
Hexachlorobutadiene	20.60	22.68	31.13	**130**
4-Chloro-3-methylphenol	15.13	31.42	25.83	**130**
2-Methylnaphthalene	13.53	9.43	21.22	**67**
Hexachlorocyclopentadiene (333 µg/kg)	47.71	98.85	57.12	**330**
2,4,6-trichlorophenol	15.62	23.03	27.93	**330**

Sample Weight/Volume	**7.5 g**	**7.5 g**	**7.5 g**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
ARI Extraction SOP	**347S**	**347S**	**347S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/03/00**	**02/23/00**	**7/15/02**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
2,4,5-trichlorophenol	22.27	27.10	17.07	**330**
2-Chloronaphthalene	11.48	11.65	18.50	**67**
2-Nitroaniline (333 µg/kg)	23.64	43.50	37.04	**330**
Dimethylphthalate	11.20	14.31	21.57	**67**
Acenaphthylene	11.79	13.54	20.08	**67**
2,6-Dinitrotoluene	9.48	13.51	15.09	**330**
3-Nitroaniline (333 µg/kg)	20.04	31.21	43.88	**400**
Acenaphthene	12.68	12.67	20.57	**67**
2,4-Dinitrophenol (1666 µg/kg)	192.78	339.11	336.16	**670**
Dibenzofuran	15.33	13.76	23.15	**67**
4-Nitrophenol (200 µg/kg)	57.13	54.88	176.12	**330**
2,4-Dinitrotoluene	16.03	14.10	15.10	**330**
Fluorene	22.86	14.19	20.32	**67**
Diethylphthlalate	29.49	20.61	20.02	**67**
4-Chlorophenyl-phenyl ether	33.59	14.83	19.11	**67**
4-Nitroaniline (333 µg/kg)	19.25	31.84	73.10	**330**
4,6-Dinitro-2-Methylphenol (1666 µg/kg)	231.32	568.85	255.02	**670**
N-Nitrosodiphenylamine	10.16	12.23	27.43	**67**
4-bromophenyl-phenyl ether	21.61	11.98	22.00	**67**
Hexachlorobenzene	13.22	13.83	23.33	**67**
Pentachlorophenol	98.71	146.39	107.24	**330**
Phenanthrene	14.17	15.10	19.97	**67**
Anthracene	13.38	10.69	23.86	**67**
Carbazole	11.72	12.28	19.87	**67**
Di-n-butylphthalate	16.32	10.95	32.56	**67**
Fluoranthene	7.93	11.18	16.77	**67**
Pyrene	26.98	34.57	18.73	**67**
Butylbenzylphthalate	14.05	14.59	14.18	**67**
Benzo(a)Anthracene	10.66	12.31	15.62	**67**
3,3'-Dichlorbenzidine	51.33	76.77	74.85	**330**
Chrysene	14.44	14.16	18.73	**67**
bis(2-Ethylhexyl) phthalate	9.63	61.04	17.30	**67**
Di-n-octylphthalate	7.85	27.59	21.31	**67**

Sample Weight/Volume	**7.5 g**	**7.5 g**	**7.5 g**	
Final Extract Volume	**0.5 mL**	**0.5 mL**	**0.5 mL**	
Spike Level*	**67 µg/kg**	**67 µg/kg**	**67 µg/kg**	
ARI Extraction SOP	**347S**	**347S**	**347S**	**Soil**
ARI Analytical SOP	**800S**	**800S**	**800S**	**Reporting**
Instrument	**Finn 2**	**Finn 4**	**Finn 8**	**Limit**
Date Analyzed	**02/03/00**	**02/23/00**	**7/15/02**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**MDL**	**RL**
Benzo(b)Fluoranthene	13.48	13.91	28.78	**67**
Benzo(k)Fluoranthene	11.11	10.88	28.15	**67**
Benzo(a)Pyrene	10.92	13.19	21.47	**67**
Indeno(1,2,3-cd)Pyrene	19.84	14.54	64.77	**67**
Dibenz(a,h)Anthracene	19.40	19.02	7.58	**67**
Benzo(ghi)Perylene	17.93	13.66	9.07	**67**
N-Nitrosodimethylamine (333 µg/kg)	115.27	98.20	26.41	**330**
Aniline	19.50	20.17	--	**67**

* Selected compounds spiked at higher levels as indicated by concentrations given in parentheses after the compound name.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Sediment
EPA Method SW-846-8270 (PSDDA) – Macrotip Sonication

Sample Weight/Volume	100 g	100 g	100 g	100 g	
Final Extract Volume	1.0 mL	1.0 mL	1.0 mL	1.0 mL	
Spike Level*	40 µg/kg	40 µg/kg	40 µg/kg	40 µg/kg	
ARI Extraction SOP	321S	321S	321S	321S	Sediment
ARI Analytical SOP	800S	800S	800S	800S	Reporting
Instrument	NT6	Finn 4	Finn 8	NT1	Limit
Date Analyzed	3/31/03	3/31/03	3/21/03	3/29/03	µg/kg
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	ppb
Analyte	MDL	MDL	MDL	MDL	RL
Diphenyl Oxide	--	--	--	--	20
Biphenyl	--	--	--	--	20
Azobenzene	0.28	0.57	3.74	4.90	20
1-Methylnaphthalene	0.25	0.59	5.97	4.83	20
Phenol	0.40	0.38	8.34	10.79	20
Bis-(2-chloroethyl) ether	0.31	0.33	5.51	8.22	40
2-Chlorophenol	0.29	0.43	5.48	8.74	20
1,3-Dichlorobenzene	0.33	0.35	6.92	6.77	20
1,4-Dichlorobenzene	0.34	0.41	6.98	7.41	20
Benzyl Alcohol (67ppb)	0.09	0.48	N/A	23.25	20
1,2-Dichlorobenzene	0.36	0.38	7.18	6.88	20
2-Methylphenol	0.42	0.44	12.49	10.26	20
2,2'-oxybis(1-chloropropane)	0.30	0.45	5.44	7.46	20
4-Methylphenol	0.46	0.50	10.82	8.44	20
N-Nitroso-di-n-propylamine	0.35	0.31	5.09	4.95	20
Hexachloroethane	0.37	0.32	6.73	8.75	20
Nitrobenzene	0.41	0.64	6.60	9.48	20
Isophorone	0.26	0.42	5.85	4.84	20
2-Nitrophenol	0.27	0.54	5.56	5.47	100
2,4-Dimethyphenol	0.34	0.62	7.06	7.63	20
Bis-(2-chloroethoxy) methane	0.30	0.41	5.86	7.49	20
Benzoic Acid (333 µg/kg)	2.94	1.95	70.46	79.09	200
2,4-Dichlorophenol	0.20	0.30	5.51	7.03	60
1,2,4-Trichlorobenzene	0.36	0.42	7.05	8.00	20
Naphthalene	0.25	0.36	6.19	3.76	20
4-Chloroaniline (333 µg/kg)	0.51	2.48	--	4.69	60
Hexachlorobutadiene	0.32	0.34	7.47	10.71	20
4-Chloro-3-methylphenol	0.31	0.55	4.94	7.44	40
2-Methylnaphthalene	0.31	0.51	7.48	6.31	20
Hexachlorocyclopentadiene (100 µg/kg)	0.94	0.55	15.81	30.93	100

Sample Weight/Volume	100 g	100 g	100 g	100 g	
Final Extract Volume	1.0 mL	1.0 mL	1.0 mL	1.0 mL	
Spike Level*	40 µg/kg	40 µg/kg	40 µg/kg	40 µg/kg	
ARI Extraction SOP	321S	321S	321S	321S	Sediment
ARI Analytical SOP	800S	800S	800S	800S	Reporting
Instrument	NT6	Finn 4	Finn 8	NT1	Limit
Date Analyzed	3/31/03	3/31/03	3/21/03	3/29/03	µg/kg
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	ppb
Analyte	MDL	MDL	MDL	MDL	RL
2,4,6-Trichlorophenol	0.51	0.23	4.68	6.52	100
2,4,5-Trichlorophenol	0.50	0.23	3.23	5.93	100
2-Chloronaphthalene	0.21	0.26	4.52	4.07	20
2-Nitroaniline (333 µg/kg)	0.75	0.90	22.72	18.66	100
Dimethylphthalate	0.19	0.25	4.36	5.75	20
Acenaphthylene	0.23	0.29	4.87	4.94	20
2,6-Dinitrotoluene	0.17	0.40	2.20	4.45	100
3-Nitroaniline (333 µg/kg)	1.86	0.91	33.48	27.55	120
Acenaphthene	0.23	0.48	4.64	4.55	20
2,4-Dinitrophenol (333 µg/kg)	5.84	4.48	51.63	64.26	200
Dibenzofuran	0.29	0.52	6.01	5.26	20
4-Nitrophenol (167 µg/kg)	2.32	1.45	30.26	36.49	100
2,4-Dinitrotoluene	0.21	0.25	2.95	7.77	100
Fluorene	0.25	0.44	4.22	5.33	20
Diethylphthalate	0.22	0.42	4.80	6.17	20
4-Chlorophenyl-phenyl ether	0.24	0.46	4.70	6.66	20
4-Nitroaniline (333 µg/kg)	1.74	0.91	42.20	32.27	100
4,6-Dinitro-2-methylphenol (333 µg/kg)	3.21	1.53	39.18	48.69	200
N-Nitrosodiphenylamine	0.94	0.30	24.40	14.78	20
4-Bromophenyl-phenyl ether	0.22	0.21	4.95	8.30	20
Hexachlorobenzene	0.28	0.28	5.80	9.23	20
Pentachlorophenol (167 µg/kg)	1.90	0.68	40.04	37.10	100
Phenanthrene	0.21	0.21	4.31	5.68	20
Anthracene	0.26	0.24	6.14	3.76	20
Carbazole	0.85	0.25	18.26	13.42	20
Di-n-butylphthalate	0.52	0.16	11.59	10.68	20
Fluoranthene	0.21	0.10	4.36	4.40	20
Pyrene	0.19	0.20	5.06	5.27	20
Butylbenzylphthalate	0.24	0.18	7.73	8.22	20
Benzo(a)Anthracene	0.22	0.11	5.34	3.73	20
3,3'-Dichlorobenzidine	2.29	5.01	N/A	30.22	100
Chrysene	0.17	0.17	4.53	5.47	20

Sample Weight/Volume	100 g	100 g	100 g	100 g	
Final Extract Volume	1.0 mL	1.0 mL	1.0 mL	1.0 mL	
Spike Level*	40 µg/kg	40 µg/kg	40 µg/kg	40 µg/kg	
ARI Extraction SOP	321S	321S	321S	321S	Sediment
ARI Analytical SOP	800S	800S	800S	800S	Reporting
Instrument	NT6	Finn 4	Finn 8	NT1	Limit
Date Analyzed	3/31/03	3/31/03	3/21/03	3/29/03	µg/kg
Reporting Units	µg/kg	µg/kg	µg/kg	µg/kg	ppb
Analyte	MDL	MDL	MDL	MDL	RL
bis(2-Ethylhexyl) phthalate	0.97	0.56	23.44	19.49	20
Di-n-octylphthalate	0.28	0.38	6.44	5.49	20
Benzo(b)Fluoranthene	0.26	0.28	8.20	6.96	20
Benzo(k)Fluoranthene	0.26	0.17	7.96	7.24	20
Benzo(a)Pyrene	0.28	0.16	5.56	4.11	20
Indeno(1,2,3-cd)Pyrene	0.26	0.19	6.57	7.59	20
Dibenzo(a,h)Anthracene	0.29	0.19	6.71	5.70	20
Benzo(ghi)Perylene	0.27	0.15	6.05	4.97	20
Tributyl Phosphate (67 µg/kg)	0.13	0.08	5.00	3.83	20
N-Nitrosodimethylamine (333 µg/kg)	0.32	0.91	--	8.52	100
Aniline	0.22	1.05	--	0.62	20

* Selected compounds spiked at higher levels as indicated by concentrations given in parentheses after the compound name.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Tissue
EPA Method SW-846-8270 – Tissuemizer Extraction
GPC Clean-up & Normal Phase Fractionation
Effective 4/23/03

Sample Weight/Volume	**20 g**	**20 g**	
Final Extract Volume	**1.0 mL**	**1.0 mL**	
Spike Level*	**50 µg/kg**	**50 µg/kg**	**Tissue**
ARI Extraction SOP	**347S**	**347S**	**Reporting**
ARI Analytical SOP	**800S**	**800S**	**Limit**
Instrument	**Finn 8**	**Finn 4**	**GC-MS**
Date Analyzed	**3/17/03**	**4/14/03**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**RL**
Azobenzene	15.12	11.68	**50**
1-Methylnaphthalene	NA	14.70	**50**
Phenol	19.20	16.36	**100**
Bis-(2-chloroethyl) ether	10.19	11.42	**100**
2-Chlorophenol	16.06	16.94	**50**
1,3-Dichlorobenzene	10.65	9.24	**50**
1,4-Dichlorobenzene	10.42	13.00	**50**
Benzyl Alcohol (100 µg/kg)	16.45	11.36	**100**
1,2-Dichlorobenzene	15.15	11.34	**50**
2-Methylphenol	13.27	21.26	**50**
2,2'-oxybis(1-chloropropane)	10.73	11.90	**50**
4-Methylphenol	19.85	13.88	**50**
N-Nitroso-di-n-propylamine	18.53	14.06	**100**
Hexachloroethane	8.26	13.16	**100**
Nitrobenzene	12.40	6.32	**50**
Isophorone	NR	NR	**NR**
2-Nitrophenol	NR	NR	**NR**
2,4-Dimethyphenol	14.83	12.30	**150**
Bis-(2-chloroethoxy) methane	16.42	9.98	**50**
Benzoic Acid (250 µg/kg)	NR	NR	**NR**
2,4-Dichlorophenol	17.47	16.36	**150**
1,2,4-Trichlorobenzene	12.59	15.50	**50**
Naphthalene	12.98	13.30	**50**
4-Chloroaniline (125 µg/kg)	68.10	54.36	**150**
Hexachlorobutadiene	13.96	15.72	**100**
4-Chloro-3-methylphenol	15.44	14.04	**100**
2-Methylnaphthalene	12.77	10.20	**50**
Hexachlorocyclopentadiene (150 µg/kg)	47.65	28.14	**250**

Sample Weight/Volume	**20 g**	**20 g**	
Final Extract Volume	**1.0 mL**	**1.0 mL**	
Spike Level*	**50 µg/kg**	**50 µg/kg**	**Tissue**
ARI Extraction SOP	**347S**	**347S**	**Reporting**
ARI Analytical SOP	**800S**	**800S**	**Limit**
Instrument	**Finn 8**	**Finn 4**	**GC-MS**
Date Analyzed	**3/17/03**	**4/14/03**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**RL**
2,4,6-trichlorophenol	20.81	11.10	**250**
2,4,5-trichlorophenol	20.09	15.40	**250**
2-Chloronaphthalene	16.90	17.30	**50**
2-Nitroaniline (125 µg/kg)	37.92	40.92	**250**
Dimethylphthalate	20.06	16.92	**50**
Acenaphthylene	15.90	13.08	**50**
2,6-Dinitrotoluene	14.26	25.08	**250**
3-Nitroaniline (125 µg/kg)	70.18	56.80	**250**
Acenaphthene	16.76	16.70	**50**
2,4-Dinitrophenol (500 µg/kg)	302.95	290.68	**500**
Dibenzofuran	14.34	8.98	**50**
4-Nitrophenol (250 µg/kg)	152.1	127.08	**250**
2,4-Dinitrotoluene	13.41	11.80	**250**
Fluorene	15.06	13.04	**50**
Diethylphthlalate	23.45	17.72	**50**
4-Chlorophenyl-phenyl ether	15.79	15.86	**50**
4-Nitroaniline (125 µg/kg)	67.99	78.24	**250**
4,6-Dinitro-2-Methylphenol (500 µg/kg)	259.19	227.04	**500**
N-Nitrosodiphenylamine	16.37	9.02	**50**
4-bromophenyl-phenyl ether	20.59	13.30	**50**
Hexachlorobenzene	22.20	12.22	**50**
Pentachlorophenol (500 µg/kg)	163.11	151.46	**250**
Phenanthrene	18.43	13.34	**50**
Anthracene	18.09	13.60	**50**
Carbazole	39.67	33.9	**50**
Di-n-butylphthalate	28.45	54.96	**50**
Fluoranthene	18.70	18.58	**50**
Pyrene	18.82	14.82	**50**
Butylbenzylphthalate	33.44	29.72	**50**
Benzo(a)Anthracene	16.37	15.48	**50**
3,3'-Dichlorbenzidine	185.94	232.44	**250**
Chrysene	19.67	16.28	**50**
bis(2-Ethylhexyl) phthalate	58.13	93.26	**50**

Sample Weight/Volume	**20 g**	**20 g**	
Final Extract Volume	**1.0 mL**	**1.0 mL**	
Spike Level*	**50 µg/kg**	**50 µg/kg**	**Tissue**
ARI Extraction SOP	**347S**	**347S**	**Reporting**
ARI Analytical SOP	**800S**	**800S**	**Limit**
Instrument	**Finn 8**	**Finn 4**	**GC-MS**
Date Analyzed	**3/17/03**	**4/14/03**	**mg/kg**
Reporting Units	**µg/kg**	**µg/kg**	**ppb**
Analyte	**MDL**	**MDL**	**RL**
Di-n-octylphthalate	14.60	44.34	**50**
Benzo(b)Fluoranthene	10.81	16.34	**50**
Benzo(k)Fluoranthene	26.29	20.84	**50**
Benzo(a)Pyrene	15.20	15.04	**50**
Indeno(1,2,3-cd)pyrene	14.79	12.20	**50**
Dibenz(a,h)Anthracene	18.99	16.74	**50**
Benzo(ghi)Perylene	16.74	15.42	**50**
N-Nitrosodimethylamine (125 µg/kg)	29.82	34.88	**250**
Aniline (125 µg/kg)	NA	NR	**NR**

*Selected compounds spiked at higher levels as indicated by concentrations given in parentheses after the compound name.
NR = Not Recovered
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – SVOA Analysis of Tissue
EPA Method SW-846-8270-SIM – Tissuemizer Extraction
GPC Clean-up & Normal Phase Fractionation
Effective 4/23/03

Sample Weight/Volume	**20 g**	
Final Extract Volume	**1.0 mL**	
Spike Level*	**10 µg/kg**	**Tissue**
ARI Extraction SOP	**347S**	**Reporting**
ARI Analytical SOP	**800S**	**Limit**
Instrument	**NT-6**	**GC-MS-SIM**
Date Analyzed	**4/7/03**	**mg/kg**
Reporting Units	**µg/kg**	**ppb**
Analyte	**MDL**	**RL**
Azobenzene	0.86	**5.0**
Bis-(2-chloroethyl) ether	3.60	**5.0**
2-Chlorophenol	1.62	**5.0**
1,3-Dichlorobenzene	1.26	**5.0**
1,4-Dichlorobenzene	1.33	**5.0**
1,2-Dichlorobenzene	1.56	**5.0**
4-Methylphenol	3.58	**5.0**
N-Nitroso-di-n-propylamine	2.73	**5.0**
Hexachloroethane	2.43	**5.0**
Nitrobenzene	2.04	**5.0**
2,4-Dichlorophenol	2.05	**5.0**
1,2,4-Trichlorobenzene	1.46	**5.0**
Naphthalene	1.66	**5.0**
Hexachlorobutadiene	2.26	**5.0**
2-Methylnaphthalene	2.01	**5.0**
2,4,6-trichlorophenol	2.57	**5.0**
2-Chloronaphthalene	1.45	**5.0**
Acenaphthylene	1.79	**5.0**
2,6-Dinitrotoluene	2.86	**5.0**
Acenaphthene	1.45	**5.0**
Dibenzofuran	1.45	**5.0**
2,4-Dinitrotoluene	1.83	**5.0**
Fluorene	1.66	**5.0**
4-bromophenyl-phenyl ether	2.33	**5.0**
Hexachlorobenzene	2.29	**5.0**
Pentachlorophenol (50ppb spike)	18.35	**25.0**
Phenanthrene	1.58	**5.0**
Anthracene	1.27	**5.0**

Sample Weight/Volume	**20 g**	
Final Extract Volume	**1.0 mL**	
Spike Level*	**10 µg/kg**	**Tissue**
ARI Extraction SOP	**347S**	**Reporting**
ARI Analytical SOP	**800S**	**Limit**
Instrument	**NT-6**	**GC-MS-SIM**
Date Analyzed	**4/7/03**	**mg/kg**
Reporting Units	**µg/kg**	**ppb**
Analyte	**MDL**	**RL**
Carbazole	3.73	**5.0**
Fluoranthene	1.72	**5.0**
Pyrene	1.35	**5.0**
Benzo(a)Anthracene	1.94	**5.0**
Chrysene	2.06	**5.0**
bis(2-Ethylhexyl) phthalate	13.60	**15.0**
Benzo(b)Fluoranthene	0.95	**5.0**
Benzo(k)Fluoranthene	1.80	**5.0**
Benzo(a)Pyrene	1.32	**5.0**
Indeno(1,2,3-cd)pyrene	1.97	**5.0**
Dibenz(a,h)Anthracene	1.91	**5.0**
Benzo(ghi)Perylene	1.42	**5.0**

* Selected compounds spiked at higher levels as indicated by concentrations given in parentheses after the compound name.
Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS - SIM Analysis of PNA in Water
EPA Method SW-846-8270 - Liquid/Liquid Extraction

Method Reference	8270	8270	8270	8270	8270	
Sample Matrix	Water	Water	Water	Water	Water	
Sample Weight/Volume	500 mL	500 mL	500 mL	500 mL	500 mL	
Extract Final Volume	0.5 mL	0.5 mL	0.5 mL	0.5 mL	0.5 mL	
Spike Level	0.1 µg/L	0.1 µg/L	0.1 µg/L	0.1 µg/L	0.1 µg/L	
Extraction Method	Liq-Liq	Liq-Liq	Liq-Liq	Liq-Liq	Liq-Liq	Water
ARI Extraction SOP	344S	344S	344S	344S	344S	Reporting
ARI Analytical SOP	801S	801S	801S	801S	801S	Limit
Instrument	NT-1	Finn 4	Finn8	NT-2	HP-4	µg/L
Date Analyzed	7/13/02	7/29/02	3/9/01	3/13/01	8/2/02	ppb
Reporting Units	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	RL
Analyte						
Naphthalene	18.25	14.52	13.05	9.82	19.56	**0.1**
2-Methylnaphthalene	32.31	14.21	8.45	13.38	19.78	**0.1**
Acenaphthylene	31.14	12.77	9.45	7.02	22.37	**0.1**
Acenaphthene	29.58	12.73	9.25	10.76	13.48	**0.1**
Dibenzofuran	30.08	17.21	7.91	4.77	9.29	**0.1**
Fluorene	36.32	14.90	8.34	13.84	22.19	**0.1**
Phenanthrene	33.45	17.20	6.75	9.88	15.46	**0.1**
Anthracene	26.80	18.34	6.83	7.86	31.75	**0.1**
Fluoranthene	23.33	18.73	12.93	14.75	18.65	**0.1**
Pyrene	32.13	13.95	8.41	14.76	44.86	**0.1**
Benzo(a)Anthracene	52.54	18.93	10.45	15.65	39.42	**0.1**
Chrysene	26.40	17.40	7.73	12.36	18.03	**0.1**
Benzo(b)Fluoranthene	38.47	7.84	11.65	14.77	22.74	**0.1**
Benzo(k)Fluoranthene	36.08	8.14	20.37	11.37	37.28	**0.1**
Benzo(a)Pyrene	36.46	18.11	14.02	13.87	34.00	**0.1**
Indeno(1,2,3-cd)Pyrene	33.58	17.09	8.10	14.79	18.15	**0.1**
Dibenz(a,h)Anthracene	51.05	22.05	7.37	9.95	17.07	**0.1**
Benzo(ghi)Perylene	23.05	20.55	6.27	10.49	20.10	**0.1**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Mehtod Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS - SIM Analysis of PNA in Water
EPA Method SW-846-8270 – Separatory Funnel Extraction
Effective 8/1/02

Method Reference	8270	8270	8270	8270	8270	
Sample Matrix	Water	Water	Water	Water	Water	
Sample Weight/Volume	500 mL	500 mL	500 mL	500 mL	500 mL	
Extract Final Volume	0.5 mL	0.5 mL	0.5 mL	0.5 mL	0.5 mL	
Spike Level	0.1 µg/L	0.1 µg/L	0.1 µg/L	0.1 µg/L	0.1 µg/L	
Extraction Method	Sep.Funnel	Sep.Funnel	Sep.Funnel	Sep.Funnel	Sep.Funnel	Water
ARI Extraction SOP	363S	363S	363S	363S	363S	Reporting
ARI Analytical SOP	801S	801S	801S	801S	801S	Limit
Instrument	NT-1	Finn 4	Finn8	NT-2	HP-4	µg/L
Date Analyzed	6/28/02	7/29/02	3/9/01	7/19/02	8/1/02	ppb
Reporting Units	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	ng/L (ppt)	RL
Analyte						
Naphthalene	19.00	23.18	11.79	21.07	20.80	**0.1**
2-Methylnaphthalene	32.32	27.01	9.83	30.37	17.67	**0.1**
Acenaphthylene	39.75	26.88	5.96	18.54	20.76	**0.1**
Acenaphthene	24.77	23.58	11.03	20.31	14.07	**0.1**
Dibenzofuran	19.89	21.33	7.58	22.43	15.48	**0.1**
Fluorene	28.32	27.61	5.95	22.15	12.99	**0.1**
Phenanthrene	24.09	16.45	6.22	17.26	16.94	**0.1**
Anthracene	22.54	24.11	8.19	17.20	17.72	**0.1**
Fluoranthene	36.05	13.36	6.72	21.75	16.83	**0.1**
Pyrene	20.05	25.15	5.78	14.73	14.08	**0.1**
Benzo(a)Anthracene	28.17	25.83	6.65	22.35	24.10	**0.1**
Chrysene	17.70	18.67	3.93	14.44	35.63	**0.1**
Benzo(b)Fluoranthene	33.69	28.74	12.66	34.97	19.06	**0.1**
Benzo(k)Fluoranthene	45.59	29.96	14.67	16.61	23.94	**0.1**
Benzo(a)Pyrene	34.65	27.00	9.22	25.16	19.65	**0.1**
Indeno(1,2,3-cd)Pyrene	30.86	28.84	3.45	39.24	19.13	**0.1**
Dibenz(a,h)Anthracene	39.63	22.20	6.29	36.43	24.66	**0.1**
Benzo(ghi)Perylene	18.40	20.52	8.22	24.19	17.66	**0.1**

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MDL and RL Summary GC-MS - SIM Analysis of PNA in Water
EPA Method SW-846-8270 – Separatory Funnel Extraction
ProSep Large Volume Injection

Method Reference	**8270**	
Sample Matrix	**Water**	
Sample Weight/Volume	**1.0 L**	
Extract Final Volume	**0.3 mL**	
Spike Level	**2.5 ng/L**	
Extraction Method	**Sep.Funnel**	
ARI Extraction SOP	**305S**	**Water**
ARI Analytical SOP	**801S**	**Reporting**
Instrument	**NT-2**	**Limit**
Date Analyzed	**9/6/99**	**ng/L**
Reporting Units	**ng/L (ppt)**	**Part-per-trillion**
Analyte	**MDL**	**RL**
Naphthalene	21.73	1.5
2-Methylnaphthalene	5.00	1.5
Acenaphthylene	12.00	1.5
Acenaphthene	0.91	1.5
Dibenzofuran	1.28	1.5
Fluorene	2.17	1.5
Phenanthrene	4.71	1.5
Anthracene	0.62	1.5
Fluoranthene	0.57	1.5
Pyrene	0.43	1.5
Benzo(a)Anthracene	0.26	1.5
Chrysene	0.29	1.5
Benzo(b)Fluoranthene	0.47	1.5
Benzo(k)Fluoranthene	0.38	1.5
Benzo(a)Pyrene	0.46	1.5
Indeno(1,2,3-cd)Pyrene	0.41	1.5
Dibenz(a,h)Anthracene	0.43	1.5
Benzo(ghi)Perylene	0.48	1.5
Pentachlorophenol	8.950	7.5

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MDL and RL Summary GC-MS - SIM Analysis of PNA in Soil
EPA Method SW-846-8270 – Microtip Sonication Extraction

Method Reference	8270	8270	8270	8270	8270	
Sample Matrix	Soil	Soil	Soil	Soil	Soil	
Sample Weight/Volume	7.5g	7.5g	7.5g	7.5g	7.5g	
Extract Final Volume	0.5 mL	0.5 mL	0.5 mL	0.5 mL	0.5 mL	
Spike Level	0.1 µg/g	0.1 µg/g	0.1 µg/g	0.1 µg/g	0.1 µg/g	
Extraction Method	Sonication	Sonication	Sonication	Sonication	Sonication	Soil
ARI Extraction SOP	371S	371S	371S	371S	371S	Reporting
ARI Analytical SOP	801S	801S	801S	801S	801S	Limit
Instrument	NT-1	Finn 4	Finn8	NT-2	HP-4	µg/Kg
Date Analyzed	3/13/01	3/13/01	3/13/01	6/15/02	4/3/01	ppb
Reporting Units	µg/Kg (ppb)	µg/Kg (ppb)	µg/Kg (ppb)	µg/Kg (ppb)	µg/Kg (ppb)	RL
Analyte						
Naphthalene	1.01	1.19	1.02	1.65	1.20	**6.7**
1-Methylnapthalene	--	--	--	1.15	--	**6.7**
2-Methylnaphthalene	1.11	0.67	0.53	1.31	0.81	**6.7**
Acenaphthylene	1.25	0.65	0.73	0.84	0.97	**6.7**
Acenaphthene	1.03	1.05	0.73	1.40	1.85	**6.7**
Dibenzofuran	1.58	0.51	0.47	1.52	1.07	**6.7**
Fluorene	1.10	0.68	0.42	1.84	1.21	**6.7**
Phenanthrene	1.43	0.49	0.75	0.95	1.42	**6.7**
Anthracene	1.23	0.29	0.43	0.83	1.07	**6.7**
Fluoranthene	1.55	1.14	1.14	1.12	2.20	**6.7**
Pyrene	1.44	0.92	0.56	2.57	1.24	**6.7**
Benzo(a)Anthracene	1.35	0.44	1.07	0.96	1.78	**6.7**
Chrysene	1.97	0.73	0.78	2.40	1.88	**6.7**
Benzo(b)Fluoranthene	1.57	1.53	1.00	1.23	1.85	**6.7**
Benzo(k)Fluoranthene	2.43	0.49	1.98	2.21	1.51	**6.7**
Benzo(a)Pyrene	1.35	0.55	0.46	0.84	1.76	**6.7**
Indeno(1,2,3-cd)Pyrene	1.34	0.84	0.82	1.82	1.59	**6.7**
Dibenz(a,h)anthracene	1.48	0.53	0.60	2.45	1.91	**6.7**
Benzo(ghi)Perylene	1.38	0.69	0.54	1.45	1.44	**6.7**

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Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS - Analysis of Butyl Tin Species
EPA Method SW-846-8270

Method Reference	8270		8270	
Sample Matrix	Pore Water		Sediment	
Sample Weight/Volume	400 mL		25.0 g	
Extract Final Volume	1.0 mL		0.5 mL	
Extraction Method	Sep Funnel		Sonication	
ARI Extraction SOP	321S	**Pore Water**	321S	**Sediment**
ARI Analytical SOP	800S	**Reporting**	800S	**Reporting**
Instrument	Finn2	**Limit**	NT1	**Limit**
Date Analyzed	7/24/99	**ng/L**	12/9/02	**mg/Kg**
Reporting Units	ng/L (ppt)	**ppt**	µg/Kg (ppb)	**ppb**
Analyte	**MDL(4)**	**RL(4)**	**MDL(4)**	**RL(4)**
Tetrabutyl Tin(1)	--	**--**	3.36	**6.0**
Tributyl Tin(2)	54.4	**75**	2.84	**6.0**
Dibutyl Tin(1)	107.4	**150**	1.76	**6.0**
Butyl Tin(3)	28.1	**75**	4.51	**6.0**

(1)Tetrabutyl & Dibutyl Tin spiked at 250 ng/L and 12 µg/Kg.
(2)Tributyl Tin spiked at 8 µg/Kg
(3)Butyl Tin spiked at 250 ng/L and 40 µg/Kg.
(4)Reported as Chloride

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
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Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

MDL and RL Summary GC-MS – VOA Analysis of Water
5 mL Purge Volume (EPA Methods 8260B & ARI SOP 704S-R4)
Effective 8/12/02

Method Reference	8260B	8260B	SOP 700	SOP 700	SOP 700	
Sample Weight/Volume	5.0 mL	5.0 mL	5.0 mL	5.0 mL	5.0 mL	
Spike Level*	1.5 µg/L	3.0 µg/L	1.5 µg/L	3.0 µg/L	5.0 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	S708-R2	700S-R4	700S-R4	700S-R4	Limit
Instrument	Finn 3	Finn 5	Finn 3	Finn 5	NT-3	mg/L
Date Analyzed	5/8/02	4/19/02	5/8/02	4/26/02	4/26/02	5 mL
Reporting Units	µg/L	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	MDL	MDL	MDL	MDL	MDL	RL
Dichlorodifluoromethane	0.155	0.277	0.138	0.248	0.310	**1.0**
Chloromethane	0.131	0.412	0.153	0.134	0.630	**1.0**
Vinyl Chloride	0.225	0.414	0.267	0.395	0.930	**1.0**
Bromomethane	0.193	0.305	0.212	0.276	0.860	**1.0**
Chloroethane	0.110	0.402	0.133	0.381	0.620	**1.0**
Trichlorofluoromethane	0.113	0.291	0.126	0.281	0.640	**1.0**
Acrolein*	0.688	3.218	1.019	3.146	2.000	**50.0**
Acetone*	1.306	2.980	1.957	3.866	2.290	**5.0**
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.075	0.453	0.090	0.432	0.390	**2.0**
1,1-Dichloroethene	0.165	0.377	0.214	0.354	0.750	**1.0**
Bromoethane	0.164	0.420	0.233	0.383	0.420	**2.0**
Iodomethane	0.099	0.441	0.120	0.388	0.570	**1.0**
Methylene Chloride	0.156	0.282	0.217	0.396	0.690	**2.0**
Carbon Disulfide	0.124	0.408	0.162	0.367	0.400	**1.0**
Acrylonitrile	0.252	0.665	0.368	0.593	0.500	**1.0**
Methyl-t-butyl ether (MTBE)	0.114	0.190	0.161	0.179	0.200	**1.0**
trans-1,2-Dichloroethene	0.131	0.418	0.163	0.393	0.720	**1.0**
Vinyl Acetate	0.152	0.208	0.208	0.196	0.340	**5.0**
1,1-Dichloroethane	0.116	0.189	0.143	0.177	0.700	**1.0**
2-Butanone*	1.196	1.226	1.802	1.152	2.360	**5.0**
2,2-Dichloropropane	0.111	0.276	0.129	0.264	0.640	**1.0**
cis-1,2-Dichloroethene	0.111	0.334	0.143	0.322	0.780	**1.0**
Chloroform	0.110	0.182	0.138	0.166	0.690	**1.0**
Bromochloromethane	0.114	0.430	0.135	0.415	0.750	**1.0**
1,1,1-Trichloroethane	0.154	0.209	0.176	0.196	0.740	**1.0**
1,1-Dichloropropene	0.152	0.236	0.177	0.223	0.650	**1.0**
Carbon Tetrachloride	0.220	0.224	0.225	0.211	0.190	**1.0**
1,2-Dichloroethane	0.325	0.159	0.361	0.161	0.770	**1.0**
Benzene	0.252	0.229	0.295	0.227	0.710	**1.0**

Method Reference	8260B	8260B	SOP 700	SOP 700	SOP 700	
Sample Weight/Volume	5.0 mL	5.0 mL	5.0 mL	5.0 mL	5.0 mL	
Spike Level*	1.5 µg/L	3.0 µg/L	1.5 µg/L	3.0 µg/L	5.0 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	S708-R2	700S-R4	700S-R4	700S-R4	Limit
Instrument	Finn 3	Finn 5	Finn 3	Finn 5	NT-3	mg/L
Date Analyzed	5/8/02	4/19/02	5/8/02	4/26/02	4/26/02	5 mL
Reporting Units	µg/L	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	MDL	MDL	MDL	MDL	MDL	RL
Trichloroethene	0.078	0.381	0.096	0.367	0.770	**1.0**
1,2-Dichloropropane	0.088	0.226	0.101	0.222	0.750	**1.0**
Bromodichloromethane	0.131	0.236	0.151	0.227	0.620	**1.0**
Dibromomethane	0.151	0.286	0.195	0.289	0.670	**1.0**
2-Chloroethyl Vinyl Ether	0.168	0.460	0.234	0.455	0.520	**5.0**
4-Methyl-2-Pentanone*	0.822	2.276	1.046	2.128	1.780	**5.0**
cis-1,3-Dichloropropene	0.110	0.208	0.133	0.205	0.660	**1.0**
Toluene	0.223	0.300	0.253	0.294	0.620	**1.0**
trans-1,3-Dichloropropene	0.136	0.215	0.160	0.207	0.620	**1.0**
1,1,2-Trichloroethane	0.184	0.290	0.215	0.281	0.640	**1.0**
1,2-Dibromoethane	0.181	0.256	0.220	0.238	0.620	**1.0**
2-Hexanone*	5.123	2.780	6.025	2.510	1.700	**5.0**
1,3-Dichloropropane	0.125	0.180	0.152	0.177	0.640	**1.0**
Tetrachloroethene	0.120	0.359	0.129	0.353	0.780	**1.0**
Chlorodibromomethane	0.185	0.162	0.211	0.149	0.590	**1.0**
Chlorobenzene	0.062	0.269	0.076	0.255	0.620	**1.0**
1,1,1,2-Tetrachloroethane	0.090	0.417	0.096	0.404	0.830	**1.0**
Ethyl Benzene	0.096	0.223	0.108	0.208	0.680	**1.0**
m,p-Xylene	0.206	0.545	0.223	0.513	1.220	**1.0**
o-Xylene	0.092	0.200	0.108	0.186	0.220	**1.0**
Styrene	0.162	0.371	0.172	0.344	0.180	**1.0**
Bromoform	0.101	0.304	0.130	0.275	0.700	**1.0**
Isopropyl Benzene	0.097	0.351	0.105	0.336	0.930	**1.0**
1,1,2,2-Tetrachloroethane	0.153	0.295	0.187	0.264	0.760	**1.0**
1,2,3-Trichloropropane	0.185	0.826	0.226	0.764	1.050	**3.0**
trans-1,4-Dichloro-2-Butene	0.122	0.533	0.160	0.487	0.500	**5.0**
n-Propyl Benzene	0.159	0.451	0.164	0.417	0.950	**1.0**
Bromobenzene	0.106	0.216	0.127	0.200	0.290	**1.0**
1,3,5-Trimethylbenzene	0.145	0.376	0.151	0.361	0.920	**1.0**
2-Chlorotoluene	0.197	0.338	0.227	0.331	0.980	**1.0**
4-Chlorotoluene	0.229	0.536	0.241	0.526	1.030	**1.0**
t-Butylbenzene	0.090	0.400	0.101	0.382	0.990	**1.0**
1,2,4-Trimethylbenzene	0.086	0.344	0.096	0.338	0.910	**1.0**

Method Reference	8260B	8260B	SOP 700	SOP 700	SOP 700	
Sample Weight/Volume	5.0 mL	5.0 mL	5.0 mL	5.0 mL	5.0 mL	
Spike Level*	1.5 µg/L	3.0 µg/L	1.5 µg/L	3.0 µg/L	5.0 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	S708-R2	700S-R4	700S-R4	700S-R4	Limit
Instrument	Finn 3	Finn 5	Finn 3	Finn 5	NT-3	mg/L
Date Analyzed	5/8/02	4/19/02	5/8/02	4/26/02	4/26/02	5 mL
Reporting Units	µg/L	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	MDL	MDL	MDL	MDL	MDL	RL
s-Butylbenzene	0.106	0.357	0.106	0.341	0.280	**1.0**
4-Isopropyl Toluene	0.115	0.551	0.111	0.517	0.270	**1.0**
1,3-Dichlorobenzene	0.090	0.341	0.112	0.327	0.940	**1.0**
1,4-Dichlorobenzene	0.165	0.447	0.197	0.423	0.950	**1.0**
n-Butylbenzene	0.101	0.549	0.123	0.522	0.770	**1.0**
1,2-Dichlorobenzene	0.142	0.317	0.163	0.306	1.100	**1.0**
1,2-Dibromo-3-Chloropropane	0.568	0.813	0.821	0.768	0.720	**5.0**
1,2,4-Trichlorobenzene	0.167	0.663	0.187	0.673	0.710	**5.0**
Hexachloro-1,3-Butadiene	0.182	0.581	0.200	0.600	0.820	**5.0**
Naphthalene	0.108	1.985	0.140	2.007	0.200	**5.0**
1,2,3-Trichlorobenzene	0.139	0.756	0.172	0.784	0.220	**5.0**
1,4-Dioxane	--	--	--	--	53.21	**200**

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MDL and RL Summary GC-MS – VOA Analysis of Water
20 mL Purge Volume (Methods 8260B & ARI SOP 704S)
Effective 8/12/02

Method Reference	8260B	8260B	SOP 700	SOP 700	
Sample Weight/Volume	20.0 mL	20.0 mL	20.0 mL	20.0 mL	
Spike Level*	0.7 µg/L	0.7 µg/L	0.7 µg/L	0.7 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	700S-R4	S708-R2	S708-R2	Limit
Instrument	Finn 1	Finn 3	Finn 1	Finn 3	mg/L
Date Analyzed	4/23/02	7/22/02	4/23/02	4/23/02	20mL Purge
Reporting Units	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
Dichlorodifluoromethane	0.138	0.063	0.199	0.074	**0.2**
Chloromethane	0.127	0.083	0.137	0.088	**0.2**
Vinyl Chloride	0.158	0.065	0.147	0.057	**0.2**
Bromomethane	0.068	0.065	0.076	0.065	**0.2**
Chloroethane	0.184	0.085	0.133	0.084	**0.2**
Trichlorofluoromethane	0.085	0.051	0.085	0.042	**0.2**
Acrolein*	0.357	0.670	3.769	0.697	**5.0**
Acetone*	0.509	1.586	0.595	1.450	**1.0**
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.085	0.035	0.094	0.028	**0.2**
1,1-Dichloroethene	0.104	0.074	0.106	0.039	**0.2**
Bromoethane	0.040	0.053	0.050	0.053	**0.2**
Iodomethane	0.099	0.047	0.106	0.042	**0.2**
Methylene Chloride	0.094	0.171	0.106	0.167	**0.3**
Carbon Disulfide	0.051	0.054	0.051	0.067	**0.2**
Acrylonitrile	0.136	0.102	0.161	0.113	**0.2**
Methyl-t-butyl ether (MTBE)	0.059	0.031	0.069	0.030	**0.2**
trans-1,2-Dichloroethene	0.081	0.095	0.094	0.088	**0.2**
Vinyl Acetate	0.127	0.127	0.154	0.126	**0.2**
1,1-Dichloroethane	0.096	0.048	0.096	0.038	**0.2**
2-Butanone*	0.744	0.706	0.903	0.723	**1.0**
2,2-Dichloropropane	0.059	0.108	0.065	0.103	**0.2**
cis-1,2-Dichloroethene	0.092	0.044	0.098	0.059	**0.2**
Chloroform	0.094	0.057	0.081	0.061	**0.2**
Bromochloromethane	0.094	0.117	0.107	0.127	**0.2**
1,1,1-Trichloroethane	0.078	0.065	0.090	0.059	**0.2**
1,1-Dichloropropene	0.088	0.062	0.088	0.053	**0.2**
Carbon Tetrachloride	0.085	0.030	0.084	0.031	**0.2**
1,2-Dichloroethane	0.105	0.109	0.128	0.094	**0.2**
Benzene	0.107	0.090	0.115	0.098	**0.2**
Trichloroethene	0.065	0.075	0.079	0.070	**0.2**

Method Reference	8260B	8260B	SOP 700	SOP 700	
Sample Weight/Volume	20.0 mL	20.0 mL	20.0 mL	20.0 mL	
Spike Level*	0.7 µg/L	0.7 µg/L	0.7 µg/L	0.7 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	700S-R4	S708-R2	S708-R2	Limit
Instrument	Finn 1	Finn 3	Finn 1	Finn 3	mg/L
Date Analyzed	4/23/02	7/22/02	4/23/02	4/23/02	20mL Purge
Reporting Units	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	MDL	MDL	MDL	MDL	RL
1,2-Dichloropropane	0.071	0.069	0.062	0.069	**0.2**
Bromodichloromethane	0.070	0.054	0.083	0.062	**0.2**
Dibromomethane	0.077	0.095	0.100	0.092	**0.2**
2-Chloroethyl Vinyl Ether	0.036	0.093	0.054	0.061	**0.5**
4-Methyl-2-Pentanone*	0.305	0.296	0.384	0.335	**1.0**
cis-1,3-Dichloropropene	0.066	0.040	0.072	0.040	**0.2**
Toluene	0.153	0.081	0.178	0.458	**0.2**
trans-1,3-Dichloropropene	0.076	0.048	0.086	0.034	**0.2**
1,1,2-Trichloroethane	0.094	0.108	0.105	0.117	**0.2**
1,2-Dibromoethane	0.081	0.030	0.101	0.030	**0.2**
2-Hexanone*	0.391	0.238	0.422	0.278	**1.0**
1,3-Dichloropropane	0.105	0.040	0.109	0.042	**0.2**
Tetrachloroethene	0.088	0.054	0.093	0.044	**0.2**
Chlorodibromomethane	0.100	0.025	0.090	0.030	**0.2**
Chlorobenzene	0.101	0.035	0.095	0.035	**0.2**
1,1,1,2-Tetrachloroethane	0.079	0.025	0.092	0.018	**0.2**
Ethyl Benzene	0.107	0.036	0.096	0.024	**0.2**
m,p-Xylene**	0.399	0.121	0.223	0.098	**0.4**
o-Xylene	0.081	0.035	0.081	0.026	**0.2**
Styrene	0.101	0.048	0.103	0.042	**0.2**
Bromoform	0.123	0.063	0.113	0.063	**0.2**
Isopropyl Benzene	0.109	0.048	0.092	0.042	**0.2**
1,1,2,2-Tetrachloroethane	0.128	0.036	0.128	0.048	**0.2**
1,2,3-Trichloropropane	0.263	0.051	0.285	0.056	**0.5**
trans-1,4-Dichloro-2-Butene	0.094	0.115	0.114	0.129	**1.0**
n-Propyl Benzene	0.119	0.056	0.097	0.054	**0.2**
Bromobenzene	0.107	0.057	0.095	0.057	**0.2**
1,3,5-Trimethylbenzene	0.114	0.057	0.109	0.053	**0.2**
2-Chlorotoluene	0.117	0.066	0.105	0.068	**0.2**
4-Chlorotoluene	0.136	0.063	0.125	0.059	**0.2**
t-Butylbenzene	0.101	0.084	0.086	0.084	**0.2**
1,2,4-Trimethylbenzene	0.146	0.067	0.131	0.062	**0.2**
s-Butylbenzene	0.097	0.054	0.087	0.044	**0.2**

Method Reference	8260B	8260B	SOP 700	SOP 700	
Sample Weight/Volume	20.0 mL	20.0 mL	20.0 mL	20.0 mL	
Spike Level*	0.7 µg/L	0.7 µg/L	0.7 µg/L	0.7 µg/L	Water
Preparation Method	5030B	5030B	5030B	5030B	Reporting
ARI Analytical SOP	S708-R2	700S-R4	S708-R2	S708-R2	Limit
Instrument	Finn 1	Finn 3	Finn 1	Finn 3	mg/L
Date Analyzed	4/23/02	7/22/02	4/23/02	4/23/02	20mL Purge
Reporting Units	µg/L	µg/L	µg/L	µg/L	ppb
Analyte	**MDL**	**MDL**	**MDL**	**MDL**	**RL**
4-Isopropyl Toluene	0.103	0.054	0.092	0.047	**0.2**
1,3-Dichlorobenzene	0.097	0.024	0.099	0.035	**0.2**
1,4-Dichlorobenzene	0.080	0.030	0.085	0.030	**0.2**
n-Butylbenzene	0.098	0.061	0.090	0.044	**0.2**
1,2-Dichlorobenzene	0.120	0.047	0.112	0.049	**0.2**
1,2-Dibromo-3-Chloropropane	0.299	0.185	0.332	0.245	**2.0**
1,2,4-Trichlorobenzene	0.095	0.050	0.105	0.053	**0.5**
Hexachloro-1,3-Butadiene	0.087	0.049	0.110	0.038	**0.5**
Naphthalene	0.106	0.076	0.109	0.075	**0.5**
1,2,3-Trichlorobenzene	0.096	0.057	0.103	0.054	**0.5**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.
* Compounds spiked at 3.5 ppb.
** m,p-Xylenes spiked at 1.4 ppb.

MDL and RL Summary GC-MS – VOA Analysis of Water
20 mL Purge Volume (Methods 524.2)
Effective 8/12/02

Sample Weight/Volume	20.0 mL	20.0 mL	Water
Spike Level*	0.7 µg/L	0.4 µg/L	Reporting
ARI Analytical SOP	706S-R3	706S-R3	Limit
Instrument	Finn 1	Finn 3	mg/L
Date Analyzed	4/23/02	3/5/03	20mL Purge
Reporting Units	µg/L	µg/L	ppb
Analyte	**MDL**	**MDL**	**RL**
Dichlorodifluoromethane	0.233		**0.2**
Chloromethane	0.144		**0.2**
Vinyl Chloride	0.179		**0.2**
Bromomethane	0.090		**0.2**
Chloroethane	0.179		**0.2**
Trichlorofluoromethane	0.137		**0.2**
1,1-Dichloroethene	0.157		**0.2**
Methylene Chloride	0.149		**0.3**
trans-1,2-Dichloroethene	0.129		**0.2**
1,1-Dichloroethane	0.139		**0.2**
2,2-Dichloropropane	0.097		**0.2**
cis-1,2-Dichloroethene	0.134		**0.2**
Chloroform	0.126		**0.2**
Bromochloromethane	0.114		**0.2**
1,1,1-Trichloroethane	0.133		**0.2**
1,1-Dichloropropene	0.109		**0.2**
Carbon Tetrachloride	0.114		**0.2**
1,2-Dichloroethane	0.171		**0.2**
Benzene	0.147		**0.2**
Trichloroethene	0.096		**0.2**
1,2-Dichloropropane	0.078		**0.2**
Bromodichloromethane	0.115		**0.2**
Dibromomethane	0.104		**0.2**
cis-1,3-Dichloropropene	0.092		**0.2**
Toluene	0.201		**0.2**
trans-1,3-Dichloropropene	0.102		**0.2**
1,1,2-Trichloroethane	0.120		**0.2**
1,2-Dibromoethane	0.115		**0.2**
1,3-Dichloropropane	0.109		**0.2**
Tetrachloroethene	0.093		**0.2**
Chlorodibromomethane	0.090		**0.2**
Chlorobenzene	0.095		**0.2**

Sample Weight/Volume	**20.0 mL**	**20.0 mL**	**Water**
Spike Level*	**0.7 µg/L**	**0.4 µg/L**	**Reporting**
ARI Analytical SOP	**706S-R3**	**706S-R3**	**Limit**
Instrument	**Finn 1**	**Finn 3**	**mg/L**
Date Analyzed	**4/23/02**	**3/5/03**	**20mL Purge**
Reporting Units	**µg/L**	**µg/L**	**ppb**
Analyte	**MDL**	**MDL**	**RL**
1,1,1,2-Tetrachloroethane	0.092		**0.2**
Ethyl Benzene	0.096		**0.2**
m,p-Xylene*	0.223		**0.4**
o-Xylene	0.081		**0.2**
Styrene	0.103		**0.2**
Bromoform	0.133		**0.2**
Isopropyl Benzene	0.093		**0.2**
1,1,2,2-Tetrachloroethane	0.163		**0.2**
1,2,3-Trichloropropane	0.268		**0.5**
n-Propyl Benzene	0.101		**0.2**
Bromobenzene	0.129		**0.2**
1,3,5-Trimethylbenzene	0.111		**0.2**
2-Chlorotoluene	0.098		**0.2**
4-Chlorotoluene	0.136		**0.2**
t-Butylbenzene	0.090		**0.2**
1,2,4-Trimethylbenzene	0.132		**0.2**
s-Butylbenzene	0.101		**0.2**
4-Isopropyl Toluene	0.090		**0.2**
1,3-Dichlorobenzene	0.110		**0.2**
1,4-Dichlorobenzene	0.096		**0.2**
n-Butylbenzene	0.097		**0.2**
1,2-Dichlorobenzene	0.140		**0.2**
1,2-Dibromo-3-Chloropropane	0.281		**2.0**
1,2,4-Trichlorobenzene	0.130		**0.5**
Hexachloro-1,3-Butadiene	0.113		**0.5**
Naphthalene	0.133		**0.5**
1,2,3-Trichlorobenzene	0.138		**0.5**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven. Method Detection Limits (MDLs) are statistical measures of short term precision. Detection at the statistical MDL may not be achievable for all analytes and methods. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes. * m,p-Xylenes spiked at 1.4 ppb.

MDL and RL Summary GC-MS – VOA Analysis of Soil & Sediment (Methods 8260B and ARI SOP 704S)

Method Reference	8260B	SOP 700	
Sample Matrix	Soil/Sediment	Soil/Sediment	
Sample Weight/Volume	5.0 g	5.0 g	
Spike Level*	3.0 /kg	3.0 /kg	
Preparation Method	5030B	5030B	
ARI Analytical SOP	708-R2	700S-R4	Soil/Sediment
Instrument	Finn 5	Finn 5	Reporting
Date Analyzed	4/19/02	4/23/02	Limit
Reporting Units	µg/kg	µg/kg	mg/kg
Analyte	**MDL**	**MDL**	**RL**
Dichlorodifluoromethane	0.27	0.25	**1.0**
Chloromethane	0.41	0.44	**1.0**
Vinyl Chloride	0.41	0.39	**1.0**
Bromomethane	0.31	0.27	**1.0**
Chloroethane	0.41	0.38	**1.0**
Trichlorofluoromethane	0.30	0.28	**1.0**
Acrolein*	3.22	3.15	**50.0**
Acetone*	2.97	3.89	**5.0**
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.45	0.43	**2.0**
1,1-Dichloroethene	0.37	0.35	**1.0**
Bromoethane	0.42	0.38	**2.0**
Iodomethane	0.44	0.39	**1.0**
Methylene Chloride	0.28	0.39	**2.0**
Carbon Disulfide	0.41	0.38	**1.0**
Acrylonitrile	0.66	0.60	**5.0**
Methyl-t-butyl ether (MTBE)	0.19	0.18	**1.0**
trans-1,2-Dichloroethene	0.41	0.39	**1.0**
Vinyl Acetate	0.21	0.20	**5.0**
1,1-Dichloroethane	0.19	0.18	**1.0**
2-Butanone*	1.22	1.16	**5.0**
2,2-Dichloropropane	0.27	0.26	**1.0**
cis-1,2-Dichloroethene	0.33	0.32	**1.0**
Chloroform	0.18	0.17	**1.0**
Bromochloromethane	0.14	0.41	**1.0**
1,1,1-Trichloroethane	0.43	0.19	**1.0**
1,1-Dichloropropene	0.23	0.22	**1.0**
Carbon Tetrachloride	0.23	0.22	**1.0**
1,2-Dichloroethane	0.16	0.16	**1.0**
Benzene	0.23	0.23	**1.0**

Method Reference	**8260B**	**SOP 700**	
Sample Matrix	**Soil/Sediment**	**Soil/Sediment**	
Sample Weight/Volume	**5.0 g**	**5.0 g**	
Spike Level*	**3.0 /kg**	**3.0 /kg**	
Preparation Method	**5030B**	**5030B**	
ARI Analytical SOP	**708-R2**	**700S-R4**	**Soil/Sediment**
Instrument	**Finn 5**	**Finn 5**	**Reporting**
Date Analyzed	**4/19/02**	**4/23/02**	**Limit**
Reporting Units	**µg/kg**	**µg/kg**	**mg/kg**
Analyte	**MDL**	**MDL**	**RL**
Trichloroethene	0.38	0.37	**1.0**
1,2-Dichloropropane	0.22	0.23	**1.0**
Bromodichloromethane	0.23	0.22	**1.0**
Dibromomethane	0.29	0.28	**1.0**
2-Chloroethyl Vinyl Ether	0.46	0.45	**5.0**
4-Methyl-2-Pentanone*	2.28	2.13	**5.0**
cis-1,3-Dichloropropene	0.21	0.20	**1.0**
Toluene	0.30	0.30	**1.0**
trans-1,3-Dichloropropene	0.22	0.21	**1.0**
1,1,2-Trichloroethane	0.29	0.28	**1.0**
1,2-Dibromoethane	0.25	0.24	**1.0**
2-Hexanone*	2.79	2.52	**5.0**
1,3-Dichloropropane	0.18	0.18	**1.0**
Tetrachloroethene	0.36	0.35	**1.0**
Chlorodibromomethane	0.16	0.15	**1.0**
Chlorobenzene	0.27	0.26	**1.0**
1,1,1,2-Tetrachloroethane	0.42	0.40	**1.0**
Ethyl Benzene	0.22	0.21	**1.0**
m,p-Xylene	0.54	0.51	**1.0**
o-Xylene	0.20	0.19	**1.0**
Styrene	0.37	0.34	**1.0**
Bromoform	0.31	0.28	**1.0**
Isopropyl Benzene	0.35	0.33	**1.0**
1,1,2,2-Tetrachloroethane	0.30	0.27	**1.0**
1,2,3-Trichloropropane	0.82	0.76	**2.0**
trans-1,4-Dichloro-2-Butene	0.53	0.49	**5.0**
n-Propyl Benzene	0.45	0.42	**1.0**
Bromobenzene	0.21	0.20	**1.0**
1,3,5-Trimethylbenzene	0.38	0.36	**1.0**
2-Chlorotoluene	0.33	0.33	**1.0**
4-Chlorotoluene	0.54	0.53	**1.0**
t-Butylbenzene	0.40	0.39	**1.0**

Method Reference	**8260B**	**SOP 700**	
Sample Matrix	**Soil/Sediment**	**Soil/Sediment**	
Sample Weight/Volume	**5.0 g**	**5.0 g**	
Spike Level*	**3.0 /kg**	**3.0 /kg**	
Preparation Method	**5030B**	**5030B**	
ARI Analytical SOP	**708-R2**	**700S-R4**	**Soil/Sediment**
Instrument	**Finn 5**	**Finn 5**	**Reporting**
Date Analyzed	**4/19/02**	**4/23/02**	**Limit**
Reporting Units	**µg/kg**	**µg/kg**	**mg/kg**
Analyte	**MDL**	**MDL**	**RL**
1,2,4-Trimethylbenzene	0.34	0.33	**1.0**
s-Butylbenzene	0.36	0.34	**1.0**
4-Isopropyl Toluene	0.55	0.52	**1.0**
1,3-Dichlorobenzene	0.33	0.32	**1.0**
1,4-Dichlorobenzene	0.44	0.43	**1.0**
n-Butylbenzene	0.54	0.52	**1.0**
1,2-Dichlorobenzene	0.32	0.30	**1.0**
1,2-Dibromo-3-Chloropropane	0.81	0.77	**5.0**
1,2,4-Trichlorobenzene	0.67	0.68	**5.0**
Hexachloro-1,3-Butadiene	0.58	0.61	**5.0**
Naphthalene	1.98	2.00	**5.0**
1,2,3-Trichlorobenzene	0.76	0.79	**5.0**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom.
Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods.
Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.
* Compounds noted labeled with an * are spiked at higer concentrations.

MDL and RL Summary GC-MS Analysis of VOA
Water and Soil EPA Method SW-846-8260

Method Reference	8260-SIM	8260		8260-SIM	8260	
Sample Matrix	Water	Water		Soil	Soil	
Sample Weight/Volume	10 mL	5 mL		1.0 g	5.0g	
Spike Level	0.05 µg/L	60 µg/L		0.4 µg/Kg	1.0 µg/Kg	
ARI Analytical SOP	703S		Reporting	703S		Reporting
Instrument	FINN 7	FINN 1	Limit	FINN 7	FINN 5	Limit
Date Analyzed	10/25/02	5/3/02	Water	10/29/02	5/15/02	Soil
Reporting Units	µg/L (ppb)	µg/L (ppb)	µg/L (ppb)	ng/Kg	µg/Kg	µg/Kg
Analyte	**MDL**	**MDL**	**RL**	**MDL**		**RL**
Vinyl Chloride	.00559	**--**	**0.02**	69.67	**--**	**0.1**
1,1-Dichloroethene	.01234	**--**	**0.02**	106.0	**--**	**0.1**
Trichloroethene	.00991	--	**0.02**	73.66	**--**	**0.1**
Tetrachloroethane	--	--	**--**	179.2	**--**	**0.2**
MTBE	--	--	**0.2**	147.2	**--**	**0.2**
Benzene	--	--	**0.2**	68.16	**--**	**0.1**
Toluene	--	--	**0.2**	72.26	**--**	**0.1**
Ethylbenzene	--	--	**0.2**	68.08	**--**	**0.1**
m,p-Xylene	--	--	**0.2**	148.09	**--**	**0.2**
o-Xylene	--	--	**0.2**	67.56	**--**	**0.1**
Cyclohexanone	--	10.8	**100**	--	**--**	**--**
Allyl Chloride	--	--	--	--	0.63	**2.0**
Chloroprene	--	--	--	--	0.21	**1.0**
Methyl Methacrylate	--	--	--	--	0.26	**5.0**
Ethyl Methacrylate	--	--	--	--	0.09	**5.0**
Methacrylonitrile	--	--	--	--	0.44	**10.0**
1,4-Dioxane(250 µg/Kg)	--	--	--	--	41.39	**2000**

Method Detection Limit studies are performed in accordance with 40 CFR Part 136, Appendix B using seven degrees of freedom. Method Detection Limits (MDLs) are statistically derived values, and are a measure of short term precision. True detection at the statistical MDL may not be achievable for all analytes and methods. Reporting Limit (RL) is defined as the lowest value at which qualitative detection of a given analyte is reported. The RL is based on the MDL, method efficiency, and analyte response. The RL will, at a minimum, equal the MDL (rounded). The RL may exceed the MDL for certain analytes.

Appendix J

GC-MS Tuning and Calibration Criteria

Volatile BFB Key Ions and Ion Abundance Criteria

Mass	Ion Abundance Criteria
50	8.0 - 40.0% of mass 95
75	30.0 - 66.0% of mass 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of mass 95
173	Less than 2.0% of mass 174
174	50.0 - 120.0% of mass 95
175	4.0 - 9.0% of mass 174
176	93.0 - 101.0% of mass 174
177	5.0 - 9.0% of mass 176

Semi-volatile DFTPP Key Ions and Ion Abundance Criteria

Mass	Ion Abundance Criteria
51	30.0 - 80.0% of mass 198
68	Less than 2.0% of mass 69
69	Present
70	Less than 2.0% of mass 69
127	25.0 - 75.0% of mass 198
197	Less than 1.0% of mass 198
198	Base peak, 100% relative abundance
199	5.0 - 9.0% of mass 198
275	10.0 - 30.0% of mass 198
365	Greater than 0.75% of mass 198
441	Present, but less than mass 443
442	40.0 - 110.0% of mass 198
443	15.0 - 24.0% of mass 142

Volatile Organic Analysis Calibration Criteria

Compound	Minimum RRF	Maximum %RSD CLP	Maximum %RSD In-house	Maximum %D
Chloromethane	0.100	20.5	30.0	25.0
Bromomethane	0.100	20.5	30.0	25.0
Vinyl Chloride	0.100	20.5	30.0	25.0
1,1-Dichloroethene	0.100	20.5	30.0	25.0
1,1-Dichloroethane	0.200	20.5	30.0	25.0
Chloroform	0.200	20.5	30.0	25.0
1,2-Dichloroethane	0.100	20.5	30.0	25.0
1,1,1-Trichloroethane	0.100	20.5	30.0	25.0
Carbon tetrachloride	0.100	20.5	30.0	25.0
Bromodichloromethane	0.200	20.5	30.0	25.0
cis-1,3-Dichloropropene	0.200	20.5	30.0	25.0
Trichloroethene	0.300	20.5	30.0	25.0
Dibromochloromethane	0.100	20.5	30.0	25.0
1,1,2-Trichloroethane	0.100	20.5	30.0	25.0
Benzene	0.500	20.5	30.0	25.0
1,2-Dichloropropane	0.100	20.5	30.0	25.0
trans-1,3-Dichloropropene	0.100	20.5	30.0	25.0
Bromoform	0.100	20.5	30.0	25.0
Tetrachloroethene	0.200	20.5	30.0	25.0
1,1,2,2-Tetrachloroethane	0.300	20.5	30.0	25.0
Toluene	0.400	20.5	30.0	25.0
Chlorobenzene	0.300	20.5	30.0	25.0
Ethylbenzene	0.100	20.5	30.0	25.0
Styrene	0.300	20.5	30.0	25.0
o-Xylene	0.300	20.5	30.0	25.0
m,p-Xylene	0.300	20.5	30.0	25.0

All other compounds must meet minimum RRF criteria of 0.010.

Semi volatile Organic Calibration Criteria

Compound	Minimum RRF	Maximum %RSD	Maximum %D
Phenol	0.800	20.5	25.0
Bis(2-Chloroethyl)ether	0.700	20.5	25.0
2-Chlorophenol	0.800	20.5	25.0
1,3-Dichlorobenzene	0.600	20.5	25.0
1,4-Dichlorobenzene	0.500	20.5	25.0
1,2-Dichlorobenzene	0.400	20.5	25.0
2-Methylphenol	0.700	20.5	25.0
Hexachloroethane	0.300	20.5	25.0
N-Nitroso-di-n-Propylamine	0.500	20.5	25.0
4-Methylphenol	0.600	20.5	25.0
Nitrobenzene	0.200	20.5	25.0
Isophorone	0.400	20.5	25.0
2-Nitrophenol	0.100	20.5	25.0
2,4-Dimethylphenol	0.200	20.5	25.0
Bis(2-chloroethoxy)methane	0.300	20.5	25.0
2,4-Dichlorophenol	0.200	20.5	25.0
1,2,4-Trichlorobenzene	0.200	20.5	25.0
Naphthalene	0.700	20.5	25.0
4-Chloro-3-methylphenol	0.200	20.5	25.0
2-Methylnaphthalene	0.400	20.5	25.0
2,4,6-Trichlorophenol	0.200	20.5	25.0
2,4,5-Trichlorophenol	0.200	20.5	25.0
2-Chloronaphthalene	0.800	20.5	25.0
Acenaphthylene	0.900	20.5	25.0
2,6-Dinitrotoluene	0.200	20.5	25.0
Acenaphthene	0.900	20.5	25.0
Dibenzofuran	0.800	20.5	25.0
2,4-Dinitrotoluene	0.200	20.5	25.0
Fluorene	0.900	20.5	25.0
4-Chlorophenyl-phenylether	0.400	20.5	25.0
4-Bromophenyl-phenylether	0.100	20.5	25.0
Hexachlorobenzene	0.100	20.5	25.0
Pentachlorophenol	0.050	20.5	25.0
Phenanthrene	0.700	20.5	25.0
Anthracene	0.700	20.5	25.0
Fluoranthene	0.600	20.5	25.0
Pyrene	0.600	20.5	25.0
Benzo(a)anthracene	0.800	20.5	25.0
Chrysene	0.700	20.5	25.0
Benzo(b)fluoranthene	0.700	20.5	25.0
Benzo(k)fluoranthene	0.700	20.5	25.0
Benzo(a)pyrene	0.700	20.5	25.0
Indeno(1,2,3-cd)pyrene	0.500	20.5	25.0
Dibenzo(a,h)anthracene	0.400	20.5	25.0
Benzo(g,h,i)perylene	0.500	20.5	25.0

All other compounds must meet a minimum RRF criteria of 0.010.

Appendix K

Quality Control Limits

Summary of Laboratory Control Limits

When laboratory generated control limits are not available and default limits are not listed in the following tables, default limits of 30-160% recovery and 30% RPD are applied for all organic non-CLP analyses. When CLP protocol is required, CLP recovery and RPD limits will be used. Default limits for all inorganic analyses are 75-125% recovery and 25% RPD.

ARI's laboratory generated Quality Control Limits may be superceded by project specific data quality objectives (DQO) provided by ARI's clients. The use of project specific DQO is subject to approval by ARI's laboratory and QA Program Managers.

Summary of Laboratory Control Limits
Conventional Wet Chemistry

	Water	Soil/Sediment
Matrix Spike Recoveries		
Ammonia	75-125	75-125
Bromide	75-125	75-125
Chloride	75-125	75-125
Cyanide	75-125	75-125
Ferrous Iron	75-125	75-125
Fluoride	75-125	75-125
Formaldehyde	75-125	75-125
Hexavalent Chromium	75-125	75-125
Nitrate/Nitrite	75-125	75-125
Oil and Grease	75-125	75-125
Phenol	75-125	75-125
Phosphorous	75-125	75-125
Sulfate	75-125	75-125
Sulfide	75-125	75-125
Total Kjeldahl Nitrogen	75-125	75-125
Total Organic Carbon	75-125	75-125
Total Organic Halogen	75-125	75-125
Duplicate RPDs		
Acidity	±20%	±20%
Alkalinity	±20%	±20%
BOD	±20%	±20%
Cation Exchange	±20%	±20%
COD	±20%	±20%
Conductivity	±20%	±20%
Salinity	±20%	±20%
Solids	±20%	±20%
Turbidity	±20%	±20%

Laboratory Control Limits for Analysis of Chlorinated Pesticides EPA Method SW-846-8081 Effective 10/14/02

	Water	Soil/Sediment	Tissue	PSEP Protocol
LCS Spike Recovery				
Lindane	38-106	52-107	48-105	38-116
Heptachlor	51-94**	66-107	58-99**	54-115
Aldrin	50-100	66-105	47-94**	46-116
Dieldrin	68-115	75-116	49-115	54-121
Endrin	67-125	70-134	30-160*	50-137
DDT	61-105	60-116	52-113	54-124
Method Blank/LCS Surrogate Recovery				
Tetrachloro-*meta*-xylene (TCMX)	47-86**	39-129	53-91**	62-120
Decachlorobiphenyl	68-102	62-112	58-105	69-101
Sample Matrix Spike Recovery				
Lindane	33-120	10-114	44-94**	10-124
Heptachlor	50-104	10-129	40-114	14-129
Aldrin	42-102	10-112	40-92**	10-127
Dieldrin	43-125	10-144	41-121	10-146
Endrin	56-123	10-147	30-160*	10-162
DDT	46-126	10-161	44-100	16-150
Sample Surrogate Recovery				
Tetrachloro-*meta*-xylene (TCMX)	38-108	29-110	17-102	20-131
Decachlorobiphenyl	30-115	18-151	48-116	10-194

Control Limits calculated using all data generated at ARI's Tukwila facility from 1/1/02 through 6/14/02 except PSEP 1/1/01 – 6/14/02; Tissue 1/1/00 - 8/1/01 and matrix spike recovery in water 1/1/00 through 6/14/02.
* Advisory limits - Insufficient data to calculate historical Control Limits.
** Corrective action based on these analytes is required only when recovery exceeds 120%.

Summary of Laboratory Control Limits
Analysis of PCBs/Aroclors
EPA SW-846 Methods 8081 & 8082[1]
Effective Date 9/2/02

	Water	Soil/ Sediment	Oil[3]	Wipe	Low Level Water[2]
LCS Spike Recovery					
Aroclor 1242	58-114	54-125	82-120	77-118	65-124
Method Blank/LCS Surrogate Recovery					
Tetrachloro-*meta*-xylene (TCMX)	49-98	37-123	86-123	72-126	52-116
Decachlorobiphenyl	28-128	58-123	65-127	48-142	31-129
Sample Matrix Spike Recovery					
Aroclor 1242	47-115	15-143	44-101	30-160[4]	26-137
Sample Surrogate Recovery					
Tetrachloro-*meta*-xylene (TCMX)	36-104	20-118	24-115	39-133	24-129
Decachlorobiphenyl	26-131	16-146	11-87	34-147	13-132

(1) Control limits calculated from all data collected between 1/1/01 and 6/30/02.
(2) Three liter sample with 1.0 mL final volume.
(3) Control limits calculated from all data collected between 1/1/00 and 8/1/01.
(4) Advisory limit - Insufficient data to calculate historical Control Limits.

Summary of Laboratory Control Limits
Herbicides
EPA Method SW-846-8151
Effective 10/10/02

	Water	Soil/Sediment
LCS Spike Recovery*		
2,4,5-TP (Silvex)	52-121	40-140
2,4-D	38-97	29-108
Dicamba	34-139	27-153
Method Blank/LCS Surrogate Recovery**		
2,4-Dichlorophenylacetic acid	45-128	40-140
Sample Matrix Spike Recovery*		
2,4,5-TP (Silvex)	58-112	16-164
2,4-D	36-97	11-120
Dicamba	53-125	21-160
Sample Surrogate Recovery**		
2,4-Dichlorophenylacetic acid	49-132	37-156

*Control Limits calculated using all data generated 1/1/98 through 6/30/02
**Control Limits calculated using all data generated 1/1/01 through 6/30/02

Summary of Laboratory Control Limits
Total Petroleum Hydrocarbons
Effective 10/17/02

Sample Matrix:	**Water**	**Soil/Sediment**		
Methods:	**NWTPH-HCID NWTPH-D AK-102 WI-DRO**	**NWTPH-HCID**	**NWTPH-D AK-102 WI-DRO**	**NWTPH-D[3] (with Acid Clean-up)**
LCS Spike Recovery				
Diesel	60-117	50-142	56-130	46-130
Method Blank/LCS Surrogate Recovery				
o-Terphenyl	55-110	68-122	41-131	45-136
Sample Matrix Spike Recovery				
Diesel[1]	57-151	31-161	26-132	[4]
Sample Surrogate Recovery				
o-Terphenyl[2]	32-116	45-136	30-106	30-120

Control Limits calculated using all data generated 1/1/00 through 8/1/02
[1] Control Limits calculated from all data generated 1/1/01 through 5/15/02.
[2] Control Limits calculated from all data generated 7/15/01 through 8/1/02.
[3] Control Limits Calculated from all data generated 9/1/01 through 3/27/02.
[4] Use Control Limits for NWTPH-D without clean-up.

Summary of Laboratory Control Limits
BTEX – EPA Method 8021
Gasoline – Method NWTPH-G
Effective 7/1/02

Sample Matrix:	Water		Soil/Sediment	
	Method 8021	Method NWTPH-G	Method 8021	Method NWTPH-G
LCS Spike Recovery				
Benzene	68-125		70-124	
Toluene	72-120		74-116	
Ethyl benzene	74-120		77-114	
Total xylenes	74-120		74-118	
Gasoline		64-118		61-122
Method Blank/LCS Surrogate Recovery				
Trifluorotoluene (TFT)	68-129	74-126	62-135	74-127
Bromobenzene	71-120	75-121	64-127	74-123
Sample Matrix Spike Recovery (+)				
Benzene	65-133		39-137*	
Toluene	78-122		47-134*	
Ethyl benzene	79-122		44-139*	
Total xylenes	73-122		58-124*	
Gasoline		66-135		41-148*
Sample Surrogate Recovery				
Trifluorotoluene (TFT)	63-132	66-129	55-130	61-132
Bromobenzene	68-122	69-124	45-149	52-141

Control Limits calculated using all data generated 1/1/01 hrough 6/14/02.
*Control Limits calculated using all data generated 1/1/98 through 12/31/00.
(+) Advisory limits

Summary of Laboratory Control Limits
PNA Analysis using HPLC
EPA Method SW-846-8310
Effective 9/1/02

	Water	Soil/Sediment
LCS Spike Recovery		
Acenaphthene	22-140	30-160*
Benzo(a)anthracene	50-123	30-160*
Fluoranthene	58-120	30-160*
Method Blank/LCS Surrogate Recovery		
Terphenyl	54-116	30-160*
Diphenyl	53-103	30-160*
Sample Matrix Spike Recovery**		
Acenaphthene	10-165	30-160*
Benzo(a)anthracene	32-168	30-160*
Fluoranthene	44-130	30-160*
Sample Surrogate Recovery		
Terphenyl	43-136	30-160*
Diphenyl	16-155	30-160*

Control Limits calculated using all data generated between 1/1/98 and 6/30/02.

* Advisory limits - Insufficient data to calculate historical Control Limits.

** Control Limits calculated using all data generated between 1/1/00 and 6/30/02.

Summary of Laboratory Control Limits
Chlorinated Phenols
EPA Method SW-846-8040
Effective 10/1/02

	Water	Soil/Sediment
LCS Spike Recovery		
Pentachlorophenol	30-140	26-146
Method Blank/LCS Surrogate Recovery		
2,4,6-Tribromophenol	32-134	30-124
Sample Matrix Spike Recovery		
Pentachlorophenol	20-141	10-145
Sample Surrogate Recovery		
2,4,6-Tribromophenol	29-135	10-129

Control Limits calculated using all data generated 1/1/98 through 6/30/02

Summary of Laboratory Control Limits
Metals Analyses
(All Methods & Sample Matrices)

	Water	Soil/Sediment
Matrix Spike Recoveries		
Aluminum	75-125	75-125
Antimony	75-125	75-125
Arsenic	75-125	75-125
Barium	75-125	75-125
Beryllium	75-125	75-125
Boron	75-125	75-125
Cadmium	75-125	75-125
Calcium	75-125	75-125
Chromium	75-125	75-125
Cobalt	75-125	75-125
Copper	75-125	75-125
Iron	75-125	75-125
Lead	75-125	75-125
Magnesium	75-125	75-125
Manganese	75-125	75-125
Mercury	75-125	75-125
Nickel	75-125	75-125
Potassium	75-125	75-125
Selenium	75-125	75-125
Silica	75-125	75-125
Silver	75-125	75-125
Sodium	75-125	75-125
Strontium	75-125	75-125
Thallium	75-125	75-125
Vanadium	75-125	75-125
Zinc	75-125	75-125

Control Limits Summary - Semivolatile Organic Compounds
EPA Method SW-846-8270
Effective 11/28/02

	Water Sep.Funnel	Water Liq./Liq.	Soil Sonication	PSEP Sed. Sonication
LCS Spike Recovery	(1/1/02 – 12/4/02)	(7/1/02 – 12/4/02)	(7/1/02 – 12/4/02)	(1/1/02 – 12/4/02)
Phenol	10-121	59-119	43-108	35-116
2-Chlorophenol	42-117	63-120	46-104	38-117
1,4-Dichlorobenzene	26-127	27-85	35-83	37-104
N-nitroso-di-n-propylamine	22-131	44-111	25-94	22-120
1,2,4-Trichlorobenzene	29-126	26-83	29-85	41-103
4-Chloro-3-methylphenol	29-115	50-101	42-98	42-111
Acenaphthene	42-123	51-108	40-99	50-103
4-Nitrophenol	10-132	39-130	27-133	42-118
2,4-Dinitrotoluene	39-138	44-118	34-108	41-132
Pentachlorophenol	10-149	34-144	51-128	22-152
Pyrene	51-129	37-126	32-122	52-113
MB/LCS Surrogate Recovery	(6/1/02 – 12/4/02)	(9/1/02 – 12/4/02)	(9/1/02 – 12/4/02)	(1/1/02 – 12/4/02)
d4-2-Chlorophenol	34-107	51-109	38-91	34-103
d4-1,2-Dichlorobenzene	26-105	39-91	35-86	35-99
2,4,6-Tribromophenol	31-115	40-125	46-109	25-122
2-Fluorophenol	23-86	41-109	26-98	28-112
d5-Phenol	10-78	49-105	34-94	33-108
d5-Nitrobenzene	36-108	49-114	35-96	28-106
2-Fluorobiphenyl	31-116	46-109	37-96	43-106
d14-p-Terphenyl	42-144	59-126	43-120	41-143
Sample Matrix Spike Recovery	(1/1/02 – 12/4/02)	(7/1/02 – 12/4/02)	(7/1/02 – 12/4/02)	(1/1/02 – 12/4/02)
Phenol	23-85	47-129	11-118	40-115
2-Chlorophenol	52-101	49-131	11-115	30-160*
1,4-Dichlorobenzene	47-94	20-88	10-91	40-88
N-nitroso-di-n-propylamine	10-147	38-112	10-96	30-160*
1,2,4-Trichlorobenzene	43-106	20-85	10-94	24-112
4-Chloro-3-methylphenol	39-117	48-113	15-111	30-160*
Acenaphthene	61-96	42-110	13-113	41-116
4-Nitrophenol	25-98	42-155	10-148	30-160*
2,4-Dinitrotoluene	75-114	39-127	10-126	30-160*
Pentachlorophenol	54-108	26-175	14-153	10-152
Pyrene	72-115	43-110	12-120	14-147
Sample Surrogate Recovery	(6/1/02 – 12/4/02)	(10/15/02 – 12/4/02)	(9/15/02 – 12/4/02)	(7/1/02 – 12/4/02)
d4-2-Chlorophenol	39-100	51-110	32-91	32-98
d4-1,2-Dichlorobenzene	35-94	39-92	26-85	31-87
2,4,6-Tribromophenol	27-147	34-142	23-131	20-139
2-Fluorophenol	21-86	47-109	25-92	19-116
d5-Phenol	10-76	43-112	29-93	34-105
d5-Nitrobenzene	35-103	49-118	20-102	15-112
2-Fluorobiphenyl	27-124	53-106	34-99	44-104
d14-p-Terphenyl	43-133	45-126	43-128	36-136

* Advisory Control Limits – Insufficient data to calculate historical Control Limits

Summary of Laboratory Control Limits
SIM Analysis for PNA
EPA Method SW-846-8270 (Modified)
Effective 10/1/02

	Water	Soil/Sediment
LCS Spike Recovery		
Phenanthrene	49-118	39-121
Benzo(k)fluoranthene	42-134	39-142
Chrysene	46-128	41-127
Method Blank/LCS Surrogate Recovery		
d10-2-Methylnaphthalene	48-107	35-113
d14-Dibenzo(a,h)anthracene	37-128	26-142
Sample Matrix Spike Recovery		
Phenanthrene	43-119	10-139
Benzo(k)fluoranthene	38-131	10-162
Chrysene	40-131	10-144
Sample Surrogate Recovery		
d10-2-Methylnaphthalene	34-120	11-127
d14-Dibenzo(a,h)anthracene	14-141	10-153

Control Limits calculated using all data generated 1/1/00 through 6/30/02

Summary of Laboratory Control Limits
SIM Analysis for Butyl Tin Species[1]
EPA Method SW-846-8270 (Modified)
(Effective 9/25/02)

	Water	Soil/Sediment
LCS Spike Recovery		
Tetrabutyl Tin	10-115	19-132
Tributyl Tin	10-155	35-153
Dibutyl Tin	10-136	10-141
Butyl Tin	10-131	10-116
Method Blank/LCS Surrogate Recovery		
Tripentyl Tin	10-122	16-108
Tripropyl Tin	12-133	29-120
Sample Matrix Spike Recovery		
Tetrabutyl Tin	10-134	11-131
Tributyl Tin	11-152	10-167
Dibutyl Tin	10-133	10-139
Butyl Tin	10-109	10-95
Sample Surrogate Recovery		
Tripentyl Tin	10-122	10-104
Tripropyl Tin	10-131	10-122

Control Limits calculated using all data generated 1/1/98 through 6/1/02.

[1] Instrument calibrations are performed using hexyl (C_6) derivatives. Results are reported as Chlorides.

Summary of Laboratory Control Limits
Skydrol & BHT
EPA Method SW-846-8270
Effective 8/1/01

	Water Liquid / Liquid	Soil Sonication
LCS Spike Recovery		
Tributyl Phosphate	33-137	33-130
Dibutyl Phenyl Phosphate	35-132	44-118
Butyl Diphenyl Phosphate	29-144	30-145
Triphenyl Phosphate	26-147	10-163
Butylated Hydroxytoluene (BHT)	30-160[2]	35-111
MB/LCS Surrogate Recovery[1]		
Sample Matrix Spike Recovery		
Tributyl Phosphate	39-151	20-139
Dibutyl Phenyl Phosphate	49-146	19-144
Butyl Diphenyl Phosphate	49-132	23-147
Triphenyl Phosphate	18-159	10-170
Butylated Hydroxytoluene (BHT)	30-160[2]	30-160[2]
Sample Surrogate Recovery[1]		

Spike (Samples & LCS) Control Limits calculated using all analytical data from 1/1/98 through 8/1/01
Surrogate recovery (Samples & MB & LCS) Control Limits calculated using all analytical data from 1/1/01 through 8/1/01.
[1] Surrogate Recovery Control Limits are the same as for Method 8270.
[2] Advisory Control Limits – Insufficient data to calculate historical Control Limits

Summary of Laboratory Control Limits Volatile Organic Compound Analyses of Water(1) EPA Method SW-846-8260 Effective 7/25/02				
	Water			
	8260B	8260B	SOP 804S	SOP 804S
	5 mL Purge	20 mL Purge	5 mL Purge	20 mL Purge
LCS Spike Recovery				
Dichlorodifluoromethane	50-150	50-150	50-150	50-150
Chloromethane	46-133	31-140	51-137	44-151
Vinyl Chloride	**49-133***	**56-138***	**49-130***	**58-138***
Bromomethane	57-148	30-159	72-140	68-141
Chloroethane	60-129	54-136	70-124	65-132
Trichlorofluoromethane	59-125	62-119	67-118	64-125
Acrolein	12-174	11-130	25-169	24-158
Trichlorotrifluoroethane	49-147	65-120	58-138	66-130
Acetone	43-152	55-151	62-148	64-144
1,1-Dichloroethene	**66-128***	**71-117***	**73-122***	**75-123***
Bromoethane	48-135	60-112	58-127	63-124
Methyl Iodide	35-141	36-125	44-132	52-134
Methylene Chloride	61-124	60-124	76-120	73-126
Acrylonitrile	56-144	63-132	73-133	74-129
Methyl tert-Butyl Ether				
Carbon Disulfide	43-161	56-141	42-159	64-135
trans-1,2-Dichloroethene	68-126	74-117	77-119	77-121
Vinyl Acetate	26-126	27-122	33-129	37-141
1,1-Dichloroethane	70-125	75-120	78-118	77-122
2-Butanone	61-151	52-137	72-137	70-135
2,2-Dichloropropane	60-138	64-127	77-121	74-125
cis-1,2-Dichloroethene	72-129	72-122	81-123	77-126
Chloroform	**69-122***	**68-120***	**78-118***	**74-125***
Bromodichloromethane	73-129	69-126	78-120	76-121
1,1,1-Trichloroethane	66-129	70-120	77-119	75-124
1,1-Dichloropropene	72-127	74-121	78-123	78-126
Carbon Tetrachloride	68-134	71-122	77-121	75-124
1,2-Dichloroethane	66-127	69-123	77-118	74-125
Benzene	**74-125***	**78-122***	**80-119***	**78-122***
Trichloroethene	**74-118***	**72-117***	**77-120***	**78-123***
1,2-Dichloropropane	**75-123***	**71-123***	**79-122***	**78-125***
Bromochloromethane	73-124	68-121	78-119	73-126
Dibromomethane	75-122	66-125	78-119	72-126
2-Chloroethylvinylether	65-138	57-122	77-131	71-132
4-Methyl-2-Pentanone	67-150	59-147	71-138	74-132
cis-1,3-Dichloropropene	74-131	69-126	74-122	75-123
Toluene	**76-127***	**77-124***	**77-121***	**76-124***
trans-1,3-Dichloropropene	68-127	59-122	70-115	68-123
2-Hexanone	59-154	67-146	70-138	74-132
1,1,2-Trichloroethane	76-126	74-124	77-121	75-125
1,3-Dichloropropane	74-121	71-130	78-121	78-123
Tetrachloroethylene	72-126	74-123	77-122	76-123

Summary of Laboratory Control Limits Volatile Organic Compound Analyses of Water(1) EPA Method SW-846-8260 Effective 7/25/02				
	Water			
	8260B	**8260B**	**SOP 804S**	**SOP 804S**
	5 mL Purge	**20 mL Purge**	**5 mL Purge**	**20 mL Purge**
Dibromochloromethane	73-132	69-128	77-121	75-123
Ethylene Dibromide	75-126	69-126	74-122	74-125
Chlorobenzene	**73-122***	**78-120***	**79-120***	**77-123***
Ethylbenzene	**75-128***	**80-136***	**79-121***	**78-121***
1,1,2,2-Tetrachloroethane	67-128	61-135	75-124	75-125
m,p-Xylene	78-128	83-129	79-121	77-123
o-Xylene	75-125	79-124	78-121	76-123
Xylenes (total)	76-127	83-126	78-121	77-123
Styrene	78-130	83-131	78-121	77-123
Isopropylbenzene	67-134	69-146	77-124	74-127
Bromoform	61-146	61-135	73-127	72-124
1,1,1,2-Tetrachloroethane	77-126	77-124	77-121	78-121
1,2,3-Trichloropropane	66-128	69-127	76-124	75-126
trans-1,4-Dichloro-2-butene	41-116	49-121	52-109	46-133
n-Propylbenzene	69-136	75-154	76-124	76-124
Bromobenzene	73-125	75-123	79-124	77-124
1,3,5-Trimethylbenzene	70-134	75-141	78-124	76-126
2-Chlorotoluene	66-131	72-139	76-124	75-126
4-Chlorotoluene	66-131	72-140	74-126	74-126
tert-Butylbenzene	69-130	72-138	75-126	74-127
1,2,4-Trimethylbenzene	73-137	79-143	80-128	78-128
sec-Butylbenzene	69-134	74-150	75-129	74-128
4-Isopropyltoluene	70-136	74-148	76-129	75-128
1,3-Dichlorobenzene	71-123	77-122	79-122	78-122
1,4-Dichlorobenzene	70-120	75-120	79-122	79-122
n-Butylbenzene	67-136	73-150	73-129	73-128
1,2-Dichlorobenzene	71-121	76-119	78-121	76-123
1,2-Dibromo-3-chloropropane	46-141	54-138	72-130	69-132
1,2,4-Trichlorobenzene	61.128	64-125	74-132	74-133
Hexachloro-1,3-butadiene	64-134	61-136	68-144	70-136
Naphthalene	51-141	57-125	70-140	71-140
1,2,3-Trichlorobenzene	58-131	59-129	70-141	72-139
MB/LCS Surrogate Recovery				
Dibromofluoromethane	60-140**	60-140**	60-140**	60-140**
d4-1,2-Dichloroethane	74-133	68-126	74-133	82-118
d8-Toluene	77-131	59-121	77-131	67-119
4-Bromofluorobenzene	79-127	62-117	79-127	67-118
D4-1,2-Dichlorobenzene	84-132	77-122	84-132	86-121
Sample Matrix Spike Recovery				
Vinyl Chloride	31-162	47-159	29-143	47-154
1,1-Dichloroethene	62-139	74-120	63-141	60-141
Chloroform	72-123	68-126	76-125	74-129
1,2-Dichloropropane	80-125	70-126	77-132	78-128

Summary of Laboratory Control Limits Volatile Organic Compound Analyses of Water(1) EPA Method SW-846-8260 Effective 7/25/02				
	Water			
	8260B	**8260B**	**SOP 804S**	**SOP 804S**
	5 mL Purge	**20 mL Purge**	**5 mL Purge**	**20 mL Purge**
Trichloroethene	38-170	47-181	51-158	46-175
Benzene	66-140	77-128	72-136	68-138
Toluene	80-129	77-129	67-138	76-127
Chlorobenzene	77-121	79-121	79-123	77-124
Ethylbenzene	70-136	87-133	70-136	74-126
Sample Surrogate Recovery				
Dibromofluoromethane	60-140**	60-140**	60-140**	60-140**
d4-1,2-Dichloroethane	74-142	62-138	83-124	78-125
d8-Toluene	84-129	66-124	83-117	80-114
4-Bromofluorobenzene	77-122	60-111	80-113	66-109
D4-1,2-Dichlorobenzene	85-135	77-127	88-118	89-124

Control Limits calculated using all analytical data from 1/1/01 through 6/27/02

(1) Laboratory Control Sample (LCS) Spike Recovery is evaluated using only the nine regulated compounds noted with an asterisk and bolded font. The other LCS spike compound recoveries are advisory and used for analytical trouble shooting should any of the nine regulated compounds be out of control.

* Regulated LCS Spike Compounds.

** Advisory Control Limits – Insufficient data to calculate historical Control Limits

Summary of Laboratory Control Limits			
Volatile Organic Compound Analyses of Soil[1]			
EPA Method SW-846-8260			
Effective 7/25/02			
	Soil		
	8260B	SOP 804S	Medium Level
LCS Spike Recovery			
Chloromethane	30-139	51-136	--
Bromomethane	45-151	67-131	--
Vinyl Chloride	**44-149***	**55-137***	**46-145***
Chloroethane	60-136	69-124	--
Methylene Chloride	25-140	68-124	--
Acetone	43-130	62-132	
Carbon Disulfide	49-157	30-165	--
1,1-Dichloroethene	**63-135***	**71-120***	**72-126***
1,1-Dichloroethane	75-127	78-117	--
trans-1,2-Dichloroethene	71-132	77-116	--
cis-1,2-Dichloroethene	80-134	83-118	--
Chloroform	**74-122***	**80-115***	**71-123***
1,2-Dichloroethane	74-131	77-117	--
2-Butanone	60-138	68-131	--
1,1,1-Trichloroethane	80-126	77-117	--
Carbon Tetrachloride	78-135	75-121	--
Vinyl Acetate	32-115	38-124	--
Bromodichloromethane	82-125	81-114	--
1,2-Dichloropropane	**83-122***	**84-115***	**78-121***
cis-1,3-Dichloropropene	73-127	74-109	--
Trichloroethene	**72-126***	**81-112***	**79-115***
Dibromochloromethane	77-134	78-118	--
1,1,2-Trichloroethane	76-125	80-113	--
Benzene	**81-120***	**84-112***	**80-117***
trans-1-Dichloropropene	82-128	79-113	--
2-Chloroethylvinylether	49-160	73-125	--
Bromoform	75-134	77-118	--
4-Methyl-2-Pentanone	67-141	73-129	--
2-Hexanone	60-145	70-132	--
Tetrachloroethylene	84-129	79-118	--
1,1,2,2-Tetrachloroethane	73-133	74-119	--
Toluene	**78-122***	**81-114***	**77-119***
Chlorobenzene	**86-118***	**85-112***	**84-116***
Ethylbenzene	**87-125***	**83-114***	**81-124***
Styrene	88-122	84-114	--
Xylenes (total)	84-122	84-113	--
Trichlorofluoromethane	55-137	58-124	--
Trichlorotrifluoroethane	51-146	43-147	--
m,p-Xylene	86-122	85-114	--
o-Xylene	84-119	83-113	--
1,2-Dichlorobenzene	85-120	84-112	--
1,3-Dichlorobenzene	86-124	84-113	--
1,4-Dichlorobenzene	84-123	85-114	--

Summary of Laboratory Control Limits			
Volatile Organic Compound Analyses of Soil[1]			
EPA Method SW-846-8260			
Effective 7/25/02			
	Soil		
	8260B	SOP 804S	Medium Level
Acrolein	22-168	52-153	--
Methyl Iodide	12-168	28-138	--
Bromoethane	56-131	47-129	--
Acrylonitrile	59-137	57-135	--
1,1-Dichloropropene	87-126	80-118	--
Dibromomethane	78-122	82-112	--
1,1,1,2-Tetrachloroethane	80-129	80-115	--
Dibromo-3-chloropropane	63-130	74-119	--
1,2,3-Trichloropropane	75-136	75-120	--
trans-1,4-Dichloro-2-butene	50-118	44-107	--
1,3,5-Trimethylbenzene	87-132	80-118	--
1,2,4-Trimethylbenzene	89-133	84-119	--
Hexachlorobutadiene	79-142	60-146	--
Ethylene Dibromide	73-126	78-113	--
Bromochloromethane	76-125	84-112	--
2,2-Dichloropropane	80-133	76-119	--
1,3-Dichloropropane	80-126	80-115	--
Isopropylbenzene	85-132	75-124	--
n-Propylbenzene	87-136	77-122	--
Bromobenzene	85-126	82-117	--
2-Chlorotoluene	81-130	73-156	--
4-Chlorotoluene	78-132	72-126	--
tert-Butylbenzene	83-128	80-118	--
sec-Butylbenzene	87-134	81-120	--
4-Isopropyltoluene	89-133	80-121	--
n-Butylbenzene	87-135	79-120	--
1,2,4-Trichlorobenzene	83-132	78-124	--
Naphthalene	73-136	79-123	--
1,2,3-Trichlorobenzene	82-128	78-125	--
MB/LCS Surrogate Recovery			
Dibromofluoromethane	60-140**	60-140**	60-140**
d4-1,2-Dichloroethane	74-128	79-123	71-131
d8-Toluene	76-119	85-114	80-116
4-Bromofluorobenzene	78-116	85-114	82-114
D4-1,2-Dichlorobenzene	78-122	88-110	84-116
Sample Matrix Spike Recovery			
Vinyl Chloride	27-187	40-160	11-166
1,1-Dichloroethene	48-147	42-144	57-126
Chloroform	65-124	66-121	70-130
1,2-Dichloropropane	66-131	66-121	79-129
Trichloroethene	55-140	36-145	39-164
Benzene	63-122	66-119	71-132
Toluene	53-129	56-125	60-155
Chlorobenzene	60-130	55-114	79-121

Summary of Laboratory Control Limits			
Volatile Organic Compound Analyses of Soil(1)			
EPA Method SW-846-8260			
Effective 7/25/02			
	Soil		
	8260B	**SOP 804S**	**Medium Level**
Ethylbenzene	52-135	56-122	61-158
Sample Surrogate Recovery			
Dibromofluoromethane	60-140**	60-140**	60-140**
d4-1,2-Dichloroethane	71-143	73-142	66-146
d8-Toluene	79-118	75-129	86-123
4-Bromofluorobenzene	69-126	71-127	82-130
D4-1,2-Dichlorobenzene	79-119	81-117	90-112

Control Limits calculated using all analytical data from 1/1/01 through 6/27/02
(1) Laboratory Control Sample (LCS) Spike Recovery is evaluated using only the nine regulated compounds noted with an asterisk and bolded font. The other LCS spike compound recoveries are advisory and used for analytical trouble shooting should any of the nine regulated compounds be out of control.
* Regulated LCS Spike Compounds.
** Advisory Control Limits – Insufficient data to calculate historical Control Limits

Summary of Laboratory Control Limits
Volatile Organic Compounds(1)
EPA Method 524.2 (20 mL purge volume)
Effective 11/4/02

LCS Spike Recovery	Water	LCS Spike Recovery	Water
Bromochloromethane	73-128	m,p-Xylene	75-127
Chloromethane	50-147	o-Xylene	74-127
Bromomethane	66-139	Trichlorofluoromethane	58-128
Vinyl Chloride	**59-139***	1,3-Dichloropropane	69-125
Chloroethane	67-133	1,2-Dichlorobenzene	74-127
Methylene Chloride	72-127	1,3-Dichlorobenzene	74-127
1,1-Dichloroethene	**68-124***	1,4-Dichlorobenzene	74-130
1,1-Dichloroethane	72-125	1,1-Dichloropropene	74-131
trans-1,2-Dichloroethene	71-124	Dibromomethane	72-128
cis-1,2-Dichloroethene	74-131	1,1,1,2-Trichloroethane	73-126
Chloroform	**73-128***	Dibromochloropropene	58-142
1,2-Dichloroethane	74-126	1,2,3-Trichloropropane	67-134
1,1,1-Trichloroethane	71-129	Dichlorodifluoromethane	10-204
Carbon Tetrachloride	70-130	1,3,5-Trimethylbenzene	74-127
Bromodichloromethane	72-127	1,2,4-Trimethylbenzene	74-130
1,2-Dichloropropane	**75-133***	1,2-Dibromoethane	71-128
cis-1,3-Dichloropropene	70-126	Isopropylbenzene	74-129
Trichloroethene	**74-126***	n-Propylbenzene	74-126
Dibromochloromethane	69-130	Bromobenzene	74-129
1,1,2-Trichloroethane	73-129	2,2-Dichloropropane	69-133
Benzene	**75-125***	tert-Butylbenzene	71-132
trans-1,3-Dichloropropene	67-125	1,3-Dichloropropane	74-127
Bromoform	68-130	s-Butylbenzene	73-132
Tetrachloroethene	74-127	4-Isopropyl Toluene	73-133
1,1,2,2-Tetrachloroethane	70-132	n-Butylbenzene	71-131
Toluene	**75-125***	Total Chlorotoluenes	74-127
Chlorobenzene	**75-126***	1,2,4-Trichlorobenzene	66-142
Ethylbenzene	**72-127***	Hexachlorobutadiene	63-148
Styrene	73-129	Naphthalene	64-147
Total Xylenes	74-127	1,2,3-Trichlorobenzene	61-149
Method Blank/LCS Surrogate Recovery		**Sample Surrogate Recovery**	
d4-1,2-Dichloroethane	82-119	d4-1,2-Dichloroethane	75-132
4-Bromofluorobenzene	71-121	4-Bromofluorobenzene	59-126
d4-1,2-Dichlorobenzene	70-122	d4-1,2-Dichlorobenzene	64-121

Control Limits calculated using all analytical data from 1/1/98 through 6/30/02
(1) Laboratory Control Sample (LCS) Spike Recovery is evaluated using only the nine regulated compounds noted with an asterisk and bolded font. The other LCS spike compound recoveries are advisory and used for analytical trouble shooting should any of the nine regulated compounds be out of control.
* Regulated LCS Spike Compounds

Summary of Laboratory Control Limits
Volatile Organic GC-MS-SIM
EPA Method SW-846-8260-SIM
10 mL Purge Volume

Effective 11/4/02

	Water
LCS Spike Recovery	
Vinyl Chloride	60-141
1,1-Dichloroethene	69-129
Method Blank/LCS Surrogate Recovery	
d4-1,2-Dichloroethane	76-119
Sample Matrix Spike Recovery	
Vinyl Chloride	29-170
1,1-Dichloroethene	41-155
Sample Surrogate Recovery	
d4-1,2-Dichloroethane	63-135

Control Limits calculated using all data generated 1/1/98 through 6/30/02

Appendix L

Internal Audit Schedule

Schedule of Laboratory Quality Assurance Audits

Process To Be Audited	Frequency
Refrigerator/Freezer Temperature Logs	Monthly*
Oven/Incubator Temperature Logs	Monthly*
Balance Records	Quarterly*
Standard Records	Monthly#
Logbooks	Monthly#
SOPs	Monthly#
Chain of Custody	Monthly#
Internal Technical Systems	Annually
Post-Completion Project Review	Monthly**

* All sections will be audited

One section will be audited each month

** Frequency may be contract specific i.e. 10% of NFESC projects must be audited

Appendix M

Laboratory Accreditations

Laboratory Accreditations

Analytical Resources Inc. is currently certified to perform environmental analysis by the State of Washington Department of Ecology, the State of Washington Department of Health and selected other states. ARI has also been accredited to perform various analyses for HAZWRAP (Hazardous Waste Remedial Actions Program), NEESA (Naval Energy and Environmental Support Activity), and the Navy Clean program.

ARI's laboratory QA/QC Program has been audited and approved by the USEPA Contract Laboratory Program for both organic and inorganics, the U.S. Army Corps of Engineers, The Boeing Company and Battelle Northwest Laboratories.

ARI analyzes performance evaluation samples quarterly for the EPA-CLP Program and semiannually for the EPA Water Pollution (WP) and Water System (WS) series. Also, all ARI laboratories periodically analyze blind in-house Performance Evaluation Samples as part of the laboratory QA/QC Program.

List of Accreditations

1) State of Washington, Department of Ecology - Environmental Laboratory Accreditation Program
2) State of Washington, Department of Health - Drinking Water Certification Program
3) State of California - Environmental Laboratory Accreditation Program
4) The Alaska State Department of Environmental Conservation - Laboratory Approval Program
5) United States Army Corps of Engineers (US ACOE)
6) United States Naval Facilities Engineering Service Center (NFESC) (formerly known as NEESA)

Continuing Contracts Resulting from On-Site Laboratory Audits

1) The Boeing Company Corporate Environmental Affairs Division
2) Battelle Northwest Laboratories
3) The City of Seattle
4) The Port of Seattle

Appendix N

Standards for Personal Conduct

Standards of Conduct

Since effective working relationships depend upon each of us, ARI expects certain minimum standards of personal conduct.

This list highlights general Company expectations and standards and does not include all possible offenses or types of conduct which may result in discipline or discharge. Management reserves the absolute right to determine the appropriate degree of discipline, including discharge, warranted in individual cases.

Employees engaged in the following activities, or similar activities deemed equally serious, will normally be terminated:

theft or embezzlement;
disclosure of trade secrets or industrial espionage;
willful violation of safety or security regulations;
conviction of a felony;
working for a competitor or establishing a competing business.

In addition, dismissal may result from other serious offenses such as:

being intoxicated, under the influence or in possession of illegal drugs on the job;
falsification of records;
abuse, destruction, waste or unauthorized use of equipment, facilities or materials;
gambling on the premises;
chronic tardiness or absenteeism;
insubordination;
unwillingness to perform the job;
unauthorized requisition of materials from vendors.

There may be no alcoholic beverages on the Company premises, other than at times designated as Company functions. At such times, non-alcoholic beverages will be provided as well.

Personal and corporate honesty and integrity have built the character of ARI. This good character is fundamental to our well-being, future growth and progress. It is vitally important that we avoid both the fact and the appearance of conflicts of personal interest with that of the firm, its clients, and any other professional contacts.

This policy requires that ARI employees have no relationships or engage in any activities that might impair their independence of judgment. Employees must not accept gifts, benefits, or hospitality that might tend to influence them in the performance of their duties. It is expected that there will be no employment by any competing company, nor any

employment by any outside interest or engagement in outside activity which might impair an employee's ability to render the full-time service to the company that employment involves.

If any possible conflict of interest situation arises, the individual concerned must make prior disclosure of the facts so that action may be taken to determine whether a problem exists and, if so, how best to eliminate it. Likewise, any financial interest in an organization doing business with ARI or which competes with us should be revealed to Company management. (Excluded from this requirement is ownership of securities traded in major stock exchanges or other recognized trading markets.)

Our standards are those generally expected of employees in any well-regarded, ethical business organization.

ARI further expects that each employee will:

Be dressed and groomed appropriately for a business office. Employees in the laboratory areas are expected to dress in compliance with established safety procedures. Specific standards will be discussed with each employee during Health and Safety orientation. Your supervisor and the Administrative Services Manager always are available to answer questions.

Standards of Personnel Conduct – continued

Maintain the confidential nature of Company information. Removal of Company documents, records, stored materials, computer printouts, or any similar information, or copies of such material or information from the office without specific permission is prohibited. Likewise, revealing confidential information to an unauthorized person or using such information in an unauthorized way is prohibited. If there could be any possible question about the applicability of this requirement to a given circumstance, ask your supervisor.

Use Company computer capabilities and facilities only for authorized business at authorized times and locations; observe strictly all computer security measures and precautions; enter, alter or delete no computer instructions or stored material apart from that required by faithful performance of assigned duties; remove, copy, use or permit to be used no computer software developed for, purchased by, or otherwise used by ARI except as required by faithful performance of assigned duties.

Conduct business dealings with clients and members of the public in a courteous manner.

Appendix O

Quality Assurance Policies

QUALITY ASSURANCE POLICY

POLICY NUMBER: 1

SUBJECT: CORRECTIONS TO DATA/BENCHSHEETS

DATE: 8/2/96

Manual corrections made on any raw data, bench sheet, logbook or document used during sample processing will be made in the following manner:

1. Draw a single line through the information to be deleted or corrected. The original information must remain readable.

2. Enter any new information, preferably above the original information.

3. Initial and date the correction.

QUALITY ASSURANCE POLICY

POLICY NUMBER: 2

SUBJECT: LINING OUT UNUSED BENCHSHEET PORTIONS

DATE: 8/2/96

All unused portions of logbook pages and benchsheets will be lined through so that information cannot be added at a later date. This will be completed in the following manner:

1. Line out unused portions of a logbook page or benchsheet by drawing a single line or "Z" through the unused portions.

2. Initial and date the page beside the lineout.

3. Do not line out a page or section until it is certain that no additional information will be added to the unused portions.

QUALITY ASSURANCE POLICY

POLICY NUMBER: 3

SUBJECT: STOP WORK ORDERS

DATE: 8/28/96

It is the responsibility of all staff members to address situations that may require the issuance of a "stop work order". Potential and actual "stop work orders" will be handled as follows:

1. If an analyst or technician observes a situation which will or may have a negative impact on data quality, that person will notify her/his section supervisor immediately.

2. The section supervisor will assess the situation. If it appears that a "stop work order" may be required, the section supervisor will notify the appropriate manager (inorganic or organic).

3. The supervisor and manager will then decide if a "stop work order" should be issued. The manager will make a final decision on whether or not to issue a "stop work order". The incident will be reported to the Quality Assurance Program Manager using a Corrective Action Request form.

4. If a "stop work order" is issued, the manager will inform the Project Managers and the QA section. The section supervisor will notify section staff of the order.

5. The laboratory manager involved will oversee the development and implementation of a Corrective Action Plan (CAP). Upon completion of the CAP the "stop work order" may be rescinded.

6. Prior to rescinding a "stop work order", verification must be made that control has been regained and that work may begin. Only the inorganic or organic manager may rescind a "stop work order".

7. When the "stop work order" is rescinded, the Project Managers, analytical staff and QA section will be notified. The QA section will require documentation verifying that the procedure is back in control.

QUALITY ASSURANCE POLICY

POLICY NUMBER: 4

SUBJECT: SOP Review

DATE: 9/3/96

All Standard Operating Procedure (SOP) documents will be reviewed and updated at least annually by qualified staff members. Laboratory management will review and approve all modifications to the SOPs.

QUALITY ASSURANCE POLICY

POLICY NUMBER: 5

SUBJECT: Reporting Dilutions

DATE: 9/11/96

Dilution factors will be recorded as whole numbers followed by "X" (i.e., 5X, 10X, etc.). This reporting convention will be used on run logs, bench sheets, raw data and final reports for all diluted samples, extracts or digestates or standards.

QUALITY ASSURANCE POLICY

POLICY NUMBER: 6

SUBJECT: Formatting for SOPs – Computer Related

DATE: 1/31/00

Conventions for formatting computer-related instructions in SOPs

Commands should be indented and formatted as **bold courier** and one or two font sizes smaller:

```
USE PARAMS ORDER PARAMS
BROW
```

Many systems and languages are *case-sensitive*, and case should match the syntax and/or stylistic standards of the language.

If only one command, like ***SET CENTURY ON***, is needed, it can be included in the rest of the text, so long as it is also italicized.

If the user must substitute a particular value in place of a general descriptor, italicize the descriptor, make it lowercase, and *do not make it bold*:

```
USE PARAMS ORDER PARAMS
COPY TO TEMPARM FOR JOB = 'job' .AND. SAMPLE = 'sample'
```

In general, keywords, variable names, formatting codes, and descriptors should be in *courier* and *italicized*.

ANALYTICAL
RESOURCES
INCORPORATED

QUALITY ASSURANCE POLICY

POLICY NUMBER:	**7**
SUBJECT:	**Manual Adjustment of Data**
DATE of IMPLEMENTATION:	**1/1/01**

Modern chromatographic instruments include computer software to identify a detector response as a chromatographic peak, characterize that peak and determine the relative height or area of the signal. The software utilizes parameters (threshold, slope, etc) that are adjusted by the instrument operator to optimize the results.

A single set of operator controlled settings that determine peak characteristics for an entire data file is defined as an "automated procedure". An automated procedure often characterizes chromatographic peaks incorrectly. ARI requires that trained analysts identify and resolve these errors using an alternate automated procedure or a "manual adjustment" of the data. Manual adjustment is defined as the process used by an analyst to adjust an individual peak or a subset of data in a chromatographic file.

1. The settings for a routine automated procedure normally used to process chromatographic data must be described in the method Standard Operating Procedure (SOP).

2. Trained analysts may substitute one automated procedure for another in order to optimize peak characteristics. The use of an alternate automated procedure must be permanently documented using either a software generated log file or analyst notes.

3. Manual adjustment of chromatographic peak characteristics will be used to correct the results of an automated procedure that, in a trained analyst's opinion, are clearly incorrect and will result in erroneous peak identification, integration or quantification.

4. Manual adjustment will be implemented in a reasonable and consistent manner. Guidelines for performing manual adjustment will be documented in method SOPs.

5. All manually adjusted data will be clearly identified for approval in the data review process. A permanent record of all manual adjustments will be maintained in both electronic and hardcopy versions of the raw data.

6. Manual adjustment of chromatographic files will not be used to falsify data for any purpose. Falsification of data through the use of manual peak adjustment is unethical, unlawful and will result in termination of the offending analyst.

Approval:

_____

Quality Assurance Program Manager Date

QUALITY ASSURANCE POLICY

POLICY NUMBER:	**8**
SUBJECT:	**Performance Evaluation Samples**
IMPLEMENTATION DATE:	**1/1/01**

Performance Evaluation Samples (PES) will be analyzed on a periodic basis to monitor laboratory performance and/or meet the requirements of an external accreditation program. PES samples contain target analytes in concentrations unknown to laboratory personnel. PES may be submitted by a third party or prepared internally under the direction of ARI's QA personnel.

PES will be submitted blind to the laboratory whenever possible.

PES will be logged-in, prepared, analyzed and reported as a routine sample without special consideration.

Appendix P

Modifications to the LQAP

Modifications to ARI's LQAP

New Revision	Date	Modifications
11-010	5/2/03	1. Benzo(k)fluoranthene RL increased to 0.06 ppb (Method 8310) 2. MDL updated for SVOA Analysis 8270 Liquid/Liquid Extraction 3. MDL updated for SVOA Analysis 8270 Macrotip Sonication 4. MDL updated for TPH-G in Soil 5. MDL Updated for BTEX in Soil 6. MDL for SVOA Analysis of Tissue Added 7. MDL Table for Butyl Tin Species Modified.
11-009	3/17/03	1. Main font changed from Universe to Arial. 2. Added GPC-2 to Instrumentation List 3. Changed RL for RRO in Water from 0.25 to 0.50 mg/kg 4. Added MDL/RL Table for Direct Injection SVOA (Glycols) 5. New MDL for Low Level PCB (1242,1016,1260) ProSep instead of Manchester Extraction 6. Table of SOPs (Appendix E) Updated
11-008	2/17/03	1. Reporting Limits for 8021 Analysis of Soil Modified 2. Reporting Limits for BHT modified. 3. Reporting Limits for Chlorophyll a, pH and Turbidity adjusted.
11-007	2/13/03	1. Caveat concerning use of LCS Spike recoveries added to CL tables for VOA 2. Removed several references to 333 Ninth Ave. North 3. Changed Water RL for HPLC analysis of Benzo(b)fluoranthrene 4. MDL & RL for TOC updated 5. RL for GRO analysis of soil corrected.
11-006	2/8/03	1. MDL Table for Thermo Jarrel Ash ICAP-61 Removed 2. Reference to Dry Weight for Soil RLs removed from ICP-MS MDL Table 3. Control Limit Tables for Full Scan VOA modified to Mark Regulatory Compounds for LCS Recovery 4. BTEX MDLs updated 5. 1,4-Dioxane added to VOA MDL 6. MDLs for MTCA Level Pesticides Added
11-005	1/8/03	1. MDL and Control Limit Tables reconciled with information in LIMS 2. Appendix D – Instrumentation and Computer Systems Updated. 3. Section 4.4.2.5 pH Meters revised 4. Appendix D – Instrumentation Updated
11-004	12/30/02	1. MDL Table for Special VOA Analyses Modified 2. Excess MDL Table for 8260 SIM-BTEX Deleted
11-003	12/27/02	1. Upper Control Limit for Soil SVOA Analyses Changed to 120 2. MDLs for PCB using Manchester Extraction Added. 3. MDLs for Pesticides using Manchester Extraction Revised. 4. MDLs for VOA-SIM Updated 5. RLs for PCB in Sediment Revised 6. MDL Table for Butyl tin species modified 7. IL/MDL Summary for ICAP-61 Revised
11-002	12/16/02	1. MDLs for Pesticides using Manchester Extraction Added 2. RL for HCB and PCP in sediment Corrected 3. Rounding errors in some SVOA RLs Corrected. 4. HPLC-PNA MDLs Updated 5. SVOA Control Limits for Liq-Liq Extraction of Water Updated 6. MDLs for HCID analyses Updated

		7. Butyl Tin MDL Table Updated 8. VOA Control Limit Table Modified to Match Instrument Output. 9. RL for iso-Propyl Benzene changed from 10.0 to 1.0 for Soil & Water (5g/mL).
11-001	11/22/02	1. Added Appendix P – Modification to the LQAP. 2. Updated Butyl Tin Control Limits Chart. 3. Revised Control Chart for Skydrol & BHT. 4. Corrected typographical errors in the VOA-SIM Control Limits Summary. 5. Updated MDLs for pesticides using ASE extraction. 6. Added MTBE MDLs for PID2 water & soil 7. Added MDL for BTEX in water by 8260B 8. Revised RLs for HPLC analysis of soil

CQM QA/QC Program

Appendix B includes the CQM QA/QC Program, which is only available in the hardcopy format of this document.

Soil Engineering Testing, Inc. QA Manual

Appendix B includes the SET QA Manual, which is only available in the hardcopy format of this document.

The Mineral Lab, Inc. Laboratory Services

Appendix B includes The Mineral Lab, Inc. Laboratory Services, which is only available in the hardcopy format of this document.

Appendix C

Screening Method Validation Study Results

Appendix D

Laboratory SOPs

Appendix E

Field SOPs

Appendix F

EDD Format