Attachment 1

Quality Assurance Plan
Addendum

US Army Corps of Engineers
Baltimore District

DRAFT

QUALITY ASSURANCE PLAN ADDENDUM

PERFORMANCE BASED PROJECT (PBC)

Prepared for:

Radford Army Ammunition Plant

JUNE 2008

DRAFT

Quality Assurance Plan Addendum Performance Based Contract (PBC)

Radford Army Ammunition Plant,
Radford, Virginia

June 2008

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Quality Assurance Plan Addendum
Performance Based Contract (PBC)

Radford Army Ammunition Plant,
Radford, Virginia

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Radford Army Ammunition Plant

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Quality Assurance Plan Addendum for PBC2

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Printed Name/Title/Date

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List of Acronyms and Abbreviations

ATK	Alliant Techsystems
ASTM	American Society of Testing Materials
BDDT	Building Debris Disposal Trench
BLA	Bag Loading Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain-of-Custody
COD	Chemical Oxygen Demand
DOD	Department of Defense
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EQuIS	Environmental Quality Information Systems
FHSO	Field Health and Safety Officer
FRA	Field Readiness Assessment
ft	Feet
g	Gram
GC	Gas Chromatography
GO/CO	Government-Owned Contractor-Operated
GW	Groundwater
HSA	Horseshoe Area
HASP	Health and Safety Plan
HSPA	Health and Safety Plan Addendum
HSWA	Hazardous and Solid Waste Amendments
IAA	Igniter Assembly Area
ICP	Inductively Coupled Plasma

List of Acronyms and Abbreviations Continued

IRP	Installation Restoration Program
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MHSP	Master Health and Safety Plan
MMA	Main Manufacturing Area
MQAP	Master Quality Assurance Plan
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MW	Monitoring Well
MWP	Master Work Plan
NBG	Northern Burning Ground
NCP	Natural Oil and Hazardous Substances Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NFA	No Further Action
NFG	National Functional Guidelines
NIST	National Institute of Standards and Technology
NRU	New River Unit
PBC	Performance Based Contract
PM	Project Manager
PMP	Project Manager Plan
QA	Quality Assurance
QC	Quality Control
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAP	Quality Assurance Plan
QAPA	Quality Assurance Plan Addendum
R	Rinse Blank

List of Acronyms and Abbreviations Continued

RAAP	Radford Army Ammunition Plant
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RL	Reporting Limit
RY	Rail Yard
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TB	Trip Blank
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TM	Task Manager
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TSDF	Treatment, Storage, and Disposal Facility
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VPDES	Virginia Permitted Discharge Elimination System
VOC	Volatile Organic Compound
WBG	Western Burning Ground

Quality Assurance Plan Addendum
Performance Based Contract (PBC)

Radford Army Ammuntition Plant, Radford, Virginia

1. Introduction and Background

This Quality Assurance Plan Addendum (QAPA) describes the project background and quality assurance (QA) mechanisms that will be implemented to ensure that usable data will be generated during the project execution for the Performance Based Contract (PBC) awarded to ARCADIS associated with the environmental restoration program at Radford Army Ammunition Plant (RAAP) Radford, Virginia. Work will be conducted under contract W91ZLK-05-D-0015: Task 0002. This is the second PBC contract awarded for RAAP, and is thus referred to as PBC2.

This Quality Assurance Plan Addendum (QAPA) is prepared in conjunction with the Master Work Plan (MWP) and the Master Quality Assurance Plan (MQAP) to address the PBC2 specific responsibilities and authorities that will be implemented during supplemental investigative and remediation activities. The project objectives will be met through the execution of the Standard Operating Procedure (SOP) included in the MWP, or as appended to this document and site, or area specific work plans.

The Installation Restoration Program (IRP) activities at RAAP operate in accordance with the provisions of the Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984 at the Main Manufacturing Area (MMA), and the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), and the Natural Oil and Hazardous Substances Contingency Plan (NCP) at the New River Unit (NRU). The U.S. Environmental Protection Agency (USEPA) issued a final Hazardous Waste Management Permit – Part II (Part II Permit) to RAAP in September 2000. This permit addresses the corrective action requirements for all Solid and Hazardous Waste Management Units (SWMUs) at RAAP.

1.1 Project Scope and History

This QAPA supports the environmental restoration of RAAP sites identified in the PBC2 contract. The goal of this PBC is to meet the requirements for all sites, as defined in the contract and summarized in the Project Management Plan (PMP) (ARCADIS, 2008). The full scope of services for this contract is defined in PBC2. All work performed under this contract will be consistent with all applicable regulatory requirements, and relevant Department of Defense (DoD) and Army policy.

1.2 Site Location and History

The MMA is an industrial area with ongoing propellant manufacturing operations. The MMA is regulated under a RCRA permit finalized in 2000, to be renegotiated in 2010. The MMA areas addressed in this Project Management Plan (PMP) include two distinct sites, SWMU 31 (RAAP-026) and RAAP-031, and two related sites, RAAP-042 and -047. Sites RAAP-042 and -047 are related by a persistent, low-level trichloroethene (TCE) groundwater (GW) plume from an unsubstantiated source. RAAP-042 is a closed surface impoundment measuring approximately 100 ft x 150 ft. The impoundment (HWMU #5) was first used in 1970. It was unlined until 1981, when a liner was added. It was taken out of operation in 1986 and closed in 1989. During operation, the impoundment received storm water runoff, spill and washdown water from the neutralization from the acid tank farm (nitric and sulfuric acids). Before 1983, some wastewater also contained nitrocellulose. RAAP-047 is a high-security active manufacturing section of the South Bank MMA. The area is on a river terrace which slopes northward down toward the New River. The river is greater than 3,000 feet away and approximately 100 to 150 ft lower in elevation.

SWMU-31 (RAAP-026) is located in the MMA, in the northwest section of the HSA. The New River flows from northeast to southwest along the northern boundary of SWMU-31. The site consists of three connected, unlined settling lagoons which accepted effluent from Power House No. 2 until the 1980s. The lagoons are presently operational, accepting effluent from the water treatment plant. The effluent consists of overflow from drinking water settling tanks and backwash from filter cleaning. The lagoons are arranged sequentially, with the primary lagoon directly accepting effluent and subsequently discharging to the secondary and tertiary lagoons. Effluent from the secondary and tertiary lagoons is regulated under a Virginia Permitted Discharge Elimination System (VPDES) permit. RAAP-031 consists of 0.045 acres located near the nitrocellulose A-line production area. A shallow concrete ditch approximately 2-ft wide runs through the site at the base of a grassy bank.

The NRU comprises more than 2,800 acres and is located approximately 6 miles from the MMA. An initial phase of remedial investigation has been completed at the site, which led to the identification of six individual areas within the greater unit requiring additional characterization and possible remediation: the Building Debris Disposal Trench (BDDT), the Bag Loading Area (BLA); the Igniter Assembly Area (IAA), the Rail Yard (RY), the Northern Burning Ground (NBG), and the Western Burning Ground (WBG). These six sites span an area of approximately 800 acres. The NRU is

managed under CERCLA, which allows for consideration of the NRU as one site with six internal areas of concern.

1.3 Status of Environmental Restoration Program

Remediation at the MMA is being conducted pursuant to RCRA Corrective Action requirements with regulatory coordination, as appropriate, with the Virginia Department of Environmental Quality (VDEQ) and the USEPA Region III. The Commonwealth of Virginia received RCRA corrective action authority in 2000 but in conjunction with the USEPA-State corrective action transition process, remediation is currently being coordinated consistent with the Permit for Corrective Action and Waste Minimization pursuant to RCRA as amended by the Hazardous Waste and Solid Waste Amendments of 1984 issued in September 2000 by USEPA (Permit Number VA1210020730). This permit will be renegotiated with VDEQ in 2010, at which time the contractor will be required to comply with the new permit. RAAP has separate permits issued by the Commonwealth of Virginia that manage the treatment, storage, and disposal facility (TSDF) operations pertaining to RCRA Subtitle C, D, and Subpart X. The Commonwealth of Virginia has also issued a post-closure care permit for closed HWMUs listed in the RCRA operating permit.

Work is being conducted at the NRU under CERCLA with the VDEQ in the lead regulatory role and the U.S. Army as the lead Federal Agency.

2. Master Quality Assurance Plan

The MQAP was prepared as a site-wide planning document (URS, 2003). The QAPA is designed to be used in conjunction with the MQAP for work conducted by ARCADIS. It specifies field and laboratory procedures that will be used in support of the investigation, delineation, and remediation activities. This document has been prepared in accordance with USEPA *Requirements for Quality Assurance Project Plans for Environmental Data Operations*, EPA QA/R-5 (March 2001); *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, EPA/240/R-02/009 (December 2002); and the REGION III QAPP Preparation Checklist (USEPA Region III, 2001)

The available SOPs previously published in are listed in Table 2-1. Specific quality control (QC) requirements include development of Data Quality Objectives (DQOs), performance of internal QC checks, and execution of appropriate analytical procedures during investigative and remedial activities are presented herein.

Applicable ARCADIS SOPs will be included in site specific work plan addenda. If an SOP for an activity is necessary and has not previously been referenced, the SOP will be prepared as necessary.

3. Document Distribution

The distribution list for all submittals is presented in the PMP. In addition to the standard document submittal list, the QAPA will also be provided to the entities identified below.

QAPA Supplemental Distribution List	Address
Kurt Beil, PE ARCADIS Quality Assurance Manager	ARCADIS 6 Terry Drive Suite 300 Newtown, PA 18940 Tel : 267.685.1800
Jane Kennedy ARCADIS Project Chemist	ARCADIS US 3850 N. Causeway Blvd. Suite 1600 Metairie, LA 70002 Tel: 504.832.4174
Marcia McGinnity Empirical Laboratories Project Manager	Empirical Laboratories, LLC 227 French Landing Dr. Suite 550 Nashville, TN 37228
Brandon Dunmore Air Toxics Project Manager	Air Toxics, Inc. 180-B Blue Ravine Road Folsom, CA 95630
ARCADIS Field Operations Manager	Prior to initiation of field operations

4. Project Organization and Responsibilities

4.1 Project Organization

The ARCADIS organizational chart for PBC2 is presented on Figure 4-1. The Project Manager (PM), Task Managers (TM)s, and Field Operations Managers are primarily responsible for the implementation of the QA program.

The primary USEPA and VDEQ personnel involved with this project include the following:

- William Geiger: USEPA RCRA PM - who will provide oversight and other additional duties; and

- Jim Cutler: VDEQ PM - who will provide oversight and perform other additional duties.

The specific QA responsibilities of the key ARCADIS project personnel and subcontractors are described below.

4.2 ARCADIS Staff

This section describes the roles and responsibilities of the ARCADIS project team members.

4.2.1 Project Manager

For the RAAP project, Mr. Tim Llewellyn will be the PM. Mr. Llewellyn will assign the Task Managers and oversee the implementation of all schedules and budgets. He will establish and interpret PBC2 contract policies and procedures and access appropriate ARCADIS resources in order to maintain technical quality. Mr. Llewellyn will coordinate with the ARCADIS Federal Programs Manager (Ms. Lee Ann Smith) and ARCADIS Technical Advisors on issues that impact the overall quality of ARCADIS' performance on the contract.

The PM is responsible for distributing documents to the U.S. Army, USEPA, VDEQ, and Task Managers who in turn distribute it to the appropriate technical staff. Additional information regarding responsibilities of the PM is provided in the PMP.

4.2.2 Deputy Project Manager

Ms. Diane Wisbeck will support the PM in contract management as well as task implementation, document preparation, personnel coordination, and budget management. Ms. Wisbeck will perform a key role in ensuring compliance with quality performance objectives. She will identify required resources and initiate acquisition of appropriate assets to complete project requirements. She will coordinate operations to ensure compliance with the project schedules. Ms. Wisbeck with also track project budges assist with quality program implementation and coordinate document preparation and submittal.

4.2.3 Task Project Managers

The Task Managers (TMs) will be responsible for the overall quality of work performed under PBC2 as it relates to the following specific roles:

- Overseeing day-to-day of task performance including all technical and administrative operations;
- Performing assessment and oversight duties as described in the PMP, MQAP and QAPA;
- Selecting and monitoring technical staff;
- Managing the development of area specific Work Plans;
- Reviewing and approving all final reports and other work products; and
- Distributing the QAPA to the ARCADIS technical staff.

TMs are as follows:

- Mr. Christopher Sharp; and
- Mr. Chris Kalinowski.

4.2.4 QA Manager

The Corporate QA Manager for the RAAP project, Mr. Kurt Beil, is responsible for oversight of all QA/QC activities. He will remain independent of day-to-day direct project involvement, but will have the responsibility for ensuring that all project and task-specific QA/QC requirements are met. He will have direct access to corporate staff, as necessary, to resolve any QA/QC problems, disputes, or deficiencies. The QA Manager's duties include:

- Reviewing and approving the QAPA and site-specific Work Plans;
- Reviewing and approving substantive changes to the QAPA and site-specific Work Plans;
- Reviewing any new work orders with the PM to determine if the QAPA requires; and
- Conducting field audits, as appropriate, in conjunction with the corporate QA office and keeping written records of those audits.

4.2.5 Health and Safety Manager

Mr. Charles Webster will serve as the project Health and Safety Manager. The Health and Safety Manager will review and internally approve the Health and Safety Plan Addendum (HSPA) that will be designed to the specific needs and operations associated with PBC2. In consultation with the PM, the Health and Safety Manager will ensure that an adequate level of personal protection exists for anticipated potential hazards for field personnel. On-site health and safety will be the responsibility of the Field Health and Safety Officer (FHSO). The FHSO will work in coordination with the PM and the project Health and Safety Manager to ensure that all activities are conducted safely and in accordance with the HSPA as well as facility requirements.

4.2.6 Project Chemist

The RAAP Project Chemist, Ms. Jane Kennedy, is responsible for data validation and verification, the generation of QC reports, and oversight of analytical laboratories. The Project Chemist's specific duties include:

- Developing the project QAPA and QA aspects of site specific Work Plans;

- Providing external review of analytical activities by performance of assessment and oversight duties as appropriate;

- Coordinating with the PM, Site TM's, and laboratory management to ensure that QA objectives appropriate to the project are set and that laboratory and field personnel are aware of these objectives;

- Reporting nonconformance with either QC criteria or QA objectives to the appropriate managers including recommending, implementing, and/or reviewing corrective actions;

- Conducting definitive analytical data evaluation and review to provide information on data limitations based on specific QC criteria; and

- Establishing that data meet the project technical, QC criteria, assessing the usability and extent of bias of data not meeting the specific technical, and quality criteria.

4.2.7 Field Operations Leaders

The Field Operations Leaders will be determined based on the specific field activities to be performed. The Field Operations Leader is responsible for coordinating the categories of work such as GW sampling, monitor well installation, well development, soil borings, and sampling. The Field Operations Leader will also be responsible for the assignment of on-site personnel and for providing technical assistance when required. The Field Operations Leader is responsible for ensuring that technical matters pertaining to the field-sampling program are addressed. He will ensure that work is being conducted as specified in the technical plans.

In addition, the Field Operations Leader is responsible for field quality assurance / quality control (QA/QC) procedures and for safety-related issues. The Field Operations Leader will coordinate all sampling activities and will ensure the availability and maintenance of all sampling materials/equipment. The Field Operations Leader or his designee will be responsible for the completion of all sampling and chain-of-custody (COC) documentation and will ensure custody of all samples is appropriately maintained.

Prior to initiation of field activities, the Field Operations Leader will utilize a copy of the MQAP and this QAPA with applicable SOPs and other project documents to conduct a

field staff orientation and briefing to acquaint project personnel with the sites and assign field responsibilities.

4.2.8 Technical Staff

The technical staff for this program will be drawn from a pool of technical resources within ARCADIS. The technical staff will implement project and site tasks, analyze data, and prepare reports/support materials. All technical personnel assigned will be experienced professionals who possess the degree of specialization and technical competence required to perform the required work effectively and efficiently. All technical staff will be familiar with the Master Health and Safety Plan (MHSP) and the ARCADIS HSPA as well as all relevant work plans, SOPs, and policies applicable to the fieldwork performed. Each field sampling team will have a copy of the HSPA, and area specific Work Plans in their possession while conducting fieldwork.

4.3 Subcontractors

4.3.1 Laboratories

Independent laboratories providing analytical services will be utilized, as appropriate, for the various project requirements including confirmation sampling, routine monitoring, and pilot/benchscale studies. Analytical chemistry laboratories shall be accredited, under the National Environmental Laboratory Accreditation Program (NELAP) for the analytical parameters required for the project for which accreditation is available through the primary accrediting state. The laboratory QA programs will be reviewed and approved by the ARCADIS Project Chemist. The laboratory will assign an experienced PM to coordinate analytical support with the project chemistry team. The laboratory staff will include a qualified QA Manager/Coordinator, who reports directly to laboratory management independently of the technical operations of the laboratory, to oversee technical adherence to the laboratory QA programs and the RAAP MQAP and QAPA. The specific duties of the laboratory PM and QA Manager/Coordinator for the RAAP analyses include:

- Reviewing the RAAP MQAP, QAPA, and area specific Work Plans to verify that analytical operations will meet project requirements as defined in the RAAP documents;

- Documenting and implementing RAAP-specific QA/QC requirements in the laboratory and reviewing analytical data (10 percent for the QA Officer) to verify the requirements were met;

- Reviewing receipt of all sample shipments and notifying the Site Manager and Project Chemist of any discrepancies within 1 day of receipt;

- Conducting internal laboratory audits to assess implementation of the laboratory Quality Assurance Manual (QAM) and procedures and providing written records of those audits;

- Rapidly notifying the Site Manager and Project Chemist regarding laboratory nonconformance with the QAPA or analytical QA/QC problems affecting RAAP samples; and

- Coordinating with the project and laboratory management to implement corrective actions as required by the MQAP, QAPA, and internal laboratory QAM.

Empirical Laboratories, LLC (Empirical) located in Nashville, TN, will be the primary laboratory performing analytical services for environmental samples collected at RAAP. Empirical will subcontract the dioxin/furan analyses to SGS Environmental Services (Wilmington, NC). Microseeps, Inc. of Pittsburgh, Pennsylvania, will perform dissolved gases analyses as required during remedial operations. Air Toxics, Inc. (Folsom, CA) will analyze soil gas samples and other air analyses that may be required for the project.

Empirical will subcontract asbestos analyses to McCall and Spero Environmental, Inc., (McCall) located in Louisville, Kentucky. McCall is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) under the US Department of Commerce National Institute of Standards and Technology to perform bulk asbestos fiber analysis.

Appendix A of this QAPA includes the Empirical QAM, reporting and detection limits, and QC limits. Appendix B of this QAPA includes the Air Toxics QAM, reporting and detection limits, and QC limits. The QAMs for SGS and Microseeps are included by reference and will be maintained in the project files.

Geotechnical laboratories will be selected based on project requirements and will be identified in the site specific work plans. Selection criteria for geotechnical laboratories

will be based on previous performance on ARCADIS projects or satisfactory recommendations.

4.3.2 Other Subcontractors

Other subcontractors will provide services under the direct supervision or direction of the ARCADIS PM or TMs or appropriate designated staff. The drilling, surveying, and other subcontractors are responsible for performance in accordance with the individual subcontracts and applicable portions of the QAPA as defined in each subcontract package. Subcontractors are responsible for rapidly notifying the Site Manager regarding nonconformance with the MQAP, QAPA, or QA/QC problems affecting RAAP operations. Subcontractors must coordinate with the Site Manager to implement corrective actions designated in this QAPA.

4.4 Key Points of Contact

Below are the names and points of contact for ARCADIS personnel and subcontractors.

Project Responsibility / Name / Email	Address / Telephone Number
Project Manager Tim Llewellyn Email: tim.llewellyn@arcadis-us.com	ARCADIS US 1114 Benfield Boulevard Suite A Millersville, MD 21108 Tel: 410.987.0032
Deputy Project Manager Diane Wisbeck Email: diane.wisbeck@arcadis-us.com	ARCADIS US 1114 Benfield Boulevard Suite A Millersville, MD 21108 Tel: 410.987.0032
Geology/Hydrology Joseph Quinnan, PE, PG Email: joseph.quinnan@arcadis-us.com	ARCADIS-US 10559 Citation Dr. Suite 100 Brighton, MI 48114 Tel : 810.225.1943
Health and Safety Manager Charles Webster Email: charles.webster@arcadis-us.com	ARCADIS US 6723 Towpath Rd Syracuse, NY 13214 Tel: 720.344.7200
Quality Assurance Manager Kurt Beil, PE	ARCADIS-US 6 Terry Dr. Suite 300 Newtown, PA 18940

Project Responsibility / Name / Email	Address / Telephone Number
Email: kurt.beil@arcadis-us.com	Tel: 267.685.1800
Project Chemistry and Data Validation Jane Kennedy Email: jane.kennedy@arcadis-us.com	ARCADIS US 3850 N. Causeway Blvd. Suite 1600 Metairie, LA 70002 Tel: 504.832.4174
Subcontractors	
Empirical Laboratoires, LLC Marcia McGinnity Email: MMcGinnity@EmpirLabs.com	Empirical Laboratories, LLC 227 French Landing Dr. Suite 550 Nashville, TN 37228 Tel: 615.345.1115
Air Toxics, Inc. Brandon Dunmore Email: b.dunmore@airtoxics.com	Air Toxics, Inc. 180-B Blue Ravine Road Folsom, CA 95630 Tel: 916-985-1000

5. Quality Assurance Objectives

QA is defined as the overall system of activities for assuring the reliability of data produced. The site specific work plans in conjunction with the RAAP MWP and MQAP present investigative, chemical, and regulatory measures associated with the QA Objectives of the PBC2 scope. Conformance with referenced SOPs and QA protocols presented in the MQAP and this QAPA will ensure attainment of QA objectives. The overall system integrates the quality planning, assessment, and corrective actions of various groups in the organization to provide the independent QA program necessary to establish and maintain an effective system for collection and analysis of environmental samples and related activities. The program encompasses the generation of complete data with its subsequent review, validation, and documentation. Section 3 of the MQAP presents the general QA objectives and source documents for the Levels of Concern (LOCs). This section of the QAPA addresses additional QA objectives for the PBC2.

The DQO process is a strategic planning approach to ensure environmental data is of the appropriate type, quantity, and quality for decision-making. Project-specific DQOs are included in Table 2-3 for investigative activities. The overall QA objective is to develop and implement procedures for sample and data collection, shipment, evaluation, and reporting that will allow reviewers to assess whether the field and laboratory procedures meet the criteria and endpoints established in the DQOs. DQOs are qualitative and quantitative statements that outline the decision-making process and specify the data required to support corrective actions. DQOs specify the level of uncertainty that will be accepted in results derived from environmental data. Guidance for the DQOs Process (USEPA, 2004), and Guidance for DQOs for Hazardous Waste Sites (USEPA, 2000) formed the basis for the DQO process and development of RAAP data quality criteria and performance specifications.

DQOs will be established for each site specific work plan because the DQOs will vary across projects. A table summarizing the DQO process will be included in each work plan. Following is a summary of the seven steps that will be conducted to develop the DQOs.

1. **State the Problem:** Define the problem to focus the study. Specific activities conducted during this process step include

    a. the identification of the planning team and the primary decision-maker,

b. the statement of the problem, and

c. the identification of available resources, constraints, and deadlines.

2. **Identify the Decision:** Define the decision statement that the study will attempt to resolve. Activities conducted during this step of the process involve the following:

   a. identification of the principal study question(s), and

   b. definition of resultant alternative actions.

3. **Identify Inputs to the Decision:** Identify information inputs required for resolving the decision statement and assessing which inputs require environmental measures. This step of the process includes identification of the data that will be required to make the decision, identification of the information sources, identification of data required for establishment of study action levels, and confirmation of appropriate field sampling and analytical methods. The type of information that is needed to resolve the decision statement and the sources of this information may include the following:

   a. Risk-Based Concentration (RBCs) in the most recent version of the USEPA Region III screening standards, Federal Maximum Contaminant Levels (MCLs), and Commonwealth of Virginia Water Quality Criteria;

   b. Method Detection Limits (MDLs) and Reporting Limits (RLs) for the site chemicals of interest;

   c. Results of an examination of site use, operational history, environmental setting, GW and surface water use and characteristics, and soil exposure characteristics;

   d. Results of physical testing of soil for geotechnical properties; and

   e. Validated results of chemical analyses performed on site samples.

4. **Define the Boundaries:** Define decision statement spatial and temporal boundaries. This step specifies

a. the spatial boundary,

b. the target population characteristics, applicable geographic areas and associated homogeneous characteristics, and

c. the constraints on sample collection.

5. **Develop a Decision Rule:** Define the following:

   a. the parameters of interest,

   b. the action levels, and

   c. develop a decision rule.

6. **Specify Acceptable Limits on Decision Errors:** Specify the decision-maker's tolerable limits on decision errors. This step includes identification of**:**

   a. parameter range of interest,

   b. decision errors, and

7. **Optimize Data Design:** Identify data collection activities commensurate with data quality specifications. This final step in the process consists of:

   a. reviewing DQO outputs and existing environmental data,

   b. developing data collection design alternatives, and

   c. documentation of operational details and theoretical assumptions.

6. Sample Management

Sample management objectives will be met through adherence to the sample identification procedures (identification convention), documentation requirements, and COC procedures in the MWP.

6.1 Sample Locations, Numbers and Types

The site specific work plans will provide itemizations of the samples to be collected, sample depths (if applicable), and analytical parameters for environmental samples proposed during this investigation. Rationale for locations and types of samples with associated QC samples identified. Data use will also be defined in the specific work plans.

6.2 Sample Container, Preservation Method, and Holding Time Requirements

The volumes, containers, and preservatives required for the sampling activities are listed in Table 6-1. The laboratory will provide new, pre-cleaned sample containers. The laboratory shall use an approved specialty container supplier that prepares the containers in accordance with USEPA bottle preparation procedures. The laboratory must maintain a record of all sample bottle lot numbers shipped to RAAP in the event of a contamination problem. Trip blanks (TB) will be transported to the site inside the same cooler/box as the Volatile Organic Compound (VOC) vials.

Sample container lids will not be mixed. All sample lids must stay with the original containers as provided by the supplier. Bottle lids (with any associated bottle) exhibiting cracks, splits, or chips shall be appropriately discarded.

Pre-preserved containers obtained from the laboratory shall be used for all samples requiring preservation. Reagents used for preservation will be reagent-grade chemicals supplied by the laboratory. Each bottle received from the laboratory must be clearly labeled with the type of chemical preservative in the bottle and the test parameters that will be determined from sample collected in the container. Sample containers will not be stored at the site for longer than 30 days.

Bottle orders will be submitted to the laboratory 5 working days prior to commencement of field operations to allow supplies of clean, fresh containers and preservatives to be shipped to the facility.

Sample preservation will be verified on receipt at the laboratory with the exception of aqueous VOC samples. VOC sample preservation shall be verified prior to analysis. The preservation or pH check will be recorded on the sample receipt form or other appropriate logbook. If the samples are improperly preserved, a corrective action form will be submitted to the laboratory PM for follow-up action. The laboratory will notify the ARCADIS Field Operations Manager or Project Chemist to implement corrective actions in the field to ensure sufficient preservative is added at the time of sample collection.

Sample holding times will be based on published EPA guidance and will be calculated for the date of collection. For parameters with extremely short holding times (48 hours or less), the calculation will include time of collection. A list of preservatives and holding times for each type of analysis are presented in Table 6-1. Additional preservation requirements and holding times for non-target analyses are listed in 40 Code of Federal Regulations (CFR) Part 136. Preservatives and holding times not listed in Table 6-1 applicable to a specific area will be provided in the site specific work plan.

6.3 Sample Identification

Each sample will be identified by a **unique** sample identification number in the logbook and on the COC record using an alphanumeric code. Field samples will be linked to geographic location via location codes. Where possible, location codes will link historical sample data with new data. Field samples will be identified using the following convention where historical identifications (IDs) are not available, contradict or duplicate the IDs previously used:

- Historical sampling locations/IDs will be utilized where possible to facilitate data linking.

- The SWMU, OU, Area, or Monitoring Well (MW) number in the format “SWMU##”, “OU##”. “A##”or “MW##” as based on the associated SWMU, operable unit, area or location of the sample collection point at the facility;

- GW, surface water, and sediment sample IDs will end with the date (in “mmddyy” format);

- Soil samples will end with the depth interval (in ft).

- Blind duplicate samples will be labeled sequentially, starting at 1, in the form OU##DUP01[location type code](mmddyy).

Following are some examples:

- GW Sample collected from MW 47 on June 1, 2008, would be: MW-47 (060108); and

- Surface Soil Sample 4 collected from 0 to 6 inches at SWMU 57 would be: SWMU57-SS004(0-0.5).

- General location type codes are listed below:

  - MW - monitor well or the current convention will be continued using MI, RI, PZ, etc.;
  - TW - temporary well;
  - SB - soil boring (by drilling);
  - GP - soil by direct push (or Geoprobe®);
  - SS - surface soil by trowel or other hand collection method;
  - EX - excavation;
  - SW - surface water by any collection method; and
  - SE - sediment by any collection method.

In addition to the above nomenclature, the COC will be completed to include the Sample Type and Sample Matrix using the codes defined below. Acceptable sample type codes are listed below:

- N - normal or primary sample;

- FD - field duplicate;

- EB - equipment blank; and

- TB - trip blank

The sample matrix will be identified using the following codes:

- IDM – investigation derived material;

- SO - soil sample;
- SE - sediment sample;
- WG - groundwater;
- WS - surface water;
- WT – wastewater; and
- SL - sludge.

These are the commonly used sampling codes. Additional coding will be developed as necessary to maintain electronic database integrity.

Field duplicate samples will be given a “blind” unique number that is different from the original sample while incorporating the standard sample pattern. This number with the corresponding field sample ID will be recorded in the field logbook, so that the duplicates can be identified at a later date.

Samples collected with an additional volume for matrix spike/matrix spike duplicates (MS/MSDs) will be designated on the COC in the remarks column.

Sample coolers will be identified with a unique number that will incorporate the cooler number and the date shipped to the laboratory. Cooler Number 1 for samples shipped on May 5, 2008, would be would be identified as 1-050508. The COC included in this cooler will carry the same number as the cooler.

Equipment blanks will be identified using the sample type code (i.e., EB) followed by the date as “MMDDYY” as a parenthetical statement. If more than one equipment blank is generated for a single day an alpha numeric character will be added to differentiate the blanks. For TBs, the sample code of “TB” will be followed by the cooler identification number. For example the TB associated with Cooler Number 3-050508 submitted on May 5, 2008 would be identified as TB3-050508.

COC records will be completed and shipped with the samples to the laboratories. Each COC will include the cooler number which will also identify the COC for sample tracking purposes. A copy of the COC will be retained with the field records. If samples

are shipped by commercial carrier, the shipping records will be maintained in the project files with the field records.

SOP 50.1 in the MWP provides details on sample label completion.

6.4 Sample Handling and Custody Requirements

Field and laboratory personnel will, at all times, be aware of the need to maintain all samples, whether in the field or in the laboratory, under strict COC protocols and in a manner to retain physical properties and chemical composition. The following sections detail sample handling and sample custody requirements from collection to ultimate disposal.

6.4.1 Sample Handling

The transportation and handling of samples will be accomplished in a manner that not only protects the integrity of the sample, but also documents sample custody. Regulations for the packaging, marking, labeling, and shipping of hazardous materials are promulgated by the U.S. Department of Transportation (DOT) in 49 CFR 171 through 177. The procedures for sample packing and shipping in accordance with regulatory requirements are documented in the HSPA (Transportation of Hazardous Materials).

6.4.2 Sample Packaging

MWP SOP 50.2 provides information on sample packaging. This section includes addition requirements and details for PBC2.

Samples will be packaged carefully to avoid breakage or cross contamination and will be shipped to the laboratory at proper temperatures. The following general packaging guidelines will be followed in addition to the DOT requirements:

- Sample containers will generally be segregated according to sample matrix and expected contaminant concentration. Soil samples will not be shipped with water samples, and low-concentration samples will not be shipped with medium- and high-concentration samples;

- Sample bottles from specific sampling locations will be placed in the same cooler where possible;

- In cases where samples for volatile analysis will be shipped in several coolers on a single day, VOC vials may be consolidated into a single cooler to minimize the number of required TBs;

- Temperature blanks may be provided by the laboratory or prepared in the field prior to sealing coolers;

- Under no circumstances will packing material such as sawdust or sand be used;

- Custody seals will be affixed to the sample cooler in such a way as to indicate any tampering during shipment and then dated and initialed; and

6.4.3 Sample Custody

The primary objective of the COC procedures is to provide an accurate, traceable record of the possession and handling of a sample from collection through completion of all required analyses and final disposal. Formal sample custody procedures begin when sample collection is initiated. Sample identification documents will be carefully prepared so that sample identification, COC, and integrity are maintained and sample disposition controlled.

A sample is in custody if it is:

- In a sampling team member's physical possession;

- In a sampling team member's view;

- Locked in a vehicle;

- In a custody-sealed container during shipment via commercial courier; or

- Held in a secured area that is restricted to authorized personnel.

The laboratory must follow internal written and approved procedures for shipping, receiving, logging, and internally transferring samples.

6.4.3.1 Field Custody Procedures

Pre-cleaned sample containers will be shipped to RAAP or other location designated by the Field Operations Leader. The Field Operations Leader may record receipt of the sample containers in the project logbook. The following field custody procedures will be used for collection of samples:

- As few persons as possible should handle samples;
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under COC protocols;
- The Field Operations Leader will determine whether proper custody procedures were followed during field operations and decide if replacement samples are required.

6.4.3.2 Chain-of-Custody Record

MWP SOP 10.4 provides COC form protocols. In addition, the COC record must be fully completed by the technical staff designated by the Field Operations Manager as responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations), the person completing the COC record should note these constraints in the "Remarks" section of the COC record. The COC record should also indicate any special preservation techniques necessary or whether the samples need to be filtered and clearly indicate field QC samples for MS/MSD, TBs, and equipment blanks. The original signed COC record accompanies the samples from the field to the laboratory where receipt is documented by appropriate signatures and dates. Copies of the COC records are maintained with the project file.

7. Documentation

Section 5.6 of the MQAP and MWPSOPs provide the primary methodology for 10.1 through 10.4 field documentation. Additional information regarding documentation and management to be employed under PBC2 are listed below.

7.1 Corrections to Field Documentation

As with all bound data logbooks, no pages will be removed for any reason. If corrections are necessary on any field documentation, they will be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside it. The correction must be initialed and dated. Corrections will include an explanation footnote, as applicable.

7.2 Photographs

Photographs will be taken as directed by the team leader. Documentation by a photograph will ensure the validity as a visual representation of an existing situation. A log will be developed to track the media that the photos are filed on (e.g., compact disc, floppy disk). Photographs, as developed or transferred to electronic media, shall be compiled into a photograph log and information recorded in field notebooks added to the log with appropriate photographs. The following information will be noted in the log for digital or non-digital photographs as applicable to the media utilized for preservation:

- Date, time, location, and direction photograph was taken;
- Reasons why the photograph was taken; and
- Sequential number of the photograph and the film roll number or electronic media identification.

7.3 Laboratory Data Reporting/Record Retention

Analytical data reports for samples collected in conjunction with contaminant delineation, risk assessment, or remediation attainment verification at RAAP will include the following items, as applicable, and will be defined as a Level 4 Data Package. The elements of the Level 4 (CLP-like) Data Package include all of the Level 2 (defined below) components and instrument tuning, initial and continuing calibrations,

raw data associated with instrument performance and sample analysis. Level 4 reports will also contain a summary report or batch identification report clearly linking all QC results to actual field sample results. The case narrative will present an explanation of all QC results reported outside control limits and samples analyzed at dilutions where all results are non-detect. The laboratory report will include copies of any nonconformance or corrective action forms associated with data generation.

The majority of analytical data packages will be defined as a Level 2 Data Package and will not include raw or calibration data. Level 2 Data Packages for RAAP will include a fully-executed COC sample receipt checklist cross-reference table of field samples that identifies laboratory and sample number preparation and analytical batch numbers, analytical results, collection and analysis dates, RLs, dilution factors, surrogate recoveries, method blank data, laboratory control samples (LCSs), matrix spikes, laboratory replicates, laboratory control limits, and explanation of data flags, as well as a case narrative and fully executed COC.

Soils will be reported on a dry weight basis. The RLs and MDLs will be corrected for percent moisture (soils only) and all dilution factors. Any compounds found less than the RL, but greater than the MDL should be reported and qualified with a “J” flag as estimated.

The above reporting protocols do not apply to asbestos reports. The asbestos reports will list the type asbestos, if present and identifiable, or will indicate that the analysis was negative. Asbestos results will not be uploaded to the project database.

The laboratory will provide an electronic data deliverable (EDD) that matches all data reported on the hard copy analytical report. Electronic data report requirements are described in Section 9.3.

All records related to the analytical effort will be maintained at the laboratory or in the office (for field screening data) in access controlled areas for at least 1 year. All records will be maintained in a secure location for a period of 6 years after the final report is issued.

7.4 Electronic Data Retention

Electronic data and media retention policies will correlate with hard copy data retention at the laboratories as well as other points of electronic data generation. Additionally, electronic data must be subject to back-up routines that will enable recovery of data

that may become corrupted or lost due to instrument, computer, and/or power failures. Electronic media will be stored in climate-controlled areas to minimize potential for degradation. Storage areas will be access limited.

8. Analytical Procedures

This section supplements Section 7.0 of the MQAP. Analytical methods will be USEPA approved unless non-standard methods are required to evaluate the presence of unanticipated or unusual compounds. Additional USEPA-approved methods that may be utilized are published in references listed below. The primary analytical methods anticipated to be utilized for samples collected during RAAP activities are listed in Table 6-1. The analytical methods are referenced in:

- Test Methods for Evaluating Solid Waste, Physical Chemical Methods, 3rd edition, SW-846, 1997 as amended;
- 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act;
- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 21st Edition, 2005;
- Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983; and
- Asbestos analysis will be performed by EPA-600/M4-82-020.

The primary parameter lists that may be reported and associated MDLs, RLs and screening standards are identified in Tables 8-1 through 8-6.

Where non-standard analytical chemistry methods are required, the Project Chemist will review performance data with the laboratory for any non-standard method prior to utilization of the procedure. The method for determination of dissolved light hydrocarbons is a non-standard method developed by Microseeps to detect very low concentrations of target compounds in groundwater. This is the only method currently anticipated that is not an EPA approved method.

Specific performance criteria, including QA protocols, for each analytical method are documented in the published methods and laboratory SOPs and the laboratory QAM. The laboratory SOPs will be examined as necessary. Note that “QAM” is a generic term for the laboratory QA document, which describes the laboratory program to ensure data of known quality are generated. The Empirical QAM is provided in Appendix A. The Air Toxics QAM is provided as Appendix B. The SGS Environmental

Services (Dioxin/Furans) and Microseeps (dissolved light hydrocarbons) QAMs are included by reference to this document.

8.1 Physical/Geotechnical Analysis

Soil samples may require the determination of physical/geotechnical parameters. Analyses will be conducted for the following:

- Grain-size analysis (ASTM D 422);
- Atterberg limits (ASTM D 4318);
- Soil moisture content (ASTM D 2216);
- Total organic carbon (Walkley-Black Method);
- pH (ASTM D 4972): and
- Cation Exchange Capacity.

8.2 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Primary calibration information is presented in Section 7.0 of the MQAP. Laboratory and field instruments and equipment used for sample analysis will be serviced and maintained by qualified personnel. Procedures will be implemented to ensure that instruments are operating properly and that calibrations are correct prior to analysis and reporting of any sample parameters.

8.2.1 Field Equipment Maintenance Field Equipment Maintenance

ARCADIS primarily rents equipment as necessary to complete field operations and acquire the necessary data. All equipment will be inspected upon receipt to ensure that it is in working order. Field personnel will be familiar with the appropriate calibration and use of all rental equipment. Supplier, type of instrument, and instrument identification numbers will be recorded in the field documentation. Calibration of all rental equipment will be verified.

Additional information for Field instrumentation is included in Section 7.4 of the MQAP.

8.2.2 Laboratory Equipment Maintenance

The laboratory must maintain an adequate stock of spare parts and consumables for all analytical equipment. Routine preventive maintenance procedures should be documented in the laboratory SOPs and/or QAM. Maintenance performed on each piece of equipment must be documented in a maintenance logbook. Daily checks of the laboratory deionized water and other support systems will be performed. The laboratory will have backup instrumentation or a process in place for most of the analytical equipment to minimize potential adverse impacts on data quality due to instrument malfunction. For example, the laboratory should have duplicate instrumentation and/or maintain service agreements for rapid response with the manufacturer major laboratory instruments (e.g., GC/MS, ICP).

8.3 Instrument Calibration and Frequency

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methodologies and SOPs. The laboratory QAM (Appendix A) provides brief descriptions of instrument calibration procedures to be performed by the analytical laboratories. Personnel properly trained in these procedures will perform operation, calibration, and maintenance of all instruments. Documentation of all routine and special maintenance and calibration information will be maintained in an appropriate logbook or reference file and will be available for inspection. All laboratory instrument calibration is set forth in analytical method SOPs.

Field instrument calibration will be performed in accordance with the applicable SOP. Table 8-7 lists typical monitoring equipment used during fieldwork. This equipment is representative of instruments typically required for RAAP GW and field sampling operations. All field personnel receive annual refresher training on the field operation of all health and safety related equipment, which includes calibration procedures. Brief descriptions of calibration procedures for major field instruments are provided in Table 8-7. All equipment calibration performed in the field must be recorded on the field instrument calibration forms and the documentation will be retained in the project file.

8.4 Inspection/Acceptance Requirements for Supplies and Consumables

Acquisition and/or purchase of material, equipment, and services will be prepared, reviewed, and approved in accordance with the requirements laboratory SOPs or as set forth in the ARCADIS subcontracting procedures, as applicable.

8.4.1 Standard Reagent Receipt and Traceability

For analytical laboratory operations, all standards are obtained directly from USEPA or through a reliable commercial supplier with a proven record for quality, traceable standards. All commercially supplied standards must be traceable to USEPA or National Institute of Standards and Technology (NIST) reference standards, and appropriate documentation will be obtained from the supplier. The certificates will be kept on file in a central location. When standards are received, they will be documented with the following: date received, chemical, lot number, concentration, and date opened or expiration date. When standards are prepared from these source materials, information will be included in a logbook with date of preparation, lot source, amount used, final volumes, resulting concentration, and preparer's initials. Laboratory SOPs and standards/reagent records will be reviewed during laboratory audits or if QC problems arise to ensure traceability requirements are met.

For field operations, standards are primarily applicable to chemical preservatives as described in Section 6.2 and field instrument calibration solutions for pH, conductivity, and turbidity. Chemical preservatives are typically obtained from the laboratory that is responsible for maintaining the traceability records. Field instrument calibration standards are obtained from chemical suppliers and records maintained by ARCADIS.

8.4.2 Field Sampling Equipment Procedures

Field supplies and equipment will be obtained from a reputable and reliable distribution company. The Field Operations Leader will inspect all supplies and equipment upon receipt at the site to verify that the correct materials were received. ARCADIS has established a program for maintaining field equipment to ensure that the equipment is available in good working order when and where it is needed. This program consists of the following elements:

- A list of reputable and reliable equipment rental suppliers to provide additional or specialized instrumentation as necessary to meet project requirements;

- An equipment manual is obtained from the rental supplier and kept on site during field activities as a guide to calibration and maintenance;

- Field personnel are trained in the proper use and care of equipment on an as-needed basis;

- MWP and/ or ARCADIS SOPs for field instrument used will be utilized. New SOPs shall be prepared, as necessary, to encompass appropriate field activities;

- Applicable SOPs will be available to field personnel for all work performed;

- The Field Operations Leader is responsible to make sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the job site; and

- A calibration/maintenance log accompanies each piece of equipment and is used to identify drift in the calibration over time, which might indicate the need for replacement of sensors or factory calibration.

8.5 Field Quality Control Elements

QC components that will be used by ARCADIS during operations at RAAP are presented below and in Section 8.0 of the MQAP. The quality components include the field QC samples and the laboratory QC elements. Rinse blanks (R), TBs, and field duplicates will be collected during the acquisition of environmental samples at RAAP. Table 8-8 presents guidelines for the collection of QC samples that will be taken in conjunction with environmental sampling. Field QC acceptance criteria are summarized in Table 8-9.

Miscellaneous QC samples may also include the analysis of source water, filters, and monitor well drilling fluids (if used). Because the water supply source is used in decontamination and well drilling activities, it may be necessary to determine the possibility for the introduction of outside contaminants. Filters may be used to evaluate dissolved constituents in GW. Filter blanks will be prepared to evaluate the potential contribution of constituents of interest to the samples. Filter blanks will be collected, preserved, and analyzed in the same manner as the field samples that they represent. Drilling fluids that are used during well installation may also be analyzed in order to assess the possibility of mud constituents affecting GW samples. Miscellaneous field QC samples will be defined and discussed in the OU-Specific Work Plan.

8.6 Laboratory Quality Control Elements

The laboratory QC elements are summarized in Table 8-10. Specific laboratory analytical QC criteria and corrective actions are summarized in Tables 8-11 through 8-17. Some analytical methods, such as air analysis incorporate only some of the QC elements listed below.

Analytical performance is monitored through various QC samples and spikes, such as laboratory method blanks, surrogate spikes, laboratory control sample (LCS), MS/MSDs and replicate samples as applicable to the method performed. All QC samples are performed on the basis of a laboratory batch. Two basic types of batches are used: the preparation batch and the analytical batch. The preparation batch includes all samples processed as a unit during organic sample preparation, metals digestion, or wet chemistry preparation. Preparation batches will not exceed 20 samples excluding associated QC samples. The analytical batch consists of all samples analyzed together in the actual analytical sequence and is also limited to a maximum of 10 or 20 samples based on the method. The QC samples associated with sample preparation include method blanks, laboratory control samples (and duplicates), and matrix spikes (and duplicates). Surrogates are introduced into samples during preparation for extractable organic constituents or prior to purging for VOCs. For some analyses, such as volatile organics, the analytical batch is equivalent to the preparation batch. The analytical sequence includes calibration standards, instrument blanks, and reference standards.

Instances may arise where elevated concentrations of target analytes/compounds, non-homogeneous samples, or matrix interferences preclude achieving the detection limits or associated QC target criteria in a specific sample. In such instances, data will be examined on a case-by-case basis during the data validation process to determine the usability of the reported values. The laboratory will report the reason for deviations from these detection limits or noncompliance with QC criteria in the case narrative. The laboratory QC samples listed below will be prepared and analyzed at the frequency presented in Table 8-18.

The laboratory-specific QC criteria are provided in appendix A (Empirical and SGS) and B (Air Toxics).

Following is a discussion of each type of QC sample utilized in the analytical laboratories.

8.6.1 Laboratory Method Blank

A laboratory method blank is an analyte-free material of similar matrix processed in the same manner, in the same analytical batch, and at the same time as a project sample. The blank is prepared using American Society of Testing Materials (ASTM) Type II water when analyzing water samples and, where practical, pre-cleaned sand or other solid material, such as sodium sulfate, when analyzing solid samples. The laboratory method blank sample is prepared in the same batch with the project samples at a frequency of 1 laboratory method blank per batch of 20 (or fewer) project samples for the given matrix type. The laboratory method blanks serve to demonstrate a contamination-free environment in the laboratory, reagents, and glassware utilized in sample preparation and analysis. The goal is for method blanks to be free of contamination or at a maximum less than the RL. Low-level contamination may be present, but must be less than RLs for undiluted samples. If contaminants are present in the method blank but not in project samples, no further action is required. Where blank contamination exceeds general method guidance criteria, the laboratory shall re-prepare and re-analyze the samples or shall contact the ARCADIS Project Chemist for determination of appropriate corrective action. Qualification of constituents detected in method blanks and in associated field samples will be based on the criteria set forth in the validation section of this QAPP. All sources of contamination that are not common laboratory contaminants as defined in the method SOPs must be investigated as part of the corrective action process.

8.6.2 Surrogate Standards

For certain organic methods, all samples, including the method blanks and QC samples, are spiked with a set of specific surrogate standards to monitor the accuracy of the analytical determination. Surrogate spikes are added at the start of the laboratory preparation process. Surrogate compounds are not typically found in environmental samples. QC criteria for surrogate recoveries are method- and matrix-specific. Surrogate recoveries must be within QC limits for method blanks and LCS samples to demonstrate acceptable method performance. If surrogate recoveries are outside QC criteria for method blanks or LCS samples, corrective action is required and the Project Chemist should be notified. The percent recovery of surrogates in a specific sample provides an indication of the total accuracy of the analytical method in that specific sample only. Surrogate recoveries that are outside QC criteria for a sample indicate a potential matrix effect. Matrix effects must be verified based on review of recoveries in the method blank or LCS, sample reanalysis, or evaluation of interfering compounds. Sample clean-up procedures required by the laboratory SOPs

must be implemented to alleviate potential matrix problems. Surrogate recoveries are calculated using the following formula.

$$\%R = \frac{SR}{SA} \times 100$$

Where:

%R = % Recovery

SR = Sample Result

SA = Surrogate Concentration Added

8.6.3 Laboratory Control Samples and Laboratory Control Sample Duplicates

An LCS or LCS Duplicate (LCSD) consists of ASTM Type II water and, where practical, pre-cleaned sand or sodium sulfate for solid matrices, or a purchased performance testing sample. Type II water is defined (D1193-91- Standard Specification for Reagent Water) by ASTM as “water that has greater than 1 megaohm-cm resistivity”. The referenced ASTM method covers requirements for water suitable for use in methods of chemical analysis and physical testing. The source of the chemicals utilized for LCS spiking will be from a different supply source than the calibration standards. Where second source standards are not available, the LCS must be spiked with materials from a separate manufacturing lot of the standard. The analytical laboratory will maintain complete records of standards tracking and preparation which will be available for review as necessary. Any deviation from utilization of second source standards will be approved by the Project Chemist.

The LCS is generally spiked with all of the analytes of interest near the mid-point of the calibration range as defined by the method. In some instances, spiking with a subset of the target compounds will be acceptable for the LCS where permissible in the SW-846 method protocol and with approval of the Project Chemist. The LCS is processed under the same sample preparation, surrogate and internal standards addition, and analytical protocols as the project samples. LCSs are analyzed at the frequency of 1 per batch of 20 samples or fewer of similar matrixes. The recovery of target analytes in the LCS provides an evaluation of method performance and accuracy. Method control may be established based on the subset of compounds listed in the method. LCSDs are analyzed with some methods but are not required QA components. LCSDs are

prepared and analyzed by the same protocols as the LCS. LCSD analyses provide precision evaluation of the method performance in addition to the accuracy information.

Laboratory QC criteria for LCSs and LCSDs are established for each method and matrix. Appendices G and H list the control limits for the laboratories performing analyses for MLAAP. The laboratory will update the QC limits annually. The LCS recovery of the method-specific control compounds/analytes must be within the laboratory-established control limits to demonstrate acceptable method performance. If the LCS recoveries are outside QC criteria for more than a few target analytes, recoveries are significantly low (<10 percent) and corrective action is required. After corrective action is complete, sample re-analysis is required for the failed parameters. If LCS recoveries exceed the QC criteria, and that parameter is not detected in any of the samples, re-analysis is not necessary. For any other deviations from the LCS control limits that cannot be resolved by sample re-analysis within holding times, the Project Chemist must be notified immediately. If critical samples are affected, the ARCADIS Task Manager may determine that resampling is required.

8.6.4 Matrix Spike and Matrix Spike Duplicate Samples

The MS and MSD samples consist of a project sample processed as three separate samples. Additional sample volume will be collected in the field, identified on the COC, and provided to the laboratory for use as the MS and MSD samples. In addition to the regular addition of monitoring standards (internal standards, surrogate), spiking analytes are added to the second sample aliquot. Generally, all method target analytes, if compatible, are added. A subset of target analytes may be used if indicated in the method SOP. An MS and MSD will be prepared for every batch of 20 samples (or fewer) for a given matrix unless sufficient sample volume is not available. Where site specific MSs cannot be performed, the laboratory shall include a batch MS/MSD or blank spike for additional evaluation of method performance in accordance with SW-846 method protocols and the laboratory SOP. Percent recoveries for batch specific MS/MSDs will be utilized only to evaluate method performance. Site samples will not be qualified based solely on the spike recoveries in matrices from other locations where the batch LCS is in control. Equipment and TBs must not be utilized for matrix spike evaluation. MS/MSD recoveries are a measure of the performance of the method on the matrices of samples being analyzed. MS recoveries outside the control limits for batches where the LCS is demonstrated to be in control indicate potential matrix effects. Sample clean-up procedures may be warranted for samples with severe matrix effects. The laboratory shall notify the Project Chemist of instances of extreme matrix effects on the analytical data to determine appropriate corrective action.

Matrix spike QC is not applicable to air samples.

The percent recovery (%R) formula is as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Where:

SSR = Spike Sample Result

SR = Sample Result

SA = Spike Added

MS and MSD recovery control limits will be based on laboratory established control limits for the methods performed. The Project Chemist will review the laboratory control limits prior to approval for use for project samples.

The RPD between the MS and MSD recoveries is calculated by the laboratory utilizing the following formula.

$$RPD = \left(\frac{PR - DR}{\frac{1}{2}(PR + DR)} \right) \times 100$$

Where:

PR = Primary Sample Result

DR = Duplicate Sample Result

The laboratory-derived advisory control limit for RPD will be utilized for evaluation of precision for MS pairs. Laboratory control limits are provided in Appendices G and H.

8.6.5 Laboratory Replicate Sample

A laboratory replicate consists of a second aliquot selected by the laboratory from the same project sample. These types of QC samples are primarily used in inorganic analyses including general chemistry techniques. Selection of replicate samples from a heterogeneous matrix requires homogenization to ensure that representative portions are analyzed. One sample per batch of 20 samples or fewer per matrix is analyzed in lieu of an MSD. The duplicate is prepared for methods that typically show concentrations of target analytes above MDLs, such as wet chemistry methods. The RPDs between the recoveries in the original and duplicate spikes measure the precision of the analytical method on the actual project samples. These limits will be utilized to evaluate laboratory precision for replicate samples prepared in the laboratory for methods where MSDs are not appropriate. If all other QC criteria are met, RPD results outside control limits indicate potential matrix effects and non-homogeneity of the sample. The laboratory shall investigate significant deviations in the RPD results by observing the sample to determine any visual heterogeneity or reviewing sample data for matrix interference. If visual observation does not indicate a potential problem, the sample may be re-analyzed. Potential matrix effects are reported and discussed in the case narrative. The RPD is calculated using the same formula as the RPD for the MS/MSD.

8.6.6 Calibration Verification Standards

A standard is obtained from a different source or, at a minimum, a different lot from that of the calibration standard. A check standard result is used to verify an existing calibration or calibration curve. The check standard provides information on the accuracy of the instrumental analytical method independent of various sample matrices. Calibration verification standards are analyzed with each analytical batch as applicable to the analytical method and SOP.

8.6.7 Method-Specific QC Samples

The laboratory will follow all specific quality processes as defined by the analytical method and laboratory SOP. Method-specific QC samples may include analysis of other QC samples or standards identified in the specific method SOP. Method-specific QC samples or standards include internal standards for gas chromatography (GC) and/or GC/mass spectroscopy (GC/MS) methods, post-digestion spikes and serial dilutions for metals analysis, and interference check samples for ICP analysis.

8.6.8 Performance Checks

The laboratory will perform analyses of performance test samples as required to maintain NELAP and other applicable accreditations. The Project Chemist will review laboratory performance test sample results on a semiannual basis. In the event that the laboratory fails any performance test parameters that impact the project samples, the laboratory will immediately notify the Project Chemist to identify appropriate corrective action implementation and to determine if any project data have been impacted.

9. Data Reduction, Validation, Reporting, and Management

In general, EPA-approved Methods will be performed for analytical work associated with PBC2. The method for quantitation of dissolved light hydrocarbons will be performed by Microseeps Laboratories, Inc., Pittsburg, PA. This method is a non-standard method to achieve very low detection limits for the compounds of interest during the monitoring of in-situ remediation systems. All other methods are EPA approved.

All laboratories performing analytical methods will be accredited under the NELAP. Additional details for the laboratory deliverables may be found in Section 9.8.3 of the MQAP and Section 4.2.4 of this document. Analytical data reports will be included in the primary investigation or study report in which the data are presented.

9.1 Detection and Reporting Limits

The laboratory MDLs and quantitative RLs are provided in Tables 8-11 through 8-17.

9.2 Rounding Rules

This section supplements Section 9.2 of the MQAP. Rounding to significant figures will be in accordance with current EPA method guidelines. The reported values must match the electronic data and utilize the same rounding routines.

9.3 Electronic Data Management

Electronic data management provides the ability to track samples and results from work plan implementation to the final report. The surveyor will provide coordinates for all sample locations in electronic format. The Field Operations Leader will review all field data for accuracy. Field data, as appropriate or applicable, will be manually entered into spreadsheet for incorporation into the project database. Risk evaluation screening standards will also be uploaded to the database.

ARCADIS will use the Environmental Quality Information Systems (EQuIS) data management system to handle environmental data for the RAAP project. EQuIS is a comprehensive geo-environmental data management database designed to store analytical test data and related data. EQuIS can be used for report and chart generation and is integrated with multiple statistical, numerical modeling, and data visualization tools.

The laboratory will provide an EDD for all analytical reports in accordance with requirements for upload to the EQuIS database system. Summary QC data will be included in the EDD to allow electronic screening of certain QC parameters.

The Project Chemist or designee will review approximately 5 percent of electronic laboratory and field data to verify the results against the hard copy and check for transcription errors. A greater than 15 percent discrepancy rate in two consecutive datasets will require additional review and verification.

Historical site data will be imported into the project database as necessary to support the PBC2. Data qualifiers and annotations previously applied will be incorporated. It is assumed that historical qualification has been applied consistent with CERCLA requirements. Qualification protocols for data generated under this QAPA and associated documents are described in Section 9.6 and are consistent with CERCLA guidance.

9.4 Data Validation

This section provides supplemental information associated with Section 9.5 of the MQAP. Data validation and usability criteria set forth in the MQAP as appended by this QAPA shall be followed unless otherwise amended in the area specific Work Plan.

9.4.1 Data Review, Validation, and Verification Requirements

Manual combined with electronic data validation will be conducted by a data validator not directly associated with the field-sampling program. The Project Chemist will oversee the performance of data validation functions. Data validation will be performed by knowledgeable and experienced individuals who can best perform evaluations within the necessary validation components. Validation staff qualifications will include experience with each of the elements required for the data verification and validation including ensuring that the measuring system meets the user's needs, assigning qualifiers to individual data values, assessing the relevancy of performance criteria, and concluding that data can proceed to quality assessment and reporting.

9.4.2 Validation and Verification Methods

Data validation will be conducted as set forth in this Section and Section 9.5.2 of the MQAP. Validation criteria will be based on these QA documents plus the analytical method performance criteria, laboratory QAM, laboratory control limits, USEPA Region

III guidance, USEPA Region III Modifications and professional judgment. The USEPA National Functional Guidelines (NFGs) for Organic and Inorganic data review will primarily be utilized as guidance for method qualification because the USEPA Contract Laboratory Program (CLP) methods will not be performed. Validation will not be performed on asbestos analyses with the exception of comparison of identifications in field duplicates.

For samples collected in support of contaminant delineation, risk assessment, and confirmation of remedial goal attainment, 100 percent of the data will undergo Region III Manual Levels M-2/IM-1 data verification and validation. Approximately 10 percent of samples, collected for the above purpose, will additionally be validated in accordance with Region III M-3/IM-2. Selection of data packages for in-depth review will be random across the time period of sample collection. Levels M-3 and IM-2 will be performed on an SDG or complete laboratory report basis. Individual samples will not be singled out for particular levels of validation.

Samples collected in support of long-term operations and maintenance of selected remedies, pilot or bench scale studies, wastewater discharge compliance, or waste characterization for disposal will not be validated. If anomalous results are observed, a Level M-1/IM-1 review will be performed. Additional verification validation will be performed as necessary if this level of review indicates potential deficiencies with laboratory performance.

Data validation will be summarized in a checklist style report documenting the items reviewed with text explanations and notations of deficiencies and a summary of the qualifications applied to the analytical data. For data that will undergo the M-2/M-3/IM-2 validations, field documents will be reviewed within the perspective of impact to data quality. Any issues noted in field documentation or records that could impact data usability or quality will be noted in the validation reports.

9.5 Reconciliation with Data Usability Requirements

For routine assessments of data quality, ARCADIS will implement the data validation procedures described in Section 9.0 of the MQAP as appended by this QAPA. The data validators will assign appropriate data qualifiers to indicate limitations on the data. The Project Chemistry team will be responsible for evaluating compliance with project requirements. Deviations from the analytical performance criteria will be documented in the data validation reports.

The Project Chemist will work with the final users of the data in performing overall data quality assessments. The data quality assessment may include some or all the following steps:

- Data that are determined to be incomplete or not usable for the project will be discussed with the project team. If critical data points are involved which impact the ability to complete the project objectives, the data users will report immediately to the TM. The TM will discuss the resolution of the issue with the ARCADIS PM and implement the necessary corrective actions (for example, resampling);

- Data that are non-detect but have RLs elevated due to blank contamination or matrix interference will be compared to screening values (see Appendices B and C). If RLs exceed the screening values, then the results will be handled as appropriate for data use; and

- Data qualified as estimated (biased high, biased low) will be utilized if it is determined that the data are useable for their intended purpose. If an estimated result is close to a screening value, then there is uncertainty in any conclusions as to whether the result exceeds the screening value. The data user must evaluate the potential uncertainty in developing recommendations for the site. If estimated results become critical data points in making final decisions on the site, the PM and TM should evaluate the use of the results and may consider the data point incomplete.

Data validation codes relate to identification (confidence concerning the presence or absence of compounds) and quantitation of target parameters. The standard data validation codes that will be utilized are defined below:

Code	Definition
R	Data point is unusable due to serious deficiencies in analytical and QC criteria. The presence or absence of the analyte/compound can not be verified
UB	Not detected substantially above the level reported in laboratory or field blanks. For organics - 5X (10X for common lab contaminants) or for metals - 10X. Data point considered non-detect at the value qualified.

Code	Definition
U	Analyte/Compound not detected. The associated value indicates the concentration above which the result would be considered a quantitative value.
J	Reported value is considered an approximate concentration.
K	Estimated value, biased high.
L	Estimated value, biased low.
UJ, UK, UL	Analyte/compound not detected above the quantitation limit. However, the reported quantitation limit is approximate (biased high, biased low).

The ultimate data assessment process involves comparing analytical results to screening values and background concentrations to determine whether the contamination present is site related (i.e., above background levels) or significant (i.e., above screening values). Additional data assessment may be performed on site-by-site basis. Any additional procedures for data quality assessment will be provided in the area specific work plan.

10. Assessment/Oversight

Assessment and oversight procedures for the RAAP activities will be implemented in accordance with the MQAP, this QAPA, the PMP and other applicable documents. The QAPA in conjunction with the MQAP outlines general roles and responsibilities for the project team. Additional procedures will be developed as necessary to meet the DQOs of a specific RAAP Area of Concern or SWMU and will be presented in an addendum to the QAPA or included in the site specific Work Plan. The following section supplements Section 11.0 of the MQAP.

10.1 Assessments and Response Actions

Assessment activities include management and assessments, technical systems audits, and performance evaluations. Management assessments include routinely scheduled meetings and conference calls to evaluate staff utilization. Assignment of qualified personnel to RAAP projects, maintenance of schedules and budgets, and quality of project deliverables are verified as part of these assessments. Performance evaluations are used to ensure that trained and qualified staff is utilized for the project. Technical assessment activities applicable to RAAP projects include peer review, data quality reviews, and technical system audits (i.e., laboratory and field). Technical systems audits include review and evaluation of field and laboratory performance to assess the implementation of quality programs and directives. Procedures for peer review and technical assessments are summarized briefly below. Both the overall and direct technical assessment activities may result in the need for corrective action. The procedure for implementing a corrective action response program for both field and laboratory situations are summarized briefly below.

10.1.1 Field Inspections

The Field Operations Manager will be responsible for inspecting all field activities to verify compliance of the activities with the project plans, Health and Safety programs, and project QA documents.

10.1.2 Laboratory Audits

The laboratories must implement a comprehensive program of internal audits to verify the compliance of their analytical and management systems with the SOPs and QA Manuals. The laboratory may be requested to perform a project-specific audit to verify compliance with RAAP project requirements. The laboratory must be accredited under

NELAP and maintain current accreditation for RAAP methods and parameters where accreditation is available through the primary accrediting authority. No laboratory audits are planned by ARCADIS.No outside laboratory audits are anticipated. The laboratory NELAP audit reports will be reviewed by the Project Chemist, as appropriate.

Asbestos laboratories must maintain current MVLAP accredition.

10.2 Corrective Action

Corrective actions will be implemented as necessary to insure data and project quality. In conjunction with the QA Manager and Project Chemist, the TM is responsible for initiating and implementing corrective action in the field. The PM and/or TMs are responsible for implementing, as necessary, corrective action in office settings. The laboratory PM, in conjunction with the laboratory technical staff and QA manager, is responsible for implementing corrective action in the laboratory. It is their combined responsibility to ensure that all analytical procedures are followed as specified and that the data generated meet the prescribed acceptance criteria. Any specific corrective actions necessary will be clearly documented in the logbooks or analytical reports.

10.2.1 Field Corrective Action Scenarios

The need for corrective action in the field may be determined by technical assessments or by more direct means such as equipment malfunction. Once a problem has been identified, it may be addressed immediately or an audit report may serve as notification to project management staff that corrective action is necessary. Immediate corrective actions taken in the field will be documented in the project logbook. Corrective actions may include, but are not limited to:

- Correcting equipment decontamination or sample handling procedures if field blanks indicate contamination;
- Recalibrating field instruments and checking battery charge;
- Training field personnel in correct sample handling or collection procedures; and
- Accepting data with an acknowledged level of uncertainty.

After a corrective action has been implemented, its effectiveness will be verified. If the action does not resolve the problem, appropriate personnel will be assigned to investigate and effectively remedy the problem.

Implementation of a Field Readiness Assessment (FRA) prior to start of fieldwork, as specified by SWP HSP-1.11, "Field Readiness Assessment Process," is required. The FRA will be constructed to determine readiness of the field activities to be performed. A FRA will be conducted:

- Prior to initial start of major phases of fieldwork;
- Prior to initiation of any significant change to the scope of work;
- As required in the Task Hazard Analysis (Exhibit 1 of the HSPA); or
- Anytime deemed necessary by the Health and Safety Manager, QA/QC Manager, or the PM.

Work considered routine (collection of water levels, routine system maintenance established in the existing work plans, etc.) may be addressed in a single FRA conducted at the start of fieldwork. Each event does not require an FRA to be conducted. Work considered "skill of the craft" (utilization of a plumber to hook water lines, etc.) is generally exempt from the FRA except the ARCADIS Site Manager or Field Operations Leader will ensure the work activity will not create a safety concern or create an unplanned interruption of site activities. This may be conducted through implementation of an FRA.

An example FRA template is presented in the HSPA.

10.2.2 Laboratory Corrective Action Scenarios

Out-of-control QC data, laboratory audits, or outside data review may determine the need for corrective action in the laboratory. Corrective actions may include, but are not limited to:

- Reanalyzing samples, if holding times permit;
- Correcting laboratory procedures;

- Recalibrating instruments using freshly prepared standards;
- Replacing solvents or other reagents that give unacceptable blank values;
- Training additional laboratory personnel in correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged level of uncertainty.

Specific laboratory corrective actions for analytical deficiencies must be consistent with the analytical method. The laboratory corrective actions must be defined in analytical SOPs. Any deviations from the analytical SOP require corrective actions and documentation with approval of the ARCADIS Project Chemist. Whenever the ARCADIS Project Chemist deems corrective action necessary, the laboratory PM will ensure that the following steps are taken:

- The cause of the problem is investigated and identified;
- Appropriate corrective action is determined;
- Corrective action is implemented and the effectiveness verified by the laboratory QA Officer; and
- Documentation of the corrective action verification is provided to the Project Chemist in a timely manner.

11. References

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Tables

Table 2-1
Quality Assurance Measures Discussed in the MQAP
Radford Army Ammunition Plant, Radford, Virginia

Quality Assurance Measure	Section in MQAP	SOP No. (MWP Appendix A)
Project Organization and Responsibilities	2.0	--
Lines of Authority	2.2	--
Chemical Data Measurements	3.2	--
Levels of Concern	3.3	--
Site Investigation	4.0/5.0	20.1, 20.2, 20.3, 20.5, 20.9, 20.11, 20.12, 30.1, 30.2, 30.7, 30.8, 30.9, 40.1, 40.2, 40.3, 50.1, 50.2 70.1, 80.1
Remediation System Monitoring	NA	--
Documentation Requirements	5.6	10.1, 10.2, 10.3, 50.1
Chain-of-custody Requirements	5.7	10.4, 50.2
Calibration Procedures	7.0	90.1
Data Reduction, Validation, Reporting, and Management	9.0	--
Corrective Action	10.0	--
Quality Assessments	11.0	--

NA – Not Addressed

Table 6-1
Summary of Methods, Containers, Preservatives, and Holding Times
Radford Army Ammunition Plant
Radford, Virginia

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Holding Time (a)
Primary Parameters						
TCL VOCs	Water	5030, 5032	8260	3 x 40-mL vial with Teflon-lined septum	Cool 4°C, pH<2 HCl	14 days
	Solid	5035	8260	3 x Encore™ ®	Cool 4°C	48 hours to preservation; 14 days to analysis
TCL SVOCs	Water	3510, 3520 (b)	8270	1 x 1-L amber G	Cool 4°C	7 days to extraction and 40 to analysis
	Solid	3540, 3550 (b)	8270	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis
PAHs	Water	3510, 3520 (b)	8270 (Low Level)	1 x 1-L amber G	Cool 4°C	7 days to extract and 40 to analysis
	Solid	3540, 3550 (b)	8270 (Low Level)	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis
TCL PCBs	Water	3510, 3520 (b)	8082	1 x 1-L amber G	Cool 4°C	7 days to extract and 40 to analysis
	Solid	3540, 3550 (b)	8082	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis
TCL Organochlorine Pestides	Water	3510, 3520 (b)	8081	1 x 1-L amber G	Cool 4°C	7 days to extract and 40 to analysis
	Solid	3540, 3550 (b)	8081	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis
Organochlorine Herbicides	Water	NA	8151	1 x 1-L amber G	Cool 4°C	7 days to extract and 40 to analysis
	Solid	NA	8151	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis
Explosives	Water	NA	8330, 8332, 8095	1 x 1-L amber G	Cool 4°C	7 days to extract and 40 to analysis
	Solid	NA	8330, 8332, 8095	1 x 8-oz amber G	Cool 4°C	14 days to extract and 40 to analysis

Table 6-1
Summary of Methods, Containers, Preservatives, and Holding Times
Radford Army Ammunition Plant
Radford, Virginia

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Holding Time (a)
Metals (except Mercury)	Water	3005, 3010	6010 / 6020	1 x 1-L PE	pH <2 with HNO_3, Cool 4°C	6 months
	Solid	3050, 3051	6010	1 x 8-oz amber G	Cool 4°C	6 months
Mercury	Water	NA	7470	1 x 1-L PE	pH <2 with HNO_3, Cool 4°C	28 days
	Solid	NA	7471	1 x 8-oz amber G	Cool 4°C	28 days
Cyanide (Total)	Water	NA	9010 / 9012 / 9014	1 x 1-L PE	pH >12 with NaOH, Cool °4C	14 days
	Solid	NA	9010 / 9012 / 9014	1 x 8-oz amber G	Cool 4°C	14 days
Perchlorate	Water	NA	314.1	1 x 120-ml PE	Cool 4°C	28 days
	Solid	NA	314.1	1 x 4-oz PE	Cool 4°C	28 days
Dioxins/Furans	Water	NA	8290	2 x 1-L amber G + 2 x 40-ml vials	Cool 4°C	30 days to extract and 45 to analysis
	Solid	NA	8290	1 x 8-oz amber G	Cool 4°C	30 days to extract and 45 to analysis
Waste Characterization Parameters						
TCLP Metals	Solid	1311 3005, 3010	6010, 6020 & 7470	1 x 1-L wide mouth G	Cool 4°C	14 days from collection to Leach
TCLP VOCs	Solid	1311 5030, 5032	8260	1 x 4-oz G packed full	Cool 4°C	14 days from collection to Leach
TCLP SVOCs	Solid	1311 3510, 3520	8270	1 x 1-L wide mouth G	Cool 4°C	14 days from collection to Leach
TCLP Pest/PCBs	Solid	1311 3510, 3520	8081/8082	1 x 1-L wide mouth G	Cool 4°C	14 days from collection to Leach
Ignitability	Solid	Na	1010	250 ml wide mouth G	Cool 4°C	NA
Reactivity	Solid	Na	9010 / 9012/ 9014 and 9034	250 ml wide mouth G	Cool 4°C	Sulfide 7 days Cyanide 14 days
Corrosivity (pH)	Solid	NA	9045	250 ml wide mouth G	Cool 4°C	Analyze ASAP

Table 6-1
Summary of Methods, Containers, Preservatives, and Holding Times
Radford Army Ammunition Plant
Radford, Virginia

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Holding Time (a)
General Chemistry Parameters						
MNA Gases	Water	NA	AM20GAX	4 x 40-mL vial with butyl rubber-lined septum	Cool 4°C	14 days [(c)]
Total & Dissolved Iron & Manganese	Water	3005, 3010	6010 / 6020	1 x 1-L PE	pH <2 with HNO_3	6 months
Alkalinity	Water	NA	SM 2320 B	120 ml PE	Cool 4°C	14 days
Ammonia	Water	NA	350.1 /4500-NH_3	120 ml PE	pH <2 with H_2SO_4; Cool 4°C	28 days
Chemical Oxygen Demand (COD)	Water	NA	410.3 / SM 5220 C / Hach 8000	120 ml PE	pH <2 with H_2SO_4; Cool 4°C	28 days
Chloride	Water	NA	SM 4500-Cl / 300	120 ml PE	Cool 4°C	28 days
Ferrous Iron	Water	NA	SM3500-FE-D	250 ml PE	None	Analyze ASAP
Hardness		NA	130.1	250 ml PE	pH <2 with HNO_3; Cool 4°C	6 months
Nitrate	Water	NA	353.2 / 300	120 ml PE	Cool 4°C	2 days
Nitrite	Water	NA	353.2 / 300	120 ml PE	Cool 4°C	2 days
Nitrate/Nitrite	Water	NA	353.2 / 300	120 ml PE	pH <2 with H_2SO_4	28 days
Phosphate	Water	NA	300	120 ml PE	pH <2 with H_2SO_4	28 days
Sulfate	Water	NA	9038 / 9056 / 300	120 ml PE	Cool 4°C	28 days
Sulfide	Water	NA	9034	500 ml PE	2 ml ZnAc; Cool 4°C	7 days
Total Dissolved Solids (TDS)	Water	NA	SM 2540 C	500 ml PE	Cool 4°C	7 days
Total Suspended Solids (TSS)	Water	NA	SM 2540 D	500 ml PE	Cool 4°C	7 days

Table 6-1
Summary of Methods, Containers, Preservatives, and Holding Times
Radford Army Ammunition Plant
Radford, Virginia

Parameter	Matrix	Preparation Method	Analytical Method	Container	Preservative	Holding Time (a)
Total Organic Carbon (TOC)	Water	NA	SM 5310 C	125 ml amber G	pH <2 with HCl or H_2SO_4, Cool 4°C	28 days
Dissolved Organic Carbon (DOC)	Water	NA	SM 5310 C	125 ml amber G	AFTER FILTRATION: pH <2 with HCl or H_2SO_4, Cool 4°C	28 days
AIR						
VOCs	Air	NA	Modified TO-15	Summa Canister	None	30 days
Asbestos						
Asbestos Fiber Analysis by PLM	Soil	NA	EPA-600.Mf-82-020	Quart size Ziplock bag	None	Not established

Maximum holding time allowed from date of collection.
Clean-up methods may be applicable if matrix interference is encountered. Clean-up methods may include alumina (Method 3610), florisil (Method 3620), silica gel (Method 3630), gel permeation chromatography (GPC) (Method 3640), and sulfur (Method 3660). Selection of appropriate method is based on nature of interference and target compounds.
This holding time is a contractual holding time that has been established by ARCADIS.

°C – Degrees centigrade
G – glass
MNA- Monitored Natural Attenuation
NA – Not Applicable
PE – Polyethylene
SVOCs – Semivolatile Organic Compounds
TAL – Target Analyte List OLM
TCL – Target Compound List OLM 3.2
TCLP – Toxicity Characteristic Leaching Procedure
VOCs – Volatile Organic Compounds

Table 8-1
Summary of Analyte Method Detection Limits, Reporting Limits, and Risk Screening Levels for TCL VOCs (Method 8260B)
Soil and Water Samples MQAP Addendum PBC-2
Radford Army Ammunition Plant,
Radford, Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
1,1,1-Trichloroethane	71-55-6	0.001	0.005	0.33	1		N	1.70E+03	1.70E+02	N	2.90E+05	2.90E+04	N	2.20E+04	2.20E+03	1.10E+01	3.00E-01	3.00E-02
1,1,2,2-Tetrachloroethane	79-34-5	0.001	0.005	0.33	1	--	C	5.30E-02	5.30E-02	C	1.40E+01	1.40E+01	C	3.20E+00	3.20E+00	6.10E+02	3.00E-01	1.40E+00
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.001	0.005	0.5	1	--	N	5.90E+04	5.90E+03	N	3.10E+07	3.10E+06	N	2.30E+06	2.30E+05	--	-	--
1,1,2-Trichloroethane	79-00-5	0.001	0.005	0.33	1	--	C	1.90E-01	1.90E-01	C	5.00E+01	5.00E+01	C	1.10E+01	1.10E+01	1.20E+03	3.00E-01	1.20E+00
1,1-Dichloroethane	75-34-3	0.001	0.005	0.33	1	--	N	9.00E+02	9.00E+01	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	4.70E+01	3.00E-01	--
1,1-Dichloroethene	75-35-4	0.001	0.005	0.42	1	--	N	3.50E+02	3.50E+01	N	5.10E+04	5.10E+03	N	3.90E+03	3.90E+02	2.50E+01	-	3.10E-02
1,2,4-Trichlorobenzene	120-82-1	0.001	0.005	0.57	2	7.00E+01	N	6.10E+01	6.10E+00	N	1.00E+04	1.00E+03	N	7.80E+02	7.80E+01	2.40E+01	1.00E-01	2.10E+00
1,2-Dibromo-3-chloropropane	96-12-8	0.001	0.005	0.33	2	-	C	2.00E-04	2.00E-04	C	3.60E+00	3.60E+00	C	2.00E-01	2.00E-01	--	-	--
1,2-Dibromoethane	106-93-4	0.001	0.005	0.33	1	-	C	5.30E-03	5.30E-03	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	--	5.00E+00	--
1,2-Dichlorobenzene	95-50-1	0.001	0.005	0.33	1	-	N	2.70E+02	2.70E+01	N	9.20E+04	9.20E+03	N	7.00E+03	7.00E+02	7.00E-01	1.00E-01	1.70E-02
1,2-Dichloroethane	107-06-2	0.001	0.005	0.33	1	-	C	1.20E-01	1.20E-01	C	3.10E+01	3.10E+01	C	7.00E+00	7.00E+00	1.00E+02	8.70E+02	--
1,2-Dichloropropane	78-87-5	0.001	0.005	0.33	1	5.00E+00	C	1.60E-01	1.60E-01	C	4.20E+01	4.20E+01	C	9.40E+00	9.40E+00	--	3.00E-01	--
1,3-Dichlorobenzene	541-73-1	0.001	0.005	0.38	1	-	N	1.80E+01	1.80E+00	N	3.10E+03	3.10E+02	N	2.30E+02	2.30E+01	1.50E+02	-	4.40E+00
1,4-Dichlorobenzene	106-46-7	0.001	0.005	0.33	1	-	C	4.70E-01	4.70E-01	C	1.20E+02	1.20E+02	C	2.70E+01	2.70E+01	2.60E+01	1.00E-01	6.00E-01
2-Butanone	78-93-3	0.002	0.01	1.5	10	--	N	7.00E+03	7.00E+02	N	6.10E+05	6.10E+04	N	4.70E+04	4.70E+03	1.40E+04	-	--
2-Hexanone	591-78-6	0.002	0.01	1	5	--	--	--	--	--	--	--	--	--	--	9.90E+01	-	--
4-Methyl-2-pentanone	108-10-1	0.001	0.01	1.5	5	--	N	6.30E+03	6.30E+02	--	--	--	--	--	--	1.70E+02	1.00E+02	--
Acetone	67-64-1	0.002	0.05	3.3	10	--	N	5.50E+03	5.50E+02	N	9.20E+05	9.20E+04	N	7.00E+04	7.00E+03	1.50E+03	-	--
Benzene	71-43-2	0.001	0.005	0.33	1	5.00E+00	C	3.40E-01	3.40E-01	C	5.20E+01	5.20E+01	C	1.20E+01	1.20E+01	3.70E+02	1.00E-01	--
Bromodichloromethane	75-27-4	0.001	0.005	0.33	1	8.00E+01	C	1.70E-01	1.70E-01	C	4.60E+01	4.60E+01	C	1.00E+01	1.00E+01	--	4.50E+02	--
Bromoform	75-25-2	0.001	0.005	0.5	1	8.00E+01	C	8.50E+00	8.50E+00	C	3.60E+02	3.60E+02	C	8.10E+01	8.10E+01	3.20E+02	-	6.50E-01
Bromomethane	74-83-9	0.001	0.01	0.5	2	-	N	8.50E+00	8.50E-01	N	1.40E+03	1.40E+02	N	1.10E+02	1.10E+01	--	-	--
Carbon disulfide	75-15-0	0.001	0.005	0.33	1	-	N	1.00E+03	1.00E+02	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	9.20E-01	-	8.50E-04
Carbon tetrachloride	56-23-5	0.001	0.005	0.33	1	5.00E+00	C	1.60E-01	1.60E-01	C	2.20E+01	2.20E+01	C	4.90E+00	4.90E+00	1.30E+01	3.00E-01	6.40E-02
Chlorobenzene	108-90-7	0.001	0.005	0.33	1	1.00E+02	N	9.00E+01	9.00E+00	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	1.30E+00	1.00E-01	8.40E-03
Chloroethane	75-00-3	0.001	0.01	0.5	2	-	C	3.60E+00	3.60E+00	C	9.90E+02	9.90E+02	C	2.20E+02	2.20E+02	--	-	--
Chloroform	67-66-3	0.001	0.005	0.33	1	8.00E+01	C	1.50E-01	1.50E-01	N	1.00E+04	1.00E+03	N	7.80E+02	7.80E+01	1.80E+00	3.00E-01	--
Chloromethane	74-87-3	0.001	0.01	0.5	2	-	N	1.90E+02	1.90E+01	--	--	--	--	--	--	--	-	--
cis-1,2-Dichloroethene	156-59-2	0.001	0.005	0.44	1	7.00E+01	N	6.10E+01	6.10E+00	N	1.00E+04	1.00E+03	N	7.80E+02	7.80E+01	--	3.00E-01	--
cis-1,3-Dichloropropene	10061-01-5	0.001	0.005	0.33	1	5.00E+00	C	4.40E-01	4.40E-01	C	2.90E+01	2.90E+01	C	6.40E+00	6.40E+00	--	3.00E-01	--
Cyclohexane	110-82-7	0.001	0.005	0.33	2	-	N	1.20E+04	1.20E+03	--	--	--	--	--	--	--	-	--
Dibromochloromethane	124-48-1	0.001	0.005	0.33	1	6.00E+01	C	1.30E-01	1.30E-01	C	3.40E+01	3.40E+01	C	7.60E+00	7.60E+00	--	-	--
Dichlorodifluoromethane	75-71-8	0.001	0.01	0.5	2	--	N	3.50E+02	3.50E+01	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	--	-	--
Ethylbenzene	100-41-4	0.001	0.005	0.35	1	7.00E+02	N	1.30E+03	1.30E+02	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	9.00E+01	1.00E-01	1.10E+00
Isopropylbenzene	98-82-8	0.001	0.005	0.33	1	--	N	6.60E+02	6.60E+01	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	2.60E+00	-	8.60E-02
Methyl acetate	79-20-9	0.002	0.005	0.87	2	--	N	6.10E+03	6.10E+02	N	1.00E+06	1.00E+05	N	7.80E+04	7.80E+03	--	-	--
methyl tert-Butyl ether	1634-04-4	0.001	0.005	0.33	1	--	C	2.60E+00	2.60E+00	C	7.20E+02	7.20E+02	C	1.60E+02	1.60E+02	1.10E+04	-	--

Table 8-1
Summary of Analyte Method Detection Limits, Reporting Limits, and Risk Screening Levels for TCL VOCs (Method 8260B)
Soil and Water Samples MQAP Addendum PBC-2
Radford Army Ammunition Plant,
Radford, Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
Methylcyclohexane	108-87-2	0.001	0.005	0.33	1	--	N	6.30E+03	6.30E+02	--	--	--	--	--	--	--	-	--
Methylene chloride	75-09-2	0.001	0.04	0.66	2	--	C	4.10E+00	4.10E+00	C	3.80E+02	3.80E+02	C	8.50E+01	8.50E+01	9.80E+01	3.00E-01	--
Styrene	100-42-5	0.001	0.005	0.33	1	1.00E+02	N	1.60E+03	1.60E+02	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	7.20E+01	1.00E-01	5.60E-01
Tetrachloroethene	127-18-4	0.001	0.005	0.33	1	5.00E+00	C	1.00E-01	1.00E-01	C	5.30E+00	5.30E+00	C	1.20E+00	1.20E+00	1.10E+02	3.00E-01	4.70E-01
Toluene	108-88-3	0.001	0.005	0.33	1	1.00E+03	N	2.30E+03	2.30E+02	N	8.20E+04	8.20E+03	N	6.30E+03	6.30E+02	2.00E+00	1.00E-01	--
trans-1,2-Dichloroethene	156-60-5	0.001	0.005	0.4	1	1.00E+02	N	1.10E+02	1.10E+01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	9.70E+02	3.00E-01	1.10E+00
trans-1,3-Dichloropropene	10061-02-6	0.001	0.005	0.33	1	-	C	4.40E-01	4.40E-01	C	2.90E+01	2.90E+01	C	6.40E+00	6.40E+00	--	3.00E-01	--
Trichloroethene	79-01-6	0.001	0.005	0.33	1	5.00E+00	C	2.60E-02	2.60E-02	C	7.20E+00	7.20E+00	C	1.60E+00	1.60E+00	2.10E+01	3.00E-01	9.70E-02
Trichlorofluoromethane	75-69-4	0.001	0.01	0.5	2		N	1.30E+03	1.30E+02	N	3.10E+05	3.10E+04	N	2.30E+04	2.30E+03		-	--
Vinyl Chloride	75-01-4	0.001	0.01	0.5	2	2.00E+00	C	1.50E-02	1.50E-02	-	--	-	C	9.00E-02	9.00E-02	9.30E+02	3.00E-01	--
Xylenes	1330-20-7	0.002	0.005	0.33	1	1.00E+04	N	2.10E+02	2.10E+01	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	1.30E+01	1.00E-01	--

Notes:

(a) Method Detection Limits and Reporting Limits provided by Empirical Laboratories, LLC

(b) USEPA Region 3 Risk-based Concentrations (October 2007)

(c) BTAG Screening Levels [1995 (soil), 2004 (surface water and sediment)].

Acronyms:

-- = Screening level unavailable.
BTAG = Biological Technical Assistance Group
CAS = Chemical Abstract Service
C!/N = RBC at HI of 0.1 < RBC-c; RBC from alternate RBC table.
C= RBC based cancer endpoint.
MCL = Maximum Contaminant Level
MDL = Method Detection Limit
mg/kg = Milligram Per kilogram
N = RBC based on non-carcinogenic endpoint.
PCBs = Polychlorinated Biphenyls
RBC = USEPA Region III Risk
RL = Reporting Limit
TCL = Target Compound List
ug/L = Microgram Per liter
VOC = volatile organic compound

Table 8-2
Summary of Analyte Method Detection Limits, Reporting Limits, and Risk Screening Levels for TCL SVOCs (Method 8270C)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford, Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	M ug/L	M ug/L	M ug/L		M ug/L	M ug/L		mg/kg	mg/kg		mg/kg	mg/kg	M ug/L	mg/kg	mg/kg
1,1'-Biphenyl	92-52-4	0.1	0.33	1	5		N	3.00E+02	3.00E+01	N	5.10E+04	5.10E+03	N	3.90E+03	3.90E+02	1.40E+01	-	1.20E+00
2,2'-oxybis(1-Chloropropane)	108-60-1	0.1	0.33	1	5	--	C		2.60E-01	C	4.10E+01	4.10E+01	C	9.10E+00	9.10E+00	--	-	--
2,4,5-Trichlorophenol	95-95-4	0.1	0.33	1	5	--	N	3.70E+03	3.70E+02	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	--	1.00E-01	--
2,4,6-Trichlorophenol	88-06-2	0.1	0.33	1	5	--	C	6.10E+00	6.10E+00	C	2.60E+02	2.60E+02	C	5.80E+01	5.80E+01	4.90E+00	1.00E-01	2.10E-01
2,4-Dichlorophenol	120-83-2	0.1	0.33	1	5	--	N	1.10E+02	1.10E+01	N	3.10E+03	3.10E+02	N	2.30E+02	2.30E+01	1.10E+01	1.00E-01	1.20E-01
2,4-Dimethylphenol	105-67-9	0.1	1.3	2	20	--	N	7.30E+02	7.30E+01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	--	1.00E-01	2.90E-02
2,4-Dinitrophenol	51-28-5	0.167	3.3	7	50	--	N	7.30E+01	7.30E+00	N	2.00E+03	2.00E+02	N	1.60E+02	1.60E+01	--	1.00E-01	--
2,4-Dinitrotoluene	121-14-2	0.1	0.33	1	5	--	N	7.30E+01	7.30E+00	N	2.00E+03	2.00E+02	N	1.60E+02	1.60E+01	4.40E+01	-	4.20E-02
2,6-Dinitrotoluene	606-20-2	0.1	0.33	1	5	--	N	3.70E+01	3.70E+00	N	1.00E+03	1.00E+02	N	7.80E+01	7.80E+00	8.10E+01	-	--
2-Chloronaphthalene	91-58-7	0.1	0.33	1.5	5	--	N	4.90E+02	4.90E+01	N	8.20E+04	8.20E+03	N	6.30E+03	6.30E+02	--	-	--
2-Chlorophenol	95-57-8	0.1	0.33	1.5	5	--	N	3.00E+01	3.00E+00	N	5.10E+03	5.10E+02	N	3.90E+02	3.90E+01	2.40E+01	1.00E-01	3.10E-02
2-Methylnaphthalene	91-57-6	0.1	0.33	1	5	--	N	2.40E+01	2.40E+00	N	4.10E+03	4.10E+02	N	3.10E+02	3.10E+01	4.70E+00	-	2.00E-02
2-Methylphenol	95-48-7	0.1	0.33	1	5	--	N	1.80E+03	1.80E+02	N	5.10E+04	5.10E+03	N	3.90E+03	3.90E+02	1.30E+01	1.00E-01	--
2-Nitroaniline	88-74-4	0.1	1.3	1	20	--	--	--	--	--	--	--	--	--	--	--	-	--
2-Nitrophenol	88-75-5	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	1.90E+03	-	--
3,3'-Dichlorobenzidine	91-94-1	0.167	0.33	1.5	5	--	C	1.50E-01	1.50E-01	C	6.40E+00	6.40E+00	C	1.40E+00	1.40E+00	4.50E+00	-	1.30E-01
3-Nitroaniline	99-09-2	0.167	1.3	1.5	20	--	--	--	--	--	--	--	--	--	--	--	-	--
4,6-Dinitro-2-methylphenol	534-52-1	0.167	1.3	2.5	20	--	--	--	--	--	--	--	--	--	--	--	-	--
4-Bromophenyl-phenylether	101-55-3	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	1.50E+00	-	1.20E+00
4-Chloro-3-Methylphenol	59-50-7	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	--	-	--
4-Chloroaniline	106-47-8	0.1	0.33	1	5	--	N	1.50E+02	1.50E+01	N	4.10E+03	4.10E+02	N	3.10E+02	3.10E+01	2.30E+02	-	--
4-Chlorophenyl-phenylether	7005-72-3	0.1	0.33	1.5	5	--	--	--	--	--	--	--	--	--	--	--	-	0.00E+00
4-Methylphenol	106-44-5	0.1	0.33	1	5	--	N	1.80E+02	1.80E+01	N	5.10E+03	5.10E+02	N	3.90E+02	3.90E+01	5.40E+02	1.00E-01	6.70E-01
4-Nitroaniline	100-01-6	0.1	1.3	1	20	--	--	--	--	--	--	--	--	--	--	--	-	--
4-Nitrophenol	100-02-7	0.1	1.3	3	20	--	-	--	-	-	--	-	-	--	-	6.00E+01	1.00E-01	--
Acenaphthene	83-32-9	0.1	0.33	1.5	5	--	N	3.70E+02	3.70E+01	N	6.10E+04	6.10E+03	N	4.70E+03	4.70E+02	5.80E+00	1.00E-01	6.70E-03
Acenaphthylene [1]	208-96-8	0.1	0.33	1.5	5	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	--	1.00E-01	5.90E-03
Acetophenone	98-86-2	0.1	0.33	1	5	--	N	6.10E+02	6.10E+01	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	--	-	--
Anthracene	120-12-7	0.1	0.33	1	5	--	N	1.80E+03	1.80E+02	N	3.10E+05	3.10E+04	N	2.30E+04	2.30E+03	1.20E-02	1.00E-01	5.70E-02
Atrazine	1912-24-9	0.1	0.33	1	5	3.00E+00	C	3.00E-01	3.00E-01	C	1.30E+01	1.30E+01	C	2.90E+00	2.90E+00	1.80E+00	-	6.60E-03
Benzaldehyde	100-52-7	0.1	0.33	1	5	--	N	3.70E+03	3.70E+02	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	--	-	--
Benzo(a)anthracene	56-55-3	0.1	0.33	1	5	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	1.80E-02	1.00E-01	1.10E-01
Benzo(a)pyrene	50-32-8	0.1	0.33	1	5	2.00E-01	C	3.00E-03	3.00E-03	C	3.90E-01	3.90E-01	C	2.20E-02	2.20E-02	1.50E-02	1.00E-01	1.50E-01
Benzo(b)fluoranthene	205-99-2	0.1	0.33	1	5	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	--	1.00E-01	--
Benzo(g,h,i)perylene [1]	191-24-2	0.1	0.33	1.5	5	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	--	1.00E-01	1.70E-01
Benzo(k)fluoranthene	207-08-9	0.1	0.33	1	5	--	C	3.00E-01	3.00E-01	C	3.90E+01	3.90E+01	C	2.20E+00	2.20E+00	--	1.00E-01	2.40E-01
Bis(2-chloroethoxy)methane	111-91-1	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	--	-	--

Table 8-2
Summary of Analyte Method Detection Limits, Reporting Limits, and Risk Screening Levels for TCL SVOCs (Method 8270C)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford, Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	M ug/L	M ug/L	M ug/L		M ug/L	M ug/L		mg/kg	mg/kg		mg/kg	mg/kg	M ug/L	mg/kg	mg/kg
Bis(2-chloroethyl)ether	111-44-4	0.167	0.33	2.5	2	--	C	9.60E-03	9.60E-03	C	2.60E+00	2.60E+00	C	5.80E-01	5.80E-01	--	-	--
Bis(2-ethylhexyl)phthalate	117-81-7	0.1	0.33	1	5	6.00E+00	C	4.80E+00	4.80E+00	C	2.00E+02	2.00E+02	C	4.60E+01	4.60E+01	1.60E+01	-	1.80E-01
Butylbenzylphthalate	85-68-7	0.1	0.33	1	5	--	N	7.30E+03	7.30E+02	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	1.90E+01	-	1.10E+01
Caprolactam	105-60-2	0.1	0.33	1	5	--	N	1.80E+04	1.80E+03	N	5.10E+05	5.10E+04	N	3.90E+04	3.90E+03	--	-	--
Carbazole	86-74-8	0.1	0.67	1	10	--	C	3.30E+00	3.30E+00	C	1.40E+02	1.40E+02	C	3.20E+01	3.20E+01	--	-	--
Chrysene	218-01-9	0.1	0.33	1	5	--	C	3.00E+00	3.00E+00	C	3.90E+02	3.90E+02	C	2.20E+01	2.20E+01	--	1.00E-01	1.70E-01
Dibenz(a,h)anthracene	53-70-3	0.1	0.33	1	5	--	C	3.00E-03	3.00E-03	C	3.90E-01	3.90E-01	C	2.20E-02	2.20E-02	--	1.00E-01	3.30E-02
Dibenzofuran	132-64-9	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	3.70E+00	-	4.20E-01
Diethylphthalate	84-66-2	0.1	0.33	1	5	--	N	2.90E+04	2.90E+03	N	8.20E+05	8.20E+04	N	6.30E+04	6.30E+03	2.10E+02	-	6.00E-01
Dimethylphthalate	131-11-3	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	--	-	--
Di-n-butylphthalate	84-74-2	0.1	0.33	1	5	--	N	3.70E+03	3.70E+02	N	1.00E+05	1.00E+04	N	7.80E+03	7.80E+02	1.90E+01	-	6.50E+00
Di-n-octylphthalate	117-84-0	0.1	0.33	1	5	--	--	--	--	--	--	--	--	--	--	2.20E+01	-	--
Fluoranthene	206-44-0	0.1	0.33	1	5	--	N	1.50E+03	1.50E+02	N	4.10E+04	4.10E+03	N	3.10E+03	3.10E+02	4.00E-02	1.00E-01	4.20E-01
Fluorene	86-73-7	0.1	0.33	1.5	5		N	2.40E+02	2.40E+01	N	4.10E+04	4.10E+03	N	3.10E+03	3.10E+02	3.00E+00	1.00E-01	7.70E-02
Hexachlorobenzene	118-74-1	0.1	0.33	1	5	1.00E+00	C	4.20E-02	4.20E-02	C	1.80E+00	1.80E+00	C	4.00E-01	4.00E-01	3.00E-04	-	2.00E-02
Hexachlorobutadiene	87-68-3	0.1	0.33	1.5	5	--	C!/N	8.60E-01	7.30E-01	C!/N	3.70E+01	2.00E+01	C!/N	8.20E+00	1.60E+00	1.30E+00	-	--
Hexachlorocyclopentadiene	77-47-4	0.1	0.33	1	5	5.00E+01	N	2.20E+02	2.20E+01	N	6.10E+03	6.10E+02	N	4.70E+02	4.70E+01	--	-	--
Hexachloroethane	67-72-1	0.1	0.33	2.5	5	--	C!/N	4.80E+00	3.70E+00	C!/N	2.00E+02	1.00E+02	C!/N	4.60E+01	7.80E+00	1.20E+01	-	1.00E+00
Indeno(1,2,3-cd)pyrene	193-39-5	0.15	0.33	1.5	5	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	--	1.00E-01	1.70E-02
Isophorone	78-59-1	0.1	0.33	1	5	--	C	7.00E+01	7.00E+01	C	3.00E+03	3.00E+03	C	6.70E+02	6.70E+02	--	-	--
Naphthalene	91-20-3	0.1	0.33	1.5	5	--	N	6.50E+00	6.50E-01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	1.10E+00	1.00E-01	1.80E-01
Nitrobenzene	98-95-3	0.1	0.33	1	5	--	N	3.50E+00	3.50E-01	N	5.10E+02	5.10E+01	N	3.90E+01	3.90E+00	--	-	--
N-Nitrosodi-n-propylamine	621-64-7	0.1	0.33	1.5	5	--	C	9.60E-03	9.60E-03	C	4.10E-01	4.10E-01	C	9.10E-02	9.10E-02	--	-	--
N-Nitrosodiphenylamine	86-30-6	0.1	0.33	1	5	--	C	1.40E+01	1.40E+01	C	5.80E+02	5.80E+02	C	1.30E+02	1.30E+02	2.10E+02	-	2.70E+00
Pentachlorophenol	87-86-5	0.1	1.3	1.5	20	1.00E+00	C	5.60E-01	5.60E-01	C	2.40E+01	2.40E+01	C	5.30E+00	5.30E+00	5.00E-01	1.00E-01	5.00E-01
Phenol	108-95-2	0.1	0.33	1	5	--	N	1.10E+04	1.10E+03	N	3.10E+05	3.10E+04	N	2.30E+04	2.30E+03	4.00E+00	1.00E-01	4.20E-01
Pyrene	129-00-0	0.1	0.33	1	5	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	2.50E-02	1.00E-01	2.00E-01
Acenaphthene	83-32-9	0.0014	0.0033	0.011	0.05	--	N	3.70E+02	3.70E+01	N	6.10E+04	6.10E+03	N	4.70E+03	4.70E+02	5.80E+00	1.00E-01	6.70E-03
Acenaphthylene [1]	208-96-8	0.00082	0.0033	0.019	0.05	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	--	1.00E-01	5.90E-03
Anthracene	120-12-7	0.00069	0.0033	0.021	0.05	--	N	1.80E+03	1.80E+02	N	3.10E+05	3.10E+04	N	2.30E+04	2.30E+03	1.20E-02	1.00E-01	5.70E-02
Benzo(a)anthracene	56-55-3	0.00131	0.0033	0.017	0.05	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	1.80E-02	1.00E-01	1.10E-01
Benzo(a)pyrene	50-32-8	0.00118	0.0033	0.017	0.05	2.00E-01	C	3.00E-03	3.00E-03	C	3.90E-01	3.90E-01	C	2.20E-02	2.20E-02	1.50E-02	1.00E-01	1.50E-01
Benzo(b)fluoranthene	205-99-2	0.00126	0.0033	0.018	0.05	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	--	1.00E-01	--
Benzo(g,h,i)perylene [1]	191-24-2	0.0022	0.0033	0.013	0.05	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	--	1.00E-01	1.70E-01
Benzo(k)fluoranthene	207-08-9	0.00123	0.0033	0.012	0.05	--	C	3.00E-01	3.00E-01	C	3.90E+01	3.90E+01	C	2.20E+00	2.20E+00	--	1.00E-01	2.40E-01
Chrysene	218-01-9	0.00094	0.0033	0.012	0.05	--	C	3.00E+00	3.00E+00	C	3.90E+02	3.90E+02	C	2.20E+01	2.20E+01	--	1.00E-01	1.70E-01
Dibenz(a,h)anthracene	53-70-3	0.00085	0.0033	0.02	0.005	--	C	3.00E-03	3.00E-03	C	3.90E-01	3.90E-01	C	2.20E-02	2.20E-02	--	1.00E-01	3.30E-02
Fluoranthene	206-44-0	0.00093	0.0033	0.016	0.05	--	N	1.50E+03	1.50E+02	N	4.10E+04	4.10E+03	N	3.10E+03	3.10E+02	4.00E-02	1.00E-01	4.20E-01

Table 8-2
Summary of Analyte Method Detection Limits, Reporting Limits, and Risk Screening Levels for TCL SVOCs (Method 8270C)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford, Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	M ug/L	M ug/L	M ug/L		M ug/L	M ug/L		mg/kg	mg/kg		mg/kg	mg/kg	M ug/L	mg/kg	mg/kg
Fluorene	86-73-7	0.00093	0.0033	0.016	0.05		N	2.40E+02	2.40E+01	N	4.10E+04	4.10E+03	N	3.10E+03	3.10E+02	3.00E+00	1.00E-01	7.70E-02
2-Methylnaphthalene	91-57-6	0.0013	0.0033	0.018	0.05	--	N	2.40E+01	2.40E+00	N	4.10E+03	4.10E+02	N	3.10E+02	3.10E+01	4.70E+00	-	2.00E-02
Indeno(1,2,3-cd)pyrene	193-39-5	0.00108	0.0033	0.018	0.05	--	C	3.00E-02	3.00E-02	C	3.90E+00	3.90E+00	C	2.20E-01	2.20E-01	--	1.00E-01	1.70E-02
Naphthalene	91-20-3	0.00158	0.0033	0.01	0.05	--	N	6.50E+00	6.50E-01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	1.10E+00	1.00E-01	1.80E-01
Pyrene	129-00-0	0.00072	0.0033	0.024	0.05	--	N	1.80E+02	1.80E+01	N	3.10E+04	3.10E+03	N	2.30E+03	2.30E+02	2.50E-02	1.00E-01	2.00E-01

Notes:

(a) Method Detection Limits and Reporting Limits provided by Empirical Laboratories, LLC

(b) USEPA Region 3 Risk-based Concentrations (October 2007)

(c) BTAG Screening Levels [1995 (soil), 2004 (surface water and sediment)].

Acronyms:

-- = Screening level unavailable.

BTAG = Biological Technical Assistance Group

CAS = Chemical Abstract Service

C!/N = RBC at HI of 0.1 < RBC-c; RBC from alternate RBC table.

C= RBC based cancer endpoint.

MCL = Maximum Contaminant Level

MDL = Method Detection Limit

mg/kg = Milligram Per kilogram

N = RBC based on non-carcinogenic endpoint.

PCBs = Polychlorinated Biphenyls

RBC = USEPA Region III Risk

RL = Reporting Limit

SVOC = Semivolatile organic compound

TCL = Target Compound List

ug/L = Microgram Per liter

Table 8-3
Summary of Analyte Detection Limits, Reporting Limits, and Risk Screening Levels for TAL Metals
(Methods 6010, 6020, 7470)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
Aluminum	7429-90-5	15	40	75	200		N	3.70E+04	3.70E+03	N	1.00E+06	1.00E+05	N	7.80E+04	7.80E+03	8.70E+01	1.00E+00	--
Antimony	7440-36-0	1	3	5	15	6.00E+00	N	1.50E+01	1.50E+00	N	4.10E+02	4.10E+01	N	3.10E+01	3.10E+00	3.00E+01	4.80E-01	2.00E+00
Arsenic	7440-38-2	0.6	2	3	10	1.00E+01	C	4.50E-02	4.50E-02	C	1.90E+00	1.90E+00	C	4.30E-01	4.30E-01	5.00E+00	3.30E+02	9.80E+00
Barium	7440-39-3	1	40	5	200	2.00E+03	N	7.30E+03	7.30E+02	N	2.00E+05	2.00E+04	N	1.60E+04	1.60E+03	4.00E+00	4.40E+02	--
Beryllium	7440-41-7	0.2	1	1	5	4.00E+00	N	7.30E+01	7.30E+00	N	2.00E+03	2.00E+02	N	1.60E+02	1.60E+01	6.60E-01	2.00E-02	--
Cadmium	7440-43-9	0.2	1	1	5	5.00E+00	N	1.80E+01	1.80E+00	N	5.10E+02	5.10E+01	N	3.90E+01	3.90E+00	2.50E-01	2.50E+00	9.90E-01
Calcium	7440-70-2	200	1000	1000	5000	--	--	--	--	--	-	--	--	--	--	1.20E+05	--	--
Chromium	7440-47-3	0.4	2	2	10	1.00E+02	N	1.10E+02	1.10E+01	N	3.10E+03	3.10E+02	N	2.30E+02	2.30E+01	8.50E+01	7.50E-03	4.30E+01
Cobalt	7440-48-4	1	3	5	15	--	--	--	--	--	-	--	--	--	--	2.30E+01	1.00E+02	5.00E+01
Copper	7440-50-8	1	5	5	25	1.30E+03	N	1.50E+03	1.50E+02	N	4.10E+04	4.10E+03	N	3.10E+03	3.10E+02	9.00E+00	1.50E+01	3.20E+01
Cyanide	57-12-5	0.25	10	0.125	5	2.00E+02	N	7.30E+02	7.30E+01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	5.00E+00	5.00E-03	1.00E-01
Iron	7439-89-6	6	20	30	100	--	N	2.60E+04	2.60E+03	N	7.20E+05	7.20E+04	N	5.50E+04	5.50E+03	3.00E+02	1.20E+01	2.00E+04
Lead[2]	7439-92-1	0.3	0.6	1.5	3	1.50E+01	--	--	--	--	7.50E+02	7.50E+02	--	4.00E+02	4.00E+02	2.50E+00	1.00E-02	3.60E+01
Magnesium	7439-95-4	200	1000	1000	5000	--	--	--	--	--	-	--	--	--	--	8.20E+04	4.40E+03	--
Manganese	7439-96-5	0.6	3	5	15	--	N	7.30E+02	7.30E+01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	1.20E+02	3.30E+02	4.60E+02
Mercury[3]	7439-97-6	0.013	0.033	0.08	0.2	2.00E+00	--	--	--	N	3.10E+02	3.10E+01	N	2.30E+01	2.30E+00	1.00E-01	5.80E-02	1.80E-01
Nickel	7440-02-0	1	8	5	10	--	N	7.30E+02	7.30E+01	N	2.00E+04	2.00E+03	N	1.60E+03	1.60E+02	5.20E+01	2.00E+00	2.30E+01
Potassium	7440-09-7	200	500	1000	2000	--	--	--	--	--	-	--	--	--	--	--	--	--
Selenium	7782-49-2	0.6	1	5	10	5.00E+01	N	1.80E+02	1.80E+01	N	5.10E+03	5.10E+02	N	3.90E+02	3.90E+01	1.00E+00	1.80E+00	2.00E+00
Silver	7440-22-4	0.2	2	2	10	--	N	1.80E+02	1.80E+01	N	5.10E+03	5.10E+02	N	3.90E+02	3.90E+01	3.20E+00	9.80E-06	1.00E+00
Sodium	7440-23-5	200	1000	1000	5000	--	--	--	--	--	-	--	--	--	--	6.80E+05	--	--
Thallium	7440-28-0	0.6	2	3	10	2.00E+00	N	2.60E+00	2.60E-01	N	7.20E+01	7.20E+00	N	5.50E+00	5.50E-01	8.00E-01	1.00E-03	--

Table 8-3
Summary of Analyte Detection Limits, Reporting Limits, and Risk Screening Levels for TAL Metals
(Methods 6010, 6020, 7470)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford Virginia

Compound	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
Vanadium	7440-62-2	1	10	5	50	--	N	3.70E+01	3.70E+00	N	1.00E+03	1.00E+02	N	7.80E+01	7.80E+00	2.00E+01	5.00E-01	--
Zinc	7440-66-6	1	4	10	20	--	N	1.10E+04	1.10E+03	N	3.10E+05	3.10E+04	N	2.30E+04	2.30E+03	1.20E+02	1.00E+01	1.20E+02

Notes:

(a) Method Detection Limits and Reporting Limits provided by Empirical Laboratories, LLC

(b) USEPA Region 3 Risk-based Concentrations (October 2007)

(c) BTAG Screening Levels [1995 (soil), 2004 (surface water and sediment)].

Acronyms:

-- = Screening level unavailable.
BTAG = Biological Technical Assistance Group
CAS = Chemical Abstract Service
C!/N = RBC at HI of 0.1 < RBC-c; RBC from alternate RBC table.
C= RBC based cancer endpoint.
MCL = Maximum Contaminant Level
MDL = Method Detection Limit
mg/kg = Milligram Per kilogram
N = RBC based on non-carcinogenic endpoint.
PCBs = Polychlorinated Biphenyls
RBC = USEPA Region III Risk
RL = Reporting Limit
TCL = Target Compound List
ug/L = Microgram Per liter

Table 8-4
Summary of Analyte MDLs, Reporting Limits, and Risk Screening Levels for TCL Pesticides (8081A), and PCBs (8082), and Herbicides (8151)
Radford Army Ammunition Plant, Radford, Virginia

	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
Pesticides by Method 8081A																		
4,4'-DDD	72-54-8	0.0002	0.0005	0.005	0.015		C	2.80E-01	2.80E-01	C	1.20E+01	1.20E+01	C	2.70E+00	2.70E+00	1.10E-02	1.00E-01	4.90E-03
4,4'-DDE	72-55-9	0.0002	0.0005	0.005	0.015	--	C	2.00E-01	2.00E-01	C	8.40E+00	8.40E+00	C	1.90E+00	1.90E+00	--	1.00E-01	3.20E-03
4,4'-DDT	50-29-3	0.0002	0.0005	0.005	0.015	--	C	2.00E-01	2.00E-01	C	8.40E+00	8.40E+00	C	1.90E+00	1.90E+00	1.00E-03	1.00E-01	--
Aldrin	309-00-2	0.0002	0.0005	0.005	0.015	--	C	3.90E-03	3.90E-03	C	1.70E-01	1.70E-01	C	3.80E-02	3.80E-02	3.00E+00	1.00E-01	2.00E-03
alpha-BHC	319-84-6	0.0002	0.0005	0.005	0.015	--	C	1.10E-02	1.10E-02	C	4.50E-01	4.50E-01	C	1.00E-01	1.00E-01	--	1.00E+02	6.00E-03
alpha-Chlordane	5103-71-9	0.0002	0.0005	0.005	0.015	--	C	1.90E-01	1.90E-01	C	8.20E+00	8.20E+00	C	1.80E+00	1.80E+00	--	1.00E-01	--
gamma-Chlordane	5103-74-2	0.0002	0.0005	0.005	0.015	--	C	1.90E-01	1.90E-01	C	8.20E+00	8.20E+00	C	1.80E+00	1.80E+00	--	1.00E-01	--
beta-BHC	319-85-7	0.0002	0.0005	0.005	0.015	--	C	3.70E-02	3.70E-02	C	1.60E+00	1.60E+00	C	3.50E-01	3.50E-01	--	1.00E+02	5.00E-03
delta-BHC	319-86-8	0.0002	0.0005	0.005	0.015	--	C	1.10E-02	1.10E-02	C	4.50E-01	4.50E-01	C	1.00E-01	1.00E-01	1.40E+02	1.00E+02	6.40E+00
Dieldrin	60-57-1	0.0002	0.0005	0.005	0.015	--	C	4.20E-03	4.20E-03	C	1.80E-01	1.80E-01	C	4.00E-02	4.00E-02	5.60E-02	1.00E-01	1.90E-03
Endosulfan I	959-98-8	0.0002	0.0005	0.005	0.015	--	N	2.20E+02	2.20E+01	N	6.10E+03	6.10E+02	N	4.70E+02	4.70E+01	5.10E-02	-	2.90E-03
Endosulfan II	33213-65-9	0.0002	0.0005	0.005	0.015	--	N	2.20E+02	2.20E+01	N	6.10E+03	6.10E+02	N	4.70E+02	4.70E+01	5.10E-02	-	1.40E-02
Endosulfan sulfate	1031-07-8	0.0002	0.0005	0.005	0.015	--	N	2.20E+02	2.20E+01	N	6.10E+03	6.10E+02	N	4.70E+02	4.70E+01	--	-	5.40E-03
Endrin	72-20-8	0.0002	0.0005	0.005	0.015	2.00E+00	N	1.10E+01	1.10E+00	N	3.10E+02	3.10E+01	N	2.30E+01	2.30E+00	3.60E-02	1.00E-01	2.20E-03
Endrin aldehyde	7421-93-4	0.0002	0.0005	0.005	0.015	--	N	1.10E+01	1.10E+00	N	3.10E+02	3.10E+01	N	2.30E+01	2.30E+00	--	1.00E-01	--
Endrin ketone	53494-70-5	0.0002	0.0005	0.005	0.015	--	N	1.10E+01	1.10E+00	N	3.10E+02	3.10E+01	N	2.30E+01	2.30E+00	--	1.00E-01	--
gamma-BHC (Lindane)	58-89-9	0.0002	0.0005	0.005	0.015	2.00E-01	C	5.20E-02	5.20E-02	C	2.20E+00	2.20E+00	C	4.90E-01	4.90E-01	--	1.00E-01	--
Heptachlor	76-44-8	0.0002	0.0005	0.005	0.015	4.00E-01	C	1.50E-02	1.50E-02	C	6.40E-01	6.40E-01	C	1.40E-01	1.40E-01	3.80E-03	1.00E-01	6.80E-02
Heptachlor epoxide	1024-57-3	0.0002	0.0005	0.005	0.015	2.00E-01	C	7.40E-03	7.40E-03	C	3.10E-01	3.10E-01	C	7.00E-02	7.00E-02	3.80E-03	1.00E-01	2.50E-03
Methoxychlor	72-43-5	0.0002	0.0005	0.005	0.015	4.00E+01	N	1.80E+02	1.80E+01	N	5.10E+03	5.10E+02	N	3.90E+02	3.90E+01	1.90E-02	1.00E-01	1.90E-02
Toxaphene	8001-35-2	0.011	0.033	0.33	1	3.00E+00	C	6.10E-02	6.10E-02	C	2.60E+00	2.60E+00	C	5.80E-01	5.80E-01	2.00E-04	-	1.00E-03
Polychlorinated Biphenyls by Method 8082																		
Aroclor 1016	12674-11-2	0.005	0.017	0.125	0.5	0.5	C!/N	9.60E-01	2.60E-01	C!/N	4.10E+01	7.20E+00	N	5.50E+00	5.50E-01	7.40E-05	1.00E-01	--
Aroclor 1221	11104-28-2	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	7.40E-05	1.00E-01	--
Aroclor 1232	11141-16-5	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	7.40E-05	1.00E-01	--
Aroclor 1242	53469-21-9	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	7.40E-05	1.00E-01	--
Aroclor 1248	12672-29-6	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	7.40E-05	1.00E-01	--
Aroclor 1254	11097-69-1	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C!/N	3.20E-01	1.60E-01	7.40E-05	1.00E-01	--
Aroclor 1260	11096-82-5	0.005	0.017	0.125	0.5	0.5	C	3.30E-02	3.30E-02	C	1.40E+00	1.40E+00	C	3.20E-01	3.20E-01	7.40E-05	1.00E-01	--
Herbicides by Method 8151																		
2,4,5-T	93-76-5	0.0025	0.0075	0.025	0.075	--	N	3.65E+02	3.65E+01	N	1.02E+04	1.02E+03	N	7.82E+02	7.82E+01	686	--	12.3
2,4,5-TP (Silvex)	93-72-1	0.025	0.0075	0.025	0.075	5.00E+01	N	2.92E+02	2.92E+01	N	8.18E+03	8.18E+02	N	6.26E+02	6.26E+01	30	--	0.675
2,4-D	94-75-7	0.025	0.075	0.25	0.75	7.00E+01	N	3.65E+02	3.65E+01	N	1.02E+04	1.02E+03	N	7.82E+02	7.82E+01	--	--	--
2-4-DB	94-82-6	0.025	0.075	0.25	0.75	--	N	2.92E+02	2.92E+01	N	8.18E+03	8.18E+02	N	6.26E+02	6.26E+01	--	--	--

Table 8-4
Summary of Analyte MDLs, Reporting Limits, and Risk Screening Levels for TCL Pesticides (8081A), and PCBs (8082), and Herbicides (8151)
Radford Army Ammunition Plant, Radford, Virginia

	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/kg	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
Dalapon	75-99-0	0.0625	0.19	0.625	1.9	2.00E+02	N	1.10E+03	1.10E+02	N	3.07E+04	3.07E+03	N	2.35E+03	2.35E+02	--	--	--
Dicamba	1918-00-9	0.0625	0.19	0.625	1.9	--	N	1.10E+03	1.10E+02	N	3.07E+04	3.07E+03	N	2.35E+03	2.35E+02	--	--	--
Dichlorprop	120-36-5	0.025	0.075	0.25	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--
Dinoseb	88-85-7	0.0125	0.038	0.125	0.38	7.00E+00	N	3.65E+01	3.65E+00	N	1.02E+03	1.02E+02	N	7.82E+01	7.82E+00	0.05	--	0.000611
MCPA	94-74-6	2.5	7.5	25	75	--	N	1.83E+01	1.83E+00	N	5.11E+02	5.11E+01	N	3.91E+01	3.91E+00	--	--	--
MCPP (Mecoprop)	93-65-2	2.5	7.5	25	75	--	N	3.65E+01	3.65E+00	N	1.02E+03	1.02E+02	N	7.82E+01	7.82E+00	--	--	--

Notes:
(a) Method Detection Limits and Reporting Limits provided by Empirical Laboratories, LLC
(b) USEPA Region 3 Risk-based Concentrations (October 2007)
(c) BTAG Screening Levels [1995 (soil), 2004 (surface water and sediment)].

Acronyms:
-- = Screening level unavailable.
BTAG = Biological Technical Assistance Group
CAS = Chemical Abstract Service
C!/N = RBC at HI of 0.1 < RBC-c; RBC from alternate RBC table.
C= RBC based cancer endpoint.
MCL = Maximum Contaminant Level
MDL = Method Detection Limit
mg/kg = Milligram Per kilogram
N = RBC based on non-carcinogenic endpoint.
PCBs = Polychlorinated Biphenyls
RBC = USEPA Region III Risk
RL = Reporting Limit
TCL = Target Compound List
ug/L = Microgram Per liter

Table 8-5
Summary of Analyte Detection Limits, Reporting Limits, and Risk Screening Levels for Explosives (Methods 8330, 8330M, and 8332)
Soil and Water Samples MQAP Addendum - PBC2
Radford Army Ammunition Plant,
Radford, Virginia

	CAS Number	Laboratory-Specific Method Detection and Reporting Limits (a)				USEPA MCLs	USEPA Region III Risk-Based Concentrations (b)									USEPA Region III BTAG Screening Levels (c)		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		mg/k	mg/kg	ug/L	ug/L	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/k	mg/kg
Compounds by Method 8330																		
1,3,5-Trinitrobenzene	99-35-4	0.1	0.5	0.1	0.5	NA	N	1.1E+03	1.1E+02	N	3.1E+04	3.1E+03	N	2.3E+03	2.3E+02	--	--	--
1,3-Dinitrobenzene	99-65-0	0.1	0.5	0.1	0.36	NA	N	3.7E+00	3.7E-01	N	1.0E+02	1.0E+01	N	7.8E+00	7.8E-01	--	--	--
2,4,6-Trinitrotoluene	118-96-7	0.1	0.5	0.1	0.5	NA	C/N	2.2E+00	1.8E+00	C!/N	9.5E+01	5.1E+01	C!/N	2.1E+01	3.9E+00	1.0E+02	--	9.2E-02
2,4-Dinitrotoluene	121-14-2	0.13	0.5	0.1	0.5	NA	N	7.3E+01	7.3E+00	N	2.0E+03	2.0E+02	N	1.6E+02	1.6E+01	4.4E+01	--	4.2E-02
2,6-Dinitrotoluene	606-20-2	0.13	0.5	0.1	0.5	NA	N	3.7E+01	3.7E+00	N	1.0E+03	1.0E+02	N	7.8E+01	7.8E+00	8.1E+01	--	--
2-Amino-4,6-dinitrotoluene	35572-78-2	0.15	0.5	0.1	0.5	NA	N	7.3E+01	7.3E+00	N	2.0E+03	2.0E+02	N	1.6E+02	1.6E+01	1.5E+03	--	--
2-Nitrotoluene	88-72-2	0.1	0.5	0.1	0.5	NA	N	6.1E+01	6.1E+00	N	1.0E+04	1.0E+03	N	7.8E+02	7.8E+01		--	--
3-Nitrotoluene	99-08-1	0.15	0.5	0.1	0.5	NA										7.5E+02	--	--
4-Amino-2,6-dinitrotoluene	1946-51-0	0.1	0.5	0.1	0.5	NA	N	7.3E+01	7.3E+00	N	2.0E+03	2.0E+02	N	1.6E+02	1.6E+01		--	--
4-Nitrotoluene	99-99-0	0.1	0.5	0.1	0.5	NA										1.9E+03	--	4.1E+00
HMX	2691-41-0	0.1	0.5	0.1	0.5	NA	N	1.8E+03	1.8E+02	N	5.1E+04	5.1E+03	N	3.9E+03	3.9E+02	1.5E+02	--	--
Nitrobenzene	98-95-3	0.11	0.5	0.1	0.33	NA	N	3.5E+00	3.5E-01	N	5.1E+02	5.1E+01	N	3.9E+01	3.9E+00		--	--
RDX	121-82-4	0.1	0.5	0.1	0.5	NA	C	6.1E-01	6.1E-01	C	2.6E+01	2.6E+01	C	5.8E+00	5.8E+00	3.6E+02	--	1.3E-02
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	479-45-8	0.1	0.5	0.1	0.5	NA	N	1.5E+02	1.5E+01	N	4.1E+03	4.1E+02	N	3.1E+02	3.1E+01	--	--	--
PETN	78-11-5	1.6	5	1.3	5	NA	--	--	--	--	--	--	--	--	--	8.5E+04	--	--
Compound by Method 8332																		
Nitroglycerin	55-63-0	1.6	4.8	1.3	4.8	NA	N	3.7E+00	3.7E-01	N	1.0E+02	1.0E+01	N	7.8E+00	7.8E-01	1.4E+02	--	--

Notes:
(a) Method Detection Limits and Reporting Limits provided by Empirical Laboratories, LLC
(b) USEPA Region 3 Risk-based Concentrations (October 2007)
(c) BTAG Screening Levels [1995 (soil), 2004 (surface water and sediment)].

Acronyms:
-- = Screening level unavailable.
BTAG = Biological Technical Assistance Group
C!/N = RBC at HI of 0.1 < RBC-c; RBC from alternate RBC table.
C= RBC based cancer endpoint.
CAS = Chemical Abstract Service
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
MCL = Maximum Contaminant Level
MDL = Method Detection Limit
mg/kg = Milligram Per kilogram
N = RBC based on non-carcinogenic endpoint.
PCBs = Polychlorinated Biphenyls
RBC = USEPA Region III Risk
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine
RL = Reporting Limit
TCL = Target Compound List
ug/L = Microgram Per liter

Table 8-6
Summary of Analyte Detection Limits, Reporting Limits, and Risk Screening Levels for Dioxin/Furans (Mehtod 8290)
Soil and Water Samples PBC2 Project QAPP Addendum
Radford Army Ammnunition Plant,
Radford, Virginia

Dioxins and Furans by Method 8290	CAS Number	Laboratory-Specific Method Detection and Reporting Limits				USEPA MCLs	USEPA Region III Risk-Based Concentrations									USEPA Region III BTAG Screening Levels		
		Soil		Water			Tap Water			Soil Industrial			Soil Residential			Aqueous Fresh Water	Soil	Sediment
		MDL	Reporting Limit	MDL	Reporting Limit	MCL	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC	C/N	RBC	Adjusted RBC			
		ppt	ppt	ppq	ppq	ug/L		ug/L	ug/L		mg/kg	mg/kg		mg/kg	mg/kg	ug/L	mg/kg	mg/kg
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	0.0591	1	0.94	10	3.00E-05	C	4.46E-07	--	C	1.91E-05	--	C	4.26E-06	--	--	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	40321-76-4	0.288	5	0.963	50	--	--		--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)[a]	39227-28-6	0.187	5	1.23	50	--	C	1.08E-05	--	C	4.62E-04	--	C	1.03E-04	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)[a]	57653-85-7	0.276	5	2.06	50	--	C	1.08E-05	--	C	4.62E-04	--	C	1.03E-04	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)[a]	19408-74-3	0.288	5	1.46	50	--	C	1.08E-05	--	C	4.62E-04	--	C	1.03E-04	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-46-9	0.293	5	3.46	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9	0.644	10	1.03	100	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9	0.162	1	0.563	10	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6	0.367	5	2.25	50	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4	0.247	5	1.5	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9	0.336	5	2.59	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9	0.153	5	2.02	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9	1.05	5	2.16	50	--	--	--	--	--	--	--	--	--	--	--	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5	0.304	5	2.97	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4	0.604	5	1.79	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7	0.257	5	1.94	50	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4,5,6,7,8-Octachlorodibenzofuran (OCDF)	39001-02-0	0.694	10	2.52	100	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
CAS = Chemical Abstract Service
ppt = part per trillion
ppq = part per quadrillion
ug/L = Microgram Per liter
MDL = Method Detection Limit
RL = Reporting Limit
Method Detection Limits provided by SGS Environmental Services, Inc,
-- = No Risk Criteria Available

MCL = Maximum Contaminant Level
BTAG = Biological Technical Assistance Group
Soil - BTAG Screening Draft Values, 1995
Water - BTAG Freshwater Screening Values, 2004
Sediment - BTAG Sediment Screening Values, 2004
RBC = USEPA Region III Risk Based Concentration, Oct 2007
C/N = Carcinogenic /Noncarcinogenic
[a] = RBC value is for Hexachlorodibenzo-p-dioxin mix
[b] = Reporting limit was not low enough to meet screening criteria - but MDL does

Table 8-7
General Field Equipment and Calibration Procedures
Radford Army Ammunition Plant
Radford, Virginia

Instrument or Equipment	Description	Field Calibration Procedure	Performance Criteria	Responsible Personnel
pH/Conductivity, Temperature Meter	Meter designed for field use with battery operation. Range pH: 0 to 14 S.U. Range conductivity: 0 to 2,000 uS.	Instruments are factory-calibrated and automatically compensate for temperature. Calibration of the meters for pH will be completed each day immediately prior to use in accordance with ARCADIS SOPs T106 and/or T131 and the manufacturers recommendations. In general pH meter calibration will include two pH buffers bracketing expected pH range of samples to be measured (i.e. 7.00 and 4.00) with a verification of the slope using a third buffer (4.00 or 10.00) The electrode will be rinsed between buffers and stored in the manufacturer recommended solutions between field measurements. Conductivity calibrations are conducted similarly to the pH calibration utilizing two calibration standards and adjusting the meter to the appropriate values. Calibrations will be verified with a pH buffer at least every 4 hours and at the end of the sampling day.	pH +/- 0.01 S.U. Conductivity at +/- 2%FSD. The instrument will be checked with a pH buffer every 4 hours and at the end of the sampling day. If the response is greater than $\pm$ 0.2 S.U. from the standard, complete re-calibration will be conducted. Conductivity will be checked every 4 hours.	Sample Collection Personnel
pH/Conductivity, Temperature, Dissolved oxygen (DO), Oxidation/ Reduction (REDOX) Meter	YSI Model 600 XL probe with YSI Model 610-D display instrumentation or the QED FC4000. Units must automatically correct for salinity at low DO readings by estimating salinity from temperature and conductivity measurements, and then internally adjusting the DO reading. The probes must contain separate pH, temperature, conductivity, DO, and ORP probes in one unit.	Each day prior to use, the pH, specific conductance, DO, and ORP probes will be calibrated or tested for responsiveness in accordance with ARCADIS SOPs and the manufacturers recommendations. The pH probe will be calibrated utilizing two buffers (pH 7.00, then pH 4.00), and a verification buffer. The ORP probe is then calibrated with the ORP standard solution (Zobell), and the DO probe is checked with saturated air in accordance with manufacturers guidance The probes should be rinsed with deionized water between each calibration solution and following calibration. Used calibration solution is to be discarded. Finally, the conductivity probe is checked with a solution of known conductivity.	Turbidity and DO - +/- 10% pH +/- 0.01 S.U. Conductivity at +/- 2%FSD The instrument calibration will be verified every 4 hours and at the end of the sampling day. For pH, if the calibration check is greater than $\pm$ 0.2 S.U. from the true value, complete calibration will be conducted.	Project Geologist, Sample Collection Personnel

Table 8-7
General Field Equipment and Calibration Procedures
Radford Army Ammunition Plant
Radford, Virginia

Instrument or Equipment	Description	Field Calibration Procedure	Performance Criteria	Responsible Personnel
Turbidimeter	Nephelometer designed for field use with battery operation. Range 0.01 to 1000 NTU.	The unit is factory calibrated. Unit responsiveness will be checked prior to use each day with appropriate standards provided by the supplier. The responsiveness is checked on the 0 to 10 range, 0 to 100 range, and 0 to 1000 range.	+/- 10%	Sample Collection Personnel
HNU Photoionization Detector	Photoionization detector that is a portable, non-destructive trace gas analyzer. Units must be Class I, Division 2, Grade A,B,C,D. Unit must have rechargeable battery, range of 0 to 2000 ppm, and a 10.2 or 11.7 eV lamp. Calibration check gas (e.g., isobutylene must be provided with unit).	Instrument is calibrated internally prior to shipment from the warehouse or every 6 months, whichever is more frequent. In the field, HNUs will be calibrated at the start of each day in accordance with manufacturers instructions. If a significant change in weather occurs during the day (i.e., change in humidity or temperature) or if the unit is turned off for an extended period, the instrument will be recalibrated at prior to use. When an HNU is used to screen samples in the field, periodic ambient readings will also be recorded in the logbook. The general calibration procedure include: • Turn unit on and allow for five minute warm-up; • Set span control for probe being used (10.2 or 11.7); • Set function switch to standby position and adjust zero using zero adjust knob; • Set function switch to the 0 to 200 ppm range; • Connect the analyzer to the regulator and calibration gas cylinder • 0pen the regulator valve and allow the meter reading to stabilize; and • Using the span knob, adjust the meter to the concentration indicated on the calibration gas cylinder.	Meter must be able to adjust properly using the span knob or the lamp may require cleaning.	Site Safety Officer

Table 8-8
Field Quality Control Samples
Radford Army Ammunition Plant, Radford, Virginia

Control	Purpose of Sample	Collection Frequency
Field Duplicate	Ensure precision in sample homogeneity during collection and analysis	20% of field samples per matrix
Rinse Blank	Ensure the decontamination of sampling equipment has been adequately performed; to assess cross contamination and/or incidental contamination to the sample container	1 per 20 samples per matrix per sample technique
Temperature Blank	To verify sample cooler temperature upon receipt at the laboratory	1 per cooler
Trip Blank	To evaluate potential cross contamination of samples during transport or storage.	1 per cooler containing sample requiring VOC analyses

Table 8-9
Field Quality Control Elements Acceptance Criteria
Radford Army Ammunition Plant, Radford, Virginia

Item	DQO	Parameter	Frequency of Association	Criteria Goal
Field Duplicates	P, R	Organics	1 per 10 samples	RPD < 40% Aqueous; difference + RL* RPD < 60% Solid; difference + 2xRL*
Trip Blank	A,R	VOCs in water	1 per cooler with aqueous VOCs	No target analytes detected greater than the RL
Rinse Blank	A,R	Entire	1 per 20 samples per matrix per equipment type requiring decontamination	No target analytes detected greater than the RL
Chain of Custody Forms	R	Entire	Every sample	Filled out correctly to include signatures; no missing or incorrect information.
Representative Sampling Forms	R	Entire	Every sample	Filled out correctly to include signatures; no missing or incorrect information.
Field Logbook	R	Entire	Every sample	Filled out correctly to include analytical parameters; map file data; and applicable coding information.
Field Instrument Calibration Logs	A	Entire	Every measurement	Measurements must have associated calibration reference

A = Accuracy C = Comparability R = Representativeness P = Precision

Table 8-10
Analytical Quality Control Elements
Radford Army Ammunition Plant, Radford, Virginia

Item	DQO	Parameter	Frequency of Association	Criteria Requirement
Analytical Method	C	Entire	Each analysis	Method analyses based on USEPA methods as defined in Section 2.5
Chemical Data Packages	C	Entire	Each lot/batch	Pass peer review and formal QA/QC check.
Laboratory System Controls	A,C,P, R	Entire	During laboratory operations	No deficiencies
Holding Time	A,C,P, R	Entire	Each analysis	No deficiencies (Table 6-1)
Initial and Continuing Calibrations	A, P	Entire	As method applicable	Must meet method criteria and laboratory SOPs.
Method Blanks	A,R	Entire	Each lot/batch	No target analyte detected in the method blanks greater than RL
Laboratory Control Sample (LCS) and LSC Duplicate	A	Entire	Each lot/batch	Must meet criteria as defined in Tables 8-7 through 8-13
Matrix Spike MS, MS Duplicates, and Laboratory Replicates	A,P	Entire	Each lot/batch	Must meet criteria as defined in Tables 8-7 through 8-13
Surrogates	A	Entire	Organic fractions, including QC samples	Must meet criteria as defined in Tables 8-7 through 8-13
Serial dilution and Post Digestion Spike	A	Metals	Inorganic Fractions, Each lot/batch	Must meet criteria as defined in Table 8-10

Legend: A = Accuracy C = Comparability R = Representativeness P = Precision

Table 8-11
Quality Control Method Criteria for Volatile Organic Compounds by USEPA SW-846 8260B
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency	Acceptance Criteria		Corrective Action
Initial Calibration 5-pt curve (linear) 6-pt curve (2^o order)	Set-up, major maintenance, or for drift correction	RRF > 0.10/0.30 for SPCCs RSD < 30% for CCCs response factors RSD for analytes < 15% or r>0.995 (linear) or r^2>0.99 (2^o order)		Sample analysis cannot begin until this criterion is met. Data reviewer should review and judge each target compound against the acceptance criteria.
Initial Calibration Verification	Immediately following initial calibration	A second source full compliment target list with a percent recovery = 75-125%		Sample analysis cannot begin until this criterion is met.
Continuing Calibration Check	Every 12 hours	RRF > 0.10/0.30 for SPCCs %Difference for RF of CCCs ±30% from initial calibration. Mean for analytes < 20% as no individual target exceeds 40%D		Sample analysis cannot begin until this criterion is met. Data reviewer should review and judge each target compound against the acceptance criteria.
Method Blank	Every day/batch.	No target analytes greater than one half of the RL		Document source of contamination. Re-analysis is required for positive results associated with blank contamination.
Tuning BFB	Prior to calibration and every 12 hours	Must meet tuning criteria		Re-tune, re-calibrate, and re-analyze affected sample analyses.
Laboratory Control Spike	Every batch	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery limits listed in the current version of the DOD QSM	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.
Internal Standards	Every sample	Recommended Standards fluorobenzene chlorobenzene-d5 1,4-dichlorobenzene-d4	Retention time ±30 seconds of mid point of initial calibration Area changes within a factor of two (-50% to +100%)	Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples associated with standards outside criteria. A third analytical run may be required at a dilution.

Table 8-11
Quality Control Method Criteria for Volatile Organic Compounds by USEPA SW-846 8260B
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency	Acceptance Criteria		Corrective Action
Surrogate	Every sample	Recommended Standards Toluene-d8 4-Bromofluorobenzene 1,2-Dichloroethane-d4	Laboratory generated control limits not to exceed those listed in the current version of the DOD QSM	If surrogate compounds do not meet criteria, there should be a re-analysis to confirm that the non-compliance is due to the sample matrix effects rather than laboratory deficiencies.
Matrix Spike and Duplicate	1 per 20 per matrix	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery	If MS/MSD results do not meet criteria, the reviewer should review the data in

Table 8-12
Quality Control Method Criteria for Semi-volatile Organic Compounds by USEPA SW-846 8270C
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency	Acceptance Criteria		Corrective Action
Initial calibration 5-pt curve (linear) 6-pt curve (2^o order)	Set-up, major maintenance, or for drift correction	RRF > 0.05 for SPCCs RSD <30% for CCC compounds RSD for target analytes < 15% or r>0.995 (linear) or r^2>0.99 (2^o order)		Sample analysis cannot begin until this criterion is met. Data reviewer should review and judge each target compound against the acceptance criteria.
Initial Calibration Verification	Immediately following every initial calibration	A second source full compliment target list with a 80-120%		Sample analysis cannot begin until this criterion is met.
Continuing Calibration Check	12 hours	RRF > 0.05 for SPCCs %Difference for RF of CCCs ±30% from initial calibration Mean for analytes < 20% as no individual target exceeds 40%D		Sample analysis cannot begin until this criterion is met. Data reviewer should review and judge each target compound against the acceptance criteria.
Internal standards	Every sample	Retention time ±30 seconds from mid point of initial calibration Area changes by a factor of two (-50% to +100%)		Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples with internal standards outside criteria.
Tuning DFTPP	12 hours	Must meet tuning criteria.		Re-tune, re-calibrate, and re-analyze affected sample analyses.
Method Blank	Per extraction batch	No target analytes greater than one half of the RL		Document source of contamination. Re-extraction/re-analysis is required for positive results associated with blank contamination.
Laboratory Control Spike	Every batch	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery limits listed in the current version of the DoD QSM	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.

Table 8-12
Quality Control Method Criteria for Semi-volatile Organic Compounds by USEPA SW-846 8270C
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency	Acceptance Criteria		Corrective Action
Internal Standards	Every sample	Recommended Standards phenanthrene-d10 chrysene-d12 perylene-d12 1,4-dichlorobenzene-d4 naphthalene-d8 acenaphthalene-d10	Retention time ±30 seconds of mid point of initial calibration Area changes within a factor of two (-50% to +100%)	Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples associated with standards outside criteria. A third analytical run may be required at a dilution.
Surrogate Spikes	Every sample	Recommended Standards nitrobenzene-d5 2-fluorobiphenyl p-terphenyl-d14 phenol-d5 2,4,6-tribromophenol 2-fluorophenol	Laboratory generated control limits not to exceed limits listed in the current version of the DoD QSM	If two base/neutral or acid surrogates are out of specification, or if one base/neutral or acid extractable surrogate has a recovery of less than 10%, then there should be a re-extraction and re-analysis to confirm that the non-compliance is due to sample matrix effects rather than laboratory deficiencies.
Matrix Spike and Duplicate	1 per 20 samples per matrix	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery limits listed in the current version of the DoD QSM	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Table 8-13
Quality Control Method Criteria for Explosives by USEPA SW-846 8330 and 8332
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial Calibration Curve 5-pt curve (linear) 6-pt curve (2^o order)	Set-up, major maintenance, or for drift correction for each column used for analysis	%RSD <20% or r>0.995 (linear) or r2>0.99 (2o order)	Sample analysis cannot begin until this criterion is met.
Initial Calibration Verification	Immediately following every initial calibration	A second source full compliment of target list with recovery = 80-120%	Sample analysis cannot begin until this criterion is met.
Continuing Calibration Check	Every ten samples or twelve hours	%D ± 15% of the response factor from the initial curve. The mean may be used as long as no individual target exceeds 30%D	Sample analysis cannot begin until this criterion is met. If criteria are not met, reanalyze the daily standard. If the daily standard fails a second time, initial calibration must be repeated. Data reviewer should review and judge each target compound against the acceptance criteria.
Method Blank	1 per batch	No target analytes detected greater than one half of the RL	Document source of contamination. Re-extraction/re-analysis is required for positive results associated with blank contamination.

Table 8-13
Quality Control Method Criteria for Explosives by USEPA SW-846 8330 and 8332
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria		Corrective Action
Laboratory Control Spike	1 per batch	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery limits listed in the current version of the DOD QSM	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.
Surrogate Spikes	Every sample	Standards A similar compound that is not expected to be found at the site	Laboratory generated control limits not to exceed limits listed in the current version of the DOD QSM	If surrogate compounds do not meet criteria, there should be a re-extraction and re-analysis to confirm that the non-compliance is due to the sample matrix effects rather than laboratory deficiencies.
Matrix Spike and Duplicate	1 per 20 samples per matrix	Standards Full compliment target list	Laboratory generated control limits not to exceed recovery limits listed in the current version of the DOD QSM	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Table 8-13
Quality Control Method Criteria for Explosives by USEPA SW-846 8330 and 8332
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Target Analyte Confirmation	Every positive detection	RPD < 40%	Report the higher of the two concentrations unless a positive bias is apparent and qualify.

Table 8-14
Quality Control Method Criteria for Target Analyte List Metals by USEAP SW-846 6020/6010B/7471A/7470A/9010C/9012A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria		Corrective Action
Tune (MS) [6020]	Daily	Analyzed a minimum of four times with RSD < 5% for analytes in the solution.		Sample analysis cannot begin until this criterion is met.
Mass Calibration (MS) [6020]	Daily	Difference < 0.1 amu from true value.		Adjust to the correct value.
Resolution Check (MS) [6020]	Daily	Peak width <0.9 amu at 10% peak height		Sample analysis cannot begin until this criterion is met.
Initial Calibration Curve (MS, ICP, Hg, & CN)	Daily, major maintenance, or to correct drift.	MS & ICP Option 1: 1-standard and a blank with a low level standard at RL.	Low level check standard + 20%.	The standards for that element must be re-prepared and re-analyzed again.
		MS & ICP Option 2: 3-standards and a blank	r > 0.995 for each element	
		Hg - 5-standards and a blank	r > 0.995	
		CN - 6 standards and a blank	r > 0.995	
Distilled Standards (CN)	Once per calibration	One high and one low distilled standard within + 10% of the true value		Sample analysis cannot begin until this criterion is met.

Table 8-14
Quality Control Method Criteria for Target Analyte List Metals by USEAP SW-846 6020/6010B/7471A/7470A/9010C/9012A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial Calibration Verification (MS, ICP, Hg, & CN)		MS & ICP - A second source full compliment of target list with a percent recovery = 90-110%	Sample analysis cannot begin until this criterion is met.
	Immediately following initial calibration.	Hg - A second source full compliment of target list with a percent recovery = 80-120%	
		CN - A second source full compliment of target list with a percent recovery = 85-115%	
Initial Calibration Blank (MS, ICP, Hg, & CN)	Immediately following initial calibration verification.	No target analytes detected at concentration above 2 X MDL.	Sample analysis cannot proceed until this criterion is met.
Interference Check (MS & ICP)	Beginning of each sample analytical run.	Recovery ±20% of true value.	Terminate the analysis, correct the problem, re-calibrate, re-verify the calibration, and reanalyze associated samples.
Continuing Calibration Check (MS, ICP, Hg, & CN)	Every 10 samples and end of analytical run.	MS & ICP - Recovery ±10%.	Reanalyze; if the CCV fails again, stop analysis, the problem corrected, the instrument recalibrated, and the calibration re-verified prior to continuing sample analyses.
		Hg - Recovery ±20%.	
		CN - Recovery ±15%.	

Table 8-14
Quality Control Method Criteria for Target Analyte List Metals by USEAP SW-846 6020/6010B/7471A/7470A/9010C/9012A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria		Corrective Action
Continuing Calibration Blank (MS, ICP, Hg, & CN)	Every 10 samples and end of analytical run.	No target analytes detected at concentration above 2 X MDL.		Sample sequence should not continue until this criterion is met. Demonstrate "clean". Affected samples will be reanalyzed.
Preparation Blank (MS, ICP, Hg, & CN)	1 per batch per matrix	No target analytes detected at concentration above one half of the RL.		Document source of contamination. Re-digestion/re-analysis is required for positive results associated with blank contamination, unless DQOs are still met.
Laboratory Control Sample (MS, ICP, Hg, & CN)	1 per batch per matrix	Standards Full compliment target list.	80-120% recovery Soil use generated limits	Recoveries indicating a low bias require a redigestion/ reanalysis. Recoveries indicating a high bias require a redigestion/ reanalysis for associated positive field samples. Qualify data biased high or biased low as appropriate.

Table 8-14
Quality Control Method Criteria for Target Analyte List Metals by USEAP SW-846 6020/6010B/7471A/7470A/9010C/9012A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria		Corrective Action
Matrix Spike and Duplicate or Sample Duplicate (MS, ICP, Hg, & CN)	1 per 20 samples per matrix	Standards Full compliment target list.	75-125% recovery; ICP & Hg: RPD<25%; CN: RPD<20%; MS: [analyte]>100xIDL - RPD<20%; Soil use generated limits	Qualify associated data biased high or biased low as appropriate.
Post Digestion Spike (PDS) (MS & ICP)	1 per 20 samples per matrix	Standards Full compliment target list.	75-125% recovery	
Serial Dilution (MS & ICP)	1 per 20 samples per matrix	Used to assess new matrices	For sample results > 5x RL for ICP or > 20x RL for MS, %D between diluted and undiluted sample result <10%.	Chemical or physical interference indicated. Investigate to identify cause.
Internal Standards (MS)	Every Analytical Sequence	Standards & Blanks	80-120% of initial calibration intensity	Terminate the analysis, correct the problem, re-calibrate, re-verify the calibration, and reanalyze associated samples.
		Samples	30-120% of initial calibration intensity	Reanalyze at consecutive five fold dilutions until criteria is met.

Table 8-15
Quality Control Method Criteria for Pesticides, Herbicides, and PCBs by USEPA SW-846 8081A, 8082 and 8151A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve (linear) 6-pt curve (2o order)	Set-up, major maintenance	%RSD<20% or r>0.995 (linear) or r2>0.99 (2o order)	Sample analysis cannot begin until this criterion is met.
Initial Calibration Verification	Immediately following every initial calibration	A second source full compliment of target list with a percent recovery = 85-115%	Sample analysis cannot begin until this criterion is met.
Continuing Calibration Check	Bracketing samples	%D recovery ± 15% of the response factor from the initial curve or mean with no individual peak >30%	Sample analysis cannot begin until this criterion is met. If criteria are not met, reanalyze the daily standard. If the daily standard fails a second time, initial calibration must be repeated. Data reviewer should review and judge each target compound against the acceptance criteria.
Endrin/4,4-DDT Breakdown	Bracketing samples	endrin degradation <15%. 4,4-DDT degradation <15%.	If criterion is not met, system must be deactivated and the affected samples reanalyzed.
Instrument Blank	After continuing calibration and highly contaminated samples.	No target analytes detected greater than one half the RL.	Demonstrate "clean". Affected samples will be reanalyzed.
Method Blank	Per extraction batch	No target analytes detected greater than one half the RL.	Document source of contamination. Re-extraction/re-analysis is required for positive results associated with blank contamination.

Table 8-15
Quality Control Method Criteria for Pesticides, Herbicides, and PCBs by USEPA SW-846 8081A, 8082 and 8151A
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria		Corrective Action
Laboratory Control Spike	Per extraction batch	Standards Full target list for 8081A and a mix of 1016 & 1260 for 8082	Laboratory generated control limits not to exceed limits listed in the current version of	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.
Surrogate Spikes	Every sample	Standards TCMX and DCB	Laboratory generated control limits not to exceed limits listed in the current version of DOD QSM	Investigate to assess cause, correct the problem, and document actions taken; re-extract and re-analyze sample. Specific method cleanups may be used to eliminate or minimize sample matrix effects. If still out, qualify.
Matrix Spike and Duplicate	1 per 20 samples per matrix	Standards Full target list for 8081A and a mix of 1016 & 1260 for 8082	Laboratory generated control limits	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to
Target Analyte Confirmation	Every positive detection	RPD < 40%		Report the higher of the two concentrations unless a positive bias is apparent and qualify.

Table 8-16
Quality Control Method Criteria for Total Organic Carbon by Walkley-Black Method (Argonomy, Methods of Soil Analysis 29-3.5.2)
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Calibration (Titration Method)	Before Processing Samples a titration blank must be analyzed	0.5+/- 0.05N	If the titrant normality is not within the QC limit, clean the burette and remake the titrant solution and/or the 1N K2Cr2O7.
Laboratory Duplicate	1 per 20 samples or batch per matrix	RPD = 20%	If the RPD is out side the QC limit, it should be noted in the lab narrative.
Method Blank	1 per 20 samples or batch per matrix	No target analytes detected greater than the RL.	Document source of contamination. Re-extraction/re-analysis is required for positive results associated with blank contamination.
Laboratory Control Sample	1 per 20 samples per matrix	Laboratory generated control limits not to exceed recovery limits of 64-128%	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.
Matrix Spike and Duplicate	1 per 20 samples per batch, per matrix	Laboratory generated control limits not to exceed recovery limits of 68-142%	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Table 8-17
Quality Control Method Criteria for General Chemistry Methods
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve	Major maintenance, instrument modification, per manufacturer's specifications	r>0.995 (linear) or r>0.99 (2^{o} order)	Sample analysis cannot begin until this criterion is met.
Initial Calibration Verification	Immediately following every initial calibration	Recovery ±10% of true value	Sample analysis cannot begin until this criterion is met. If criteria are not met, reanalyze the daily standards. If the ICV fails a second time, initial calibration must be repeated.
Continuing Calibration Check	Every 10 samples, end of analytical run	Recovery ±10% of true value	Sample analysis cannot proceed until this criterion is met. Reanalyze CCC. If the CCC fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Continuing Calibration Blank	Every 10 samples, end of analytical run	No target analytes detected greater than the RL.	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze each sample analyzed since the last acceptable CCB.

Table 8-17
Quality Control Method Criteria for General Chemistry Methods
Radford Army Ammunition Plant
Radford, Virginia

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Method Blank	1 per 20 samples or batch per matrix	No target analytes detected greater than the RL.	Document source of contamination. Re-extraction/re-analysis is required for positive results associated with blank contamination.
Laboratory Control Sample	1 per 20 samples per matrix	Laboratory generated control limits not to exceed recovery limits of 75-125% or RPD of 30%	Recoveries indicating a low bias require a re-extraction/reanalysis. Recoveries indicating a high bias require a re-extraction/re-analysis for associated positive field samples. Qualify associated data biased high or biased low as appropriate.
Matrix Spike and Duplicate	1 per 20 samples per batch, per matrix	Laboratory generated control limits not to exceed recovery limits of 60-140% or RPD of 30%	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Figures

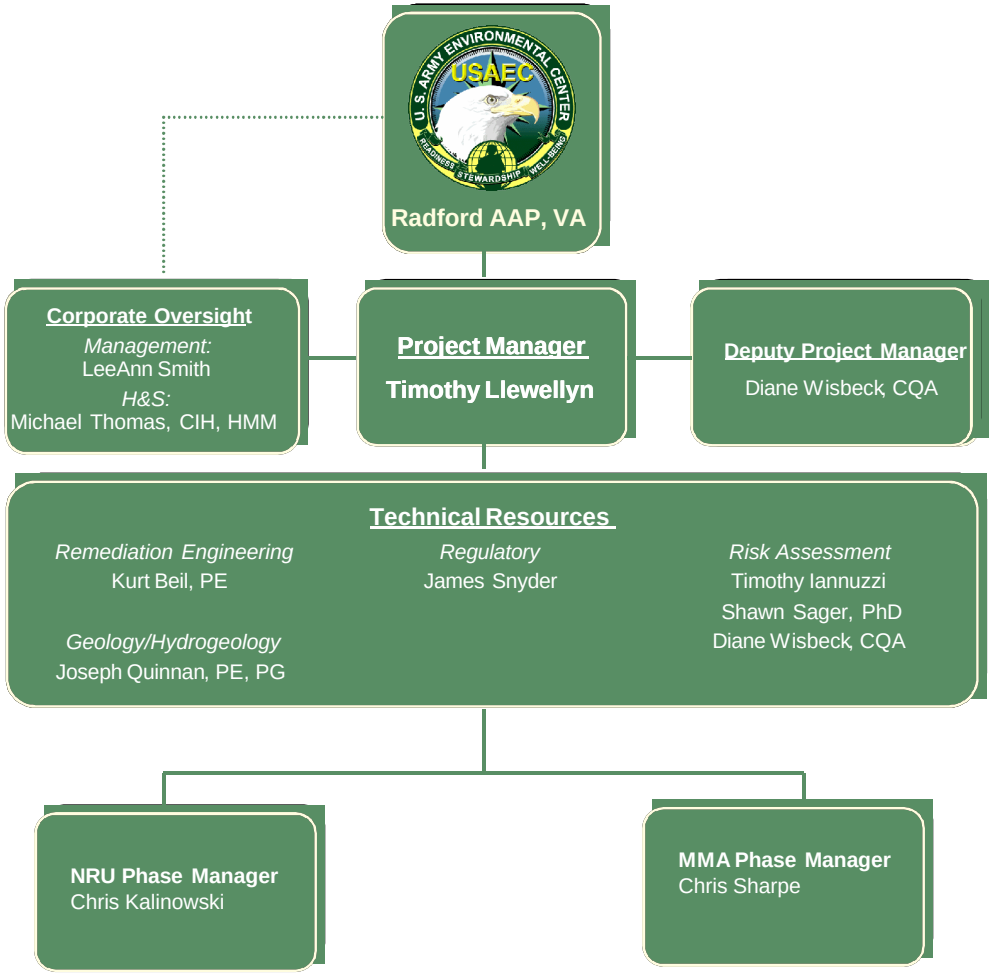

Figure 4-1
Project Organization Chart
Radford Army Ammunition Plant
Radford, Virginia

Appendix A

Quality Assurance Manual
Empirical Laboratory

(Provided on CD)

New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW04 -- Inorganic Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW04.03000	SCM	Acid Digestion, Soil Sediment & Sludge	[SW-846 3050B, Rev. 2, 12/96]	Metals
Certified	Yes	NJ	SHW04.03700	SCM	Chromium VI Digestion	[SW-846 3060A, Rev. 1, 12/96]	Metals
Certified	Yes	NJ	SHW04.33500	SCM	AA, Manual Cold Vapor	[SW-846 7471A, Rev. 1, 9/94]	Mercury - solid waste

Category: SHW05 -- Organic Parameters, Prep. / Screening

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW05.04000	SCM	Automatic Soxhlet Extraction	[SW-846 3541, Rev. 0, 9/94]	Semivolatile organics
Certified	Yes	NJ	SHW05.05000	SCM	Ultrasonic Extraction	[SW-846 3550B, Rev. 2, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.06000	SCM	Waste Dilution	[SW-846 3580A, Rev. 1, 7/92]	Organics
Certified	Yes	NJ	SHW05.06100	SCM	Waste Dilution, Volatile organics	[SW-846 3585, Rev. 0, 12/96]	Organics
Certified	Yes	NJ	SHW05.07300	SCM	Closed System Purge & Trap	[SW-846 5035L, Rev. 0, 12/96]	Volatile organics - low conc.
Certified	Yes	NJ	SHW05.07310	SCM	Methanol Extract, Closed System P & T	[SW-846 5035H, Rev. 0, 12/96]	Volatile organics - high conc.
Certified	Yes	NJ	SHW05.12000	SCM	Cleanup-Florisil	[SW-846 3620B, Rev. 2, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.13000	SCM	Cleanup-Silica Gel	[SW-846 3630C, Rev. 3, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.14000	SCM	Cleanup-Gel Permeation	[SW-846 3640A, Rev. 1, 9/94]	Semivolatile organics
Certified	Yes	NJ	SHW05.15000	SCM	Cleanup-Acid/Base Partition	[SW-846 3650B, Rev. 2, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.16000	SCM	Cleanup-Sulfur Removal	[SW-846 3660B, Rev. 2, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.17000	SCM	Cleanup-Sulfuric Acid/KMnO4	[SW-846 3665A, Rev. 1, 12/96]	Semivolatile organics

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW09.16000	SCM	Mix with Water or Calcium Chloride	[SW-846 9045C, Rev. 3, 1/95]	pH - soil and waste

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.05550	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phenol
Certified	Yes	NJ	SHW07.05560	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Trichlorophenol (2,4,5-)
Certified	Yes	NJ	SHW07.05570	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Trichlorophenol (2,4,6-)
Certified	Yes	NJ	SHW07.05590	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methylphenol (3-)
Certified	Yes	NJ	SHW07.05600	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dibenzofuran
Certified	Yes	NJ	SHW07.05691	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorobenzene (1,2-)
Certified	Yes	NJ	SHW07.05692	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorobenzene (1,3-)
Certified	Yes	NJ	SHW07.05700	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorobenzene (1,4-)
Certified	Yes	NJ	SHW07.05720	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzyl alcohol
Certified	Yes	NJ	SHW07.05750	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pyridine

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW09.02000	NPW, SCM	Distillation	[SW-846 9010B, Rev. 2, 12/96]	Cyanide
Certified	Yes	NJ	SHW09.05000	NPW, SCM	Colorimetric, Automated	[SW-846 9012A, Rev. 1, 12/96]	Cyanide
Certified	Yes	NJ	SHW09.13000	NPW, SCM	Turbidimetric	[SW-846 9038, Rev. 0, 9/86]	Sulfate
Certified	Yes	NJ	SHW09.13050	NPW, SCM	Ion Chromatography	[SW-846 9056, Rev. 0, 9/94]	Sulfate
Certified	Yes	NJ	SHW09.14000	NPW, SCM	Electrometric	[SW-846 9040B, Rev. 2, 1/95]	pH - waste, >20% water
Certified	Yes	NJ	SHW09.19000	NPW, SCM	Infrared Spectrometry or FID	[SW-846 9060, Rev. 0, 9/86]	Total organic carbon (TOC)
Certified	Yes	NJ	SHW09.24100	NPW, SCM	Extraction & Gravimetric - LL or SPE	[SW-846 1664A, Rev. 1, 2/99]	Oil & grease - hem
Applied	No	NJ	SHW09.29150	NPW, SCM	Ion Chromatography	[SW-846 9056, Rev. 0, 12/94]	Nitrite
Certified	Yes	NJ	SHW09.30150	NPW, SCM	Ion Chromatography	[SW-846 9056, Rev. 0, 12/94]	Nitrate
Certified	Yes	NJ	SHW09.33100	NPW, SCM	Ion Chromatography	[SW-846 9056, Rev. 0, 12/96]	Chloride
Certified	Yes	NJ	SHW09.34150	NPW, SCM	Ion Chromatography	[SW-846 9056, Rev. 0, 12/96]	Fluoride

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New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.05230	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Diethyl phthalate
Certified	Yes	NJ	SHW07.05240	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethyl phthalate
Certified	Yes	NJ	SHW07.05250	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Di-n-butyl phthalate
Certified	Yes	NJ	SHW07.05260	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Di-n-octyl phthalate
Certified	Yes	NJ	SHW07.05270	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Acenaphthene
Certified	Yes	NJ	SHW07.05280	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Anthracene
Certified	Yes	NJ	SHW07.05290	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Acenaphthylene
Certified	Yes	NJ	SHW07.05300	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzo(a)anthracene
Certified	Yes	NJ	SHW07.05310	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzo(a)pyrene
Certified	Yes	NJ	SHW07.05320	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzo(b)fluoranthene
Certified	Yes	NJ	SHW07.05330	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzo(ghi)perylene
Certified	Yes	NJ	SHW07.05340	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Benzo(k)fluoranthene
Certified	Yes	NJ	SHW07.05350	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chrysene
Certified	Yes	NJ	SHW07.05360	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dibenzo(a,h)anthracene
Certified	Yes	NJ	SHW07.05370	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Fluoranthene
Certified	Yes	NJ	SHW07.05380	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Fluorene
Certified	Yes	NJ	SHW07.05390	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Indeno(1,2,3-cd)pyrene
Certified	Yes	NJ	SHW07.05400	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methylnaphthalene (2-)
Certified	Yes	NJ	SHW07.05410	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Naphthalene
Certified	Yes	NJ	SHW07.05420	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phenanthrene
Certified	Yes	NJ	SHW07.05430	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pyrene
Certified	Yes	NJ	SHW07.05440	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methyl phenol (4-chloro-3-)
Certified	Yes	NJ	SHW07.05450	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chlorophenol (2-)
Certified	Yes	NJ	SHW07.05460	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorophenol (2,4-)
Certified	Yes	NJ	SHW07.05470	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethylphenol (2,4-)
Certified	Yes	NJ	SHW07.05480	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinitrophenol (2,4-)
Certified	Yes	NJ	SHW07.05490	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinitrophenol (2-methyl-4,6-)
Certified	Yes	NJ	SHW07.05500	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methylphenol (2-)
Certified	Yes	NJ	SHW07.05510	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methylphenol (4-)
Certified	Yes	NJ	SHW07.05520	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitrophenol (2-)
Certified	Yes	NJ	SHW07.05530	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitrophenol (4-)
Certified	Yes	NJ	SHW07.05540	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pentachlorophenol

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227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.05004	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosodiethylamine
Certified	Yes	NJ	SHW07.05005	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosodimethylamine
Certified	Yes	NJ	SHW07.05006	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitroso-di-n-propylamine
Certified	Yes	NJ	SHW07.05010	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosodiphenylamine
Certified	Yes	NJ	SHW07.05011	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosomethylethylamine
Certified	Yes	NJ	SHW07.05012	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosopyrrolidine
Certified	Yes	NJ	SHW07.05020	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Diphenylamine
Certified	Yes	NJ	SHW07.05030	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Carbazole
Certified	Yes	NJ	SHW07.05040	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorobenzidine (3,3'-)
Certified	Yes	NJ	SHW07.05048	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Aniline
Certified	Yes	NJ	SHW07.05050	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chloraniline (4-)
Certified	Yes	NJ	SHW07.05060	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitroaniline (2-)
Certified	Yes	NJ	SHW07.05062	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitroaniline (3-)
Certified	Yes	NJ	SHW07.05063	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitroaniline (4-)
Certified	Yes	NJ	SHW07.05070	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chloronaphthalene (2-)
Certified	Yes	NJ	SHW07.05080	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachlorobenzene
Certified	Yes	NJ	SHW07.05090	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachlorobutadiene (1,3-)
Certified	Yes	NJ	SHW07.05100	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachlorocyclopentadiene
Certified	Yes	NJ	SHW07.05110	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachloroethane
Certified	Yes	NJ	SHW07.05115	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachloropropene
Certified	Yes	NJ	SHW07.05120	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Trichlorobenzene (1,2,4-)
Certified	Yes	NJ	SHW07.05130	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Bis (2-chloroethoxy) methane
Certified	Yes	NJ	SHW07.05132	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Bis (2-chloroethyl) ether
Certified	Yes	NJ	SHW07.05140	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Bis (2-chloroisopropyl) ether
Certified	Yes	NJ	SHW07.05150	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chlorophenyl-phenyl ether (4-)
Certified	Yes	NJ	SHW07.05160	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Bromophenyl-phenyl ether (4-)
Certified	Yes	NJ	SHW07.05170	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinitrotoluene (2,4-)
Certified	Yes	NJ	SHW07.05180	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinitrotoluene (2,6-)
Certified	Yes	NJ	SHW07.05190	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Isophorone
Certified	Yes	NJ	SHW07.05200	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Nitrobenzene
Certified	Yes	NJ	SHW07.05210	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Butyl benzyl phthalate
Certified	Yes	NJ	SHW07.05220	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Bis (2-ethylhexyl) phthalate

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.04830	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methanesulfonate (Ethyl-)
Certified	Yes	NJ	SHW07.04835	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methanesulfonate (Methyl-)
Certified	Yes	NJ	SHW07.04840	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methapyrilene
Certified	Yes	NJ	SHW07.04845	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Methylcholanthrene (3-)
Certified	Yes	NJ	SHW07.04850	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Napthoquinone (1,4-)
Certified	Yes	NJ	SHW07.04855	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Napththylamine (1-)
Certified	Yes	NJ	SHW07.04860	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Napththylamine (2-)
Certified	Yes	NJ	SHW07.04870	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitroso-di-n-butylamine
Certified	Yes	NJ	SHW07.04875	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosomorpholine
Certified	Yes	NJ	SHW07.04880	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	N-Nitrosopiperidine
Certified	Yes	NJ	SHW07.04885	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Parathion
Certified	Yes	NJ	SHW07.04890	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Parathion methyl
Certified	Yes	NJ	SHW07.04895	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pentachlorobenzene
Certified	Yes	NJ	SHW07.04900	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pentachloroethane
Certified	Yes	NJ	SHW07.04905	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pentachloronitrobenzene
Certified	Yes	NJ	SHW07.04910	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phenacetin
Certified	Yes	NJ	SHW07.04915	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phenylenediamine (1,4-)
Certified	Yes	NJ	SHW07.04920	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phenylethylamine (alpha, alpha-Dimethyl)
Certified	Yes	NJ	SHW07.04925	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phorate
Certified	Yes	NJ	SHW07.04930	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phosphorothioate (O,O,O-Triethyl)
Certified	Yes	NJ	SHW07.04935	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Phosphorothioate (O,O-Diethyl-O-2-pyrazinyl) [Thionazin]
Certified	Yes	NJ	SHW07.04940	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Picoline (2-)
Certified	Yes	NJ	SHW07.04945	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Pronamide
Certified	Yes	NJ	SHW07.04950	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Quinoline -1-Oxide (4-Nitro)
Certified	Yes	NJ	SHW07.04955	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Safrole
Certified	Yes	NJ	SHW07.04960	NPW, SCM	GC, Extract or Dir Inj, NPD or FPD,Cap	[SW-846 8270C, Rev. 3, 12/96]	Sulfotepp
Certified	Yes	NJ	SHW07.04975	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Tetrachlorobenzene (1,2,4,5-)
Certified	Yes	NJ	SHW07.04980	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Tetrachlorophenol (2,3,4,6-)
Certified	Yes	NJ	SHW07.04985	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Toluidine (2-) (2-Methylaniline)
Certified	Yes	NJ	SHW07.04990	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Toluidine (5-Nitro-2-)
Certified	Yes	NJ	SHW07.04995	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Trinitrobenzene (1,3,5-)

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227 FRENCH LANDING DR
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Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.04398	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Acetonitrile
Certified	Yes	NJ	SHW07.04400	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Acrolein
Certified	Yes	NJ	SHW07.04410	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Acrylonitrile
Certified	Yes	NJ	SHW07.04500	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Hexachlorobutadiene (1,3-)
Certified	Yes	NJ	SHW07.04530	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Hexachloroethane
Certified	Yes	NJ	SHW07.04540	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260C, Rev. 2, 12/96]	Naphthalene
Certified	Yes	NJ	SHW07.04550	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Styrene
Certified	Yes	NJ	SHW07.04560	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Tetrachloroethane (1,1,1,2-)
Certified	Yes	NJ	SHW07.04570	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichlorobenzene (1,2,4-)
Certified	Yes	NJ	SHW07.04580	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Nitrobenzene
Certified	Yes	NJ	SHW07.04590	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dioxane (1,4-)
Certified	Yes	NJ	SHW07.04665	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Acetophenone
Certified	Yes	NJ	SHW07.04670	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Acetylaminofluorene (2-)
Certified	Yes	NJ	SHW07.04675	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Aminobiphenyl (4-)
Certified	Yes	NJ	SHW07.04680	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Aramite
Certified	Yes	NJ	SHW07.04705	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Chlorobenzilate
Certified	Yes	NJ	SHW07.04715	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Diallate (cis)
Certified	Yes	NJ	SHW07.04720	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Diallate (trans)
Certified	Yes	NJ	SHW07.04755	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dichlorophenol (2,6-)
Certified	Yes	NJ	SHW07.04760	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethoate
Certified	Yes	NJ	SHW07.04767	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethylaminoazobenzene
Certified	Yes	NJ	SHW07.04770	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethylbenz(a)anthracene (7,12-)
Certified	Yes	NJ	SHW07.04775	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dimethyl benzidine (3,3-)
Certified	Yes	NJ	SHW07.04780	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinitrobenzene (1,3-)
Certified	Yes	NJ	SHW07.04785	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Dinoseb
Certified	Yes	NJ	SHW07.04790	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Disulfoton
Certified	Yes	NJ	SHW07.04795	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Famphur
Certified	Yes	NJ	SHW07.04800	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Hexachlorophene
Certified	Yes	NJ	SHW07.04810	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Isodrin
Certified	Yes	NJ	SHW07.04815	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Isosafrole (cis-)
Certified	Yes	NJ	SHW07.04820	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Isosafrole (trans-)
Certified	Yes	NJ	SHW07.04825	NPW, SCM	GC/MS, Extract or Dir Inj, Capillary	[SW-846 8270C, Rev. 3, 12/96]	Kepone

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.04200	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloroethane (1,1-)
Certified	Yes	NJ	SHW07.04210	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloroethane (1,2-)
Certified	Yes	NJ	SHW07.04220	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloroethene (1,1-)
Certified	Yes	NJ	SHW07.04230	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloroethene (trans-1,2-)
Certified	Yes	NJ	SHW07.04235	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloroethene (cis-1,2-)
Certified	Yes	NJ	SHW07.04240	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloropropane (1,2-)
Certified	Yes	NJ	SHW07.04241	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloropropane (1,3-)
Certified	Yes	NJ	SHW07.04250	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloropropene (cis-1,3-)
Certified	Yes	NJ	SHW07.04255	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloro-2-butene (trans-1,4-)
Certified	Yes	NJ	SHW07.04260	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Methylene chloride (Dichloromethane)
Certified	Yes	NJ	SHW07.04270	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Tetrachloroethane (1,1,2,2-)
Certified	Yes	NJ	SHW07.04280	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Tetrachloroethene
Certified	Yes	NJ	SHW07.04290	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichloroethane (1,1,1-)
Certified	Yes	NJ	SHW07.04300	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichloroethane (1,1,2-)
Certified	Yes	NJ	SHW07.04310	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichloroethene
Certified	Yes	NJ	SHW07.04320	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichlorofluoromethane
Certified	Yes	NJ	SHW07.04322	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichloro (1,1,2-) trifluoroethane (1,2,2-)
Certified	Yes	NJ	SHW07.04325	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichloropropane (1,2,3-)
Certified	Yes	NJ	SHW07.04327	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Vinyl acetate
Certified	Yes	NJ	SHW07.04330	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Vinyl chloride
Certified	Yes	NJ	SHW07.04340	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Acetone
Certified	Yes	NJ	SHW07.04350	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Carbon disulfide
Certified	Yes	NJ	SHW07.04360	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Butanone (2-)
Certified	Yes	NJ	SHW07.04367	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Ethyl methacrylate
Certified	Yes	NJ	SHW07.04370	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Hexanone (2-)
Certified	Yes	NJ	SHW07.04371	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Methacrylonitrile
Certified	Yes	NJ	SHW07.04373	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Methyl methacrylate
Certified	Yes	NJ	SHW07.04375	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Methyl iodide
Certified	Yes	NJ	SHW07.04376	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Iso-butyl alcohol
Certified	Yes	NJ	SHW07.04380	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Pentanone (4-methyl-2-)
Certified	Yes	NJ	SHW07.04385	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Propionitrile
Certified	Yes	NJ	SHW07.04390	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Methyl tert-butyl ether

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ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.04013	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Sec-butylbenzene
Certified	Yes	NJ	SHW07.04014	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Tert-butylbenzene
Certified	Yes	NJ	SHW07.04020	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Chlorobenzene
Certified	Yes	NJ	SHW07.04030	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichlorobenzene (1,2-)
Certified	Yes	NJ	SHW07.04040	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichlorobenzene (1,3-)
Certified	Yes	NJ	SHW07.04050	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichlorobenzene (1,4-)
Certified	Yes	NJ	SHW07.04060	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Ethylbenzene
Certified	Yes	NJ	SHW07.04065	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Isopropylbenzene
Certified	Yes	NJ	SHW07.04067	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Propylbenzene (n-)
Certified	Yes	NJ	SHW07.04070	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Toluene
Certified	Yes	NJ	SHW07.04071	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Isopropyltoluene (4-)
Certified	Yes	NJ	SHW07.04072	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trichlorobenzene (1,2,3-)
Certified	Yes	NJ	SHW07.04073	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trimethylbenzene (1,2,4-)
Certified	Yes	NJ	SHW07.04074	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Trimethylbenzene (1,3,5-)
Certified	Yes	NJ	SHW07.04080	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Xylenes (total)
Certified	Yes	NJ	SHW07.04088	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Allyl chloride
Certified	Yes	NJ	SHW07.04089	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Bromochloromethane
Certified	Yes	NJ	SHW07.04090	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Bromodichloromethane
Certified	Yes	NJ	SHW07.04100	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Bromoform
Certified	Yes	NJ	SHW07.04110	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Bromomethane
Certified	Yes	NJ	SHW07.04115	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Butadiene (2-chloro-1,3-)
Certified	Yes	NJ	SHW07.04120	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Carbon tetrachloride
Certified	Yes	NJ	SHW07.04130	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Chloroethane
Certified	Yes	NJ	SHW07.04140	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Chloroethyl vinyl ether (2-)
Certified	Yes	NJ	SHW07.04150	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Chloroform
Certified	Yes	NJ	SHW07.04160	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Chloromethane
Certified	Yes	NJ	SHW07.04170	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichloropropene (trans-1,3-)
Certified	Yes	NJ	SHW07.04180	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dibromochloromethane
Certified	Yes	NJ	SHW07.04185	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dibromoethane (1,2-) (EDB)
Certified	Yes	NJ	SHW07.04186	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dibromomethane
Certified	Yes	NJ	SHW07.04187	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dibromo-3-chloropropane (1,2-)
Certified	Yes	NJ	SHW07.04190	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Dichlorodifluoromethane

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New Jersey Department of Environmental Protection

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ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW06 -- Organic Parameters, Chromatography

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW06.13170	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1260
Certified	Yes	NJ	SHW06.23010	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	Dalapon
Certified	Yes	NJ	SHW06.23020	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	Dicamba
Certified	Yes	NJ	SHW06.23021	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev. 1, 9/96]	Dichlorprop
Certified	Yes	NJ	SHW06.23030	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	Dinoseb
Certified	Yes	NJ	SHW06.23040	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	D (2,4-)
Certified	Yes	NJ	SHW06.23050	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	T (2,4,5-)
Certified	Yes	NJ	SHW06.23060	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev 1, 9/96]	TP (2,4,5-) (Silvex)
Certified	Yes	NJ	SHW06.23063	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev. 1, 9/96]	MCPA
Certified	Yes	NJ	SHW06.23064	NPW, SCM	GC, Extraction, ECD, Capillary	[SW-846 8151A, Rev. 1, 9/96]	MCPP
Certified	Yes	NJ	SHW06.28010	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	HMX
Certified	Yes	NJ	SHW06.28020	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	RDX
Certified	Yes	NJ	SHW06.28030	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Trinitrobenzene (1,3,5-)
Certified	Yes	NJ	SHW06.28040	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Dinitrobenzene (1,3-)
Certified	Yes	NJ	SHW06.28050	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Tetryl
Certified	Yes	NJ	SHW06.28060	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Nitrobenzene
Certified	Yes	NJ	SHW06.28070	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Trinitrotoluene (2,4,6-)
Certified	Yes	NJ	SHW06.28080	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Dinitrotoluene (4-amino-2,6-)
Certified	Yes	NJ	SHW06.28090	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Dinitrotoluene (2-amino-4,6-)
Certified	Yes	NJ	SHW06.28100	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Dinitrotoluene (2,4-)
Certified	Yes	NJ	SHW06.28110	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Dinitrotoluene (2,6-)
Certified	Yes	NJ	SHW06.28120	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Nitrotoluene (2-)
Certified	Yes	NJ	SHW06.28130	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Nitrotoluene (3-)
Certified	Yes	NJ	SHW06.28140	NPW, SCM	HPLC, UV Detector	[SW-846 8330, Rev. 0, 9/94]	Nitrotoluene (4-)

Category: SHW07 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW07.04010	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Benzene
Certified	Yes	NJ	SHW07.04012	NPW, SCM	GC/MS, P & T or Direct Injection, Capillary	[SW-846 8260B, Rev. 2, 12/96]	Butyl benzene (n-)

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW06 -- Organic Parameters, Chromatography

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW06.02010	NPW, SCM	Microextraction, GC, ECD	[SW-846 8011, Rev. 0, 7/92]	Dibromoethane (1,2-) (EDB)
Certified	Yes	NJ	SHW06.02020	NPW, SCM	Microextraction, GC, ECD	[SW-846 8011, Rev. 0, 7/92]	Dibromo-3-chloropropane (1,2-)
Certified	Yes	NJ	SHW06.04010	NPW, SCM	GC P&T, FID	[SW-846 8015B, Rev. 2, 12/96]	Gasoline range organic
Certified	Yes	NJ	SHW06.04500	NPW, SCM	Extraction, GC, FID	[SW-846 8015B, Rev. 2, 12/96]	Diesel range organic
Certified	Yes	NJ	SHW06.12010	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Aldrin
Certified	Yes	NJ	SHW06.12020	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Alpha BHC
Certified	Yes	NJ	SHW06.12030	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Beta BHC
Certified	Yes	NJ	SHW06.12040	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Delta BHC
Certified	Yes	NJ	SHW06.12050	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Lindane (gamma BHC)
Certified	Yes	NJ	SHW06.12060	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Chlordane (technical)
Certified	Yes	NJ	SHW06.12070	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Chlordane (alpha)
Certified	Yes	NJ	SHW06.12080	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Chlordane (gamma)
Certified	Yes	NJ	SHW06.12090	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	DDD (4,4'-)
Certified	Yes	NJ	SHW06.12100	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	DDE (4,4'-)
Certified	Yes	NJ	SHW06.12110	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	DDT (4,4'-)
Certified	Yes	NJ	SHW06.12120	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Dieldrin
Certified	Yes	NJ	SHW06.12130	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endosulfan I
Certified	Yes	NJ	SHW06.12140	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endosulfan II
Certified	Yes	NJ	SHW06.12150	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endosulfan sulfate
Certified	Yes	NJ	SHW06.12160	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endrin
Certified	Yes	NJ	SHW06.12170	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endrin aldehyde
Certified	Yes	NJ	SHW06.12180	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Endrin ketone
Certified	Yes	NJ	SHW06.12190	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Heptachlor
Certified	Yes	NJ	SHW06.12200	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Heptachlor epoxide
Certified	Yes	NJ	SHW06.12210	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Methoxychlor
Certified	Yes	NJ	SHW06.12220	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8081A, Rev. 1, 12/96]	Toxaphene
Certified	Yes	NJ	SHW06.13110	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1016
Certified	Yes	NJ	SHW06.13120	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1221
Certified	Yes	NJ	SHW06.13130	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1232
Certified	Yes	NJ	SHW06.13140	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1242
Certified	Yes	NJ	SHW06.13150	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1248
Certified	Yes	NJ	SHW06.13160	NPW, SCM	GC, Extraction, ECD or HECD, Capillary	[SW-846 8082, Rev. 0, 12/96]	PCB 1254

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New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW04 -- Inorganic Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW04.05000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Aluminum
Certified	Yes	NJ	SHW04.06500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Antimony
Certified	Yes	NJ	SHW04.09000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Arsenic
Certified	Yes	NJ	SHW04.11500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Barium
Certified	Yes	NJ	SHW04.13500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Beryllium
Certified	Yes	NJ	SHW04.15100	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Boron
Certified	Yes	NJ	SHW04.15500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Cadmium
Certified	Yes	NJ	SHW04.17500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Calcium
Certified	Yes	NJ	SHW04.18500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Chromium
Certified	Yes	NJ	SHW04.21000	NPW, SCM	Colorimetric	[SW-846 7196A, Rev. 1, 7/92]	Chromium (VI)
Certified	Yes	NJ	SHW04.22500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Cobalt
Certified	Yes	NJ	SHW04.24500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Copper
Certified	Yes	NJ	SHW04.26000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Iron
Certified	Yes	NJ	SHW04.27500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Lead
Certified	Yes	NJ	SHW04.30500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Magnesium
Certified	Yes	NJ	SHW04.31500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Manganese
Certified	Yes	NJ	SHW04.33000	NPW, SCM	AA, Manual Cold Vapor	[SW-846 7470A, Rev. 1, 9/94]	Mercury - liquid waste
Certified	Yes	NJ	SHW04.34000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Molybdenum
Certified	Yes	NJ	SHW04.35500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2, 12/96]	Nickel
Certified	Yes	NJ	SHW04.38000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Potassium
Certified	Yes	NJ	SHW04.39000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Selenium
Certified	Yes	NJ	SHW04.41000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Silver
Certified	Yes	NJ	SHW04.43000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Sodium
Certified	Yes	NJ	SHW04.45000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Thallium
Certified	Yes	NJ	SHW04.47100	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Tin
Certified	Yes	NJ	SHW04.47500	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Vanadium
Certified	Yes	NJ	SHW04.49000	NPW, SCM	ICP	[SW-846 6010B, Rev. 2 12/96]	Zinc

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New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

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Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP06 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP06.03610	NPW	Extract, GC/MS	[EPA 625]	Methylphenol (2-)
Certified	Yes	NJ	WPP06.03660	NPW	Extract, GC/MS	[EPA 625]	Hexachlorocyclopentadiene
Certified	Yes	NJ	WPP06.03680	NPW	Extract, GC/MS	[EPA 625]	N-Nitrosodimethylamine
Certified	Yes	NJ	WPP06.03690	NPW	Extract, GC/MS	[EPA 625]	N-Nitrosodiphenylamine
Certified	Yes	NJ	WPP06.03720	NPW	Extract, GC/MS	[EPA 625]	Pyridine

Category: WPP08 -- Acute Toxicity Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP08.01010	NPW	Daphnia SPP. Mortality	[EPA 2021.0] [OTHER N.J.A.C. 7:18]	Toxicity - acute, FW organism
Certified	Yes	NJ	WPP08.01020	NPW	Ceriodaphnia Mortality	[EPA 2002.0] [OTHER N.J.A.C. 7:18]	Toxicity - acute, FW organism
Certified	Yes	NJ	WPP08.01030	NPW	Fathead Minnow (FHM) Mortality	[OTHER N.J.A.C. 7:18] [EPA 2000.0]	Toxicity - acute, FW organism
Certified	Yes	NJ	WPP08.01060	NPW	Bannerfish Shiner Mortality	[OTHER N.J.A.C. 7:18] [EPA 2000.0]	Toxicity - acute, FW organism
Certified	Yes	NJ	WPP08.01070	NPW	Mysid Mortality	[EPA 2007.0] [OTHER N.J.A.C. 7:18]	Toxicity - acute, estuary and marine organism
Certified	Yes	NJ	WPP08.01080	NPW	Sheephead Minnow (SHM) Mortality	[EPA 2004.0] [OTHER N.J.A.C. 7:18]	Toxicity - acute, estuary and marine organism
Certified	Yes	NJ	WPP08.01090	NPW	Menidia SPP Mortality	[EPA 2006.0] [OTHER N.J.A.C. 7:18]	Toxicity - acute, estuary and marine organism
Certified	Yes	NJ	WPP08.02010	NPW	FHM Larval Survival & Growth	[EPA 1000.0]	Toxicity - chronic, FW organism
Certified	Yes	NJ	WPP08.02030	NPW	Ceriodaphnia Survival & Reproduction	[EPA 1002.0]	Toxicity - chronic, FW organism
Applied	No	NJ	WPP08.03060	NPW	Champia Parvula Reproduction	[EPA 1009.0]	Toxicity - chronic, estuary & marine organism

Category: SHW02 -- Characteristics of Hazardous Waste

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW02.01000	NPW, SCM	Pensky Martens	[SW-846 1010, Rev. 0, 9/86]	Ignitability
Certified	Yes	NJ	SHW02.03000	NPW, SCM	Aqueous Waste, Potentiometric	[SW-846 9040B, Rev. 2, 1/95]	Corrosivity - pH waste, >20% water
Certified	Yes	NJ	SHW02.04000	NPW, SCM	Weight Loss In Acid Media	[SW-846 1110, Rev. 0, 9/86]	Corrosivity toward steel
Certified	Yes	NJ	SHW02.06900	NPW, SCM	TCLP, Toxicity Procedure, ZHE	[SW-846 1311, Rev. 0, 7/92]	Volatile organics
Certified	Yes	NJ	SHW02.07000	NPW, SCM	TCLP, Toxicity Procedure, Shaker	[SW-846 1311, Rev. 0, 7/92]	Metals - semi volatile organics
Certified	Yes	NJ	SHW02.08000	NPW, SCM	Synthetic PPT Leachate Procedure	[SW-846 1312, Rev. 0, 9/94]	Metals - organics

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP06 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP06.03320	NPW	Extract, GC/MS	[EPA 625]	Hexachlorobutadiene (1,3-)
Certified	Yes	NJ	WPP06.03330	NPW	Extract, GC/MS	[EPA 625]	Hexachloroethane
Certified	Yes	NJ	WPP06.03340	NPW	Extract, GC/MS	[EPA 625]	Indeno(1,2,3-cd)pyrene
Certified	Yes	NJ	WPP06.03350	NPW	Extract, GC/MS	[EPA 625]	Isophorone
Certified	Yes	NJ	WPP06.03358	NPW	Extract, GC/MS	[EPA 625]	Methylnaphthalene (2-)
Certified	Yes	NJ	WPP06.03360	NPW	Extract, GC/MS	[EPA 625]	Naphthalene
Certified	Yes	NJ	WPP06.03366	NPW	Extract, GC/MS	[EPA 625]	Chloroaniline (4-)
Certified	Yes	NJ	WPP06.03367	NPW	Extract, GC/MS	[EPA 625]	Nitroaniline (2-)
Certified	Yes	NJ	WPP06.03368	NPW	Extract, GC/MS	[EPA 625]	Nitroaniline (3-)
Certified	Yes	NJ	WPP06.03369	NPW	Extract, GC/MS	[EPA 625]	Nitroaniline (4-)
Certified	Yes	NJ	WPP06.03370	NPW	Extract, GC/MS	[EPA 625]	Nitrobenzene
Certified	Yes	NJ	WPP06.03380	NPW	Extract, GC/MS	[EPA 625]	N-Nitroso-di-n-propylamine
Certified	Yes	NJ	WPP06.03390	NPW	Extract, GC/MS	[EPA 625]	Phenanthrene
Certified	Yes	NJ	WPP06.03400	NPW	Extract, GC/MS	[EPA 625]	Pyrene
Certified	Yes	NJ	WPP06.03410	NPW	Extract, GC/MS	[EPA 625]	Trichlorobenzene (1,2,4-)
Certified	Yes	NJ	WPP06.03420	NPW	Extract, GC/MS	[EPA 625]	Methyl phenol (4-chloro-3-)
Certified	Yes	NJ	WPP06.03430	NPW	Extract, GC/MS	[EPA 625]	Chlorophenol (2-)
Certified	Yes	NJ	WPP06.03440	NPW	Extract, GC/MS	[EPA 625]	Dichlorophenol (2,4-)
Certified	Yes	NJ	WPP06.03450	NPW	Extract, GC/MS	[EPA 625]	Dimethylphenol (2,4-)
Certified	Yes	NJ	WPP06.03460	NPW	Extract, GC/MS	[EPA 625]	Dinitrophenol (2,4-)
Certified	Yes	NJ	WPP06.03470	NPW	Extract, GC/MS	[EPA 625]	Dinitrophenol (2-methyl-4,6-)
Certified	Yes	NJ	WPP06.03480	NPW	Extract, GC/MS	[EPA 625]	Nitrophenol (2-)
Certified	Yes	NJ	WPP06.03490	NPW	Extract, GC/MS	[EPA 625]	Nitrophenol (4-)
Certified	Yes	NJ	WPP06.03500	NPW	Extract, GC/MS	[EPA 625]	Pentachlorophenol
Certified	Yes	NJ	WPP06.03510	NPW	Extract, GC/MS	[EPA 625]	Phenol
Certified	Yes	NJ	WPP06.03518	NPW	Extract, GC/MS	[EPA 625]	Trichlorophenol (2,4,5-)
Certified	Yes	NJ	WPP06.03520	NPW	Extract, GC/MS	[EPA 625]	Trichlorophenol (2,4,6-)
Certified	Yes	NJ	WPP06.03530	NPW	Extract, GC/MS	[EPA 625]	Benzoic acid
Certified	Yes	NJ	WPP06.03540	NPW	Extract, GC/MS	[EPA 625]	Methylphenol (4-)
Certified	Yes	NJ	WPP06.03570	NPW	Extract, GC/MS	[EPA 625]	Aniline
Certified	Yes	NJ	WPP06.03580	NPW	Extract, GC/MS	[EPA 625]	Benzidine
Certified	Yes	NJ	WPP06.03590	NPW	Extract, GC/MS	[EPA 625]	Carbazole

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP06 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP06.03010	NPW	Extract, GC/MS	[EPA 625]	Acenaphthene
Certified	Yes	NJ	WPP06.03020	NPW	Extract, GC/MS	[EPA 625]	Acenaphthylene
Certified	Yes	NJ	WPP06.03030	NPW	Extract, GC/MS	[EPA 625]	Anthracene
Certified	Yes	NJ	WPP06.03040	NPW	Extract, GC/MS	[EPA 625]	Benzo(a)anthracene
Certified	Yes	NJ	WPP06.03050	NPW	Extract, GC/MS	[EPA 625]	Benzo(b)fluoranthene
Certified	Yes	NJ	WPP06.03060	NPW	Extract, GC/MS	[EPA 625]	Benzo(k)fluoranthene
Certified	Yes	NJ	WPP06.03070	NPW	Extract, GC/MS	[EPA 625]	Benzo(a)pyrene
Certified	Yes	NJ	WPP06.03080	NPW	Extract, GC/MS	[EPA 625]	Benzo(ghi)perylene
Certified	Yes	NJ	WPP06.03090	NPW	Extract, GC/MS	[EPA 625]	Butyl benzyl phthalate
Certified	Yes	NJ	WPP06.03100	NPW	Extract, GC/MS	[EPA 625]	Bis (2-chloroethyl) ether
Certified	Yes	NJ	WPP06.03110	NPW	Extract, GC/MS	[EPA 625]	Bis (2-chloroethoxy) methane
Certified	Yes	NJ	WPP06.03120	NPW	Extract, GC/MS	[EPA 625]	Bis (2-ethylhexyl) phthalate
Certified	Yes	NJ	WPP06.03130	NPW	Extract, GC/MS	[EPA 625]	Bis (2-chloroisopropyl) ether
Certified	Yes	NJ	WPP06.03140	NPW	Extract, GC/MS	[EPA 625]	Bromophenyl-phenyl ether (4-)
Certified	Yes	NJ	WPP06.03150	NPW	Extract, GC/MS	[EPA 625]	Chloronaphthalene (2-)
Certified	Yes	NJ	WPP06.03160	NPW	Extract, GC/MS	[EPA 625]	Chlorophenyl-phenyl ether (4-)
Certified	Yes	NJ	WPP06.03170	NPW	Extract, GC/MS	[EPA 625]	Chrysene
Certified	Yes	NJ	WPP06.03180	NPW	Extract, GC/MS	[EPA 625]	Dibenzo(a,h)anthracene
Certified	Yes	NJ	WPP06.03186	NPW	Extract, GC/MS	[EPA 625]	Dibenzofuran
Certified	Yes	NJ	WPP06.03190	NPW	Extract, GC/MS	[EPA 625]	Di-n-butyl phthalate
Dropped	No	NJ	WPP06.03200	NPW	Extract, GC/MS	[EPA 625]	Dichlorobenzene (1,3-)
Dropped	No	NJ	WPP06.03210	NPW	Extract, GC/MS	[EPA 625]	Dichlorobenzene (1,2-)
Dropped	No	NJ	WPP06.03220	NPW	Extract, GC/MS	[EPA 625]	Dichlorobenzene (1,4-)
Certified	Yes	NJ	WPP06.03230	NPW	Extract, GC/MS	[EPA 625]	Dichlorobenzidine (3,3'-)
Certified	Yes	NJ	WPP06.03240	NPW	Extract, GC/MS	[EPA 625]	Diethyl phthalate
Certified	Yes	NJ	WPP06.03250	NPW	Extract, GC/MS	[EPA 625]	Dimethyl phthalate
Certified	Yes	NJ	WPP06.03260	NPW	Extract, GC/MS	[EPA 625]	Dinitrotoluene (2,4-)
Certified	Yes	NJ	WPP06.03270	NPW	Extract, GC/MS	[EPA 625]	Dinitrotoluene (2,6-)
Certified	Yes	NJ	WPP06.03280	NPW	Extract, GC/MS	[EPA 625]	Di-n-octyl phthalate
Certified	Yes	NJ	WPP06.03290	NPW	Extract, GC/MS	[EPA 625]	Fluoranthene
Certified	Yes	NJ	WPP06.03300	NPW	Extract, GC/MS	[EPA 625]	Fluorene
Certified	Yes	NJ	WPP06.03310	NPW	Extract, GC/MS	[EPA 625]	Hexachlorobenzene

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227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP06 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP06.02040	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Bromomethane
Certified	Yes	NJ	WPP06.02050	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Carbon tetrachloride
Certified	Yes	NJ	WPP06.02060	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Chlorobenzene
Certified	Yes	NJ	WPP06.02070	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Chloroethane
Certified	Yes	NJ	WPP06.02080	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Chloroethyl vinyl ether (2-)
Certified	Yes	NJ	WPP06.02090	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Chloroform
Certified	Yes	NJ	WPP06.02100	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Chloromethane
Certified	Yes	NJ	WPP06.02110	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dibromochloromethane
Certified	Yes	NJ	WPP06.02120	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichlorobenzene (1,2-)
Certified	Yes	NJ	WPP06.02130	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichlorobenzene (1,3-)
Certified	Yes	NJ	WPP06.02140	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichlorobenzene (1,4-)
Certified	Yes	NJ	WPP06.02150	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloroethane (1,1-)
Certified	Yes	NJ	WPP06.02160	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloroethane (1,2-)
Certified	Yes	NJ	WPP06.02170	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloroethene (1,1-)
Certified	Yes	NJ	WPP06.02180	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloroethene (trans-1,2-)
Certified	Yes	NJ	WPP06.02190	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloropropane (1,2-)
Certified	Yes	NJ	WPP06.02200	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloropropene (cis-1,3-)
Certified	Yes	NJ	WPP06.02210	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Dichloropropene (trans-1,3-)
Certified	Yes	NJ	WPP06.02220	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Ethylbenzene
Certified	Yes	NJ	WPP06.02230	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Methylene chloride (Dichloromethane)
Certified	Yes	NJ	WPP06.02232	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Methyl tert-butyl ether
Certified	Yes	NJ	WPP06.02234	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Tert-butyl alcohol
Certified	Yes	NJ	WPP06.02238	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Styrene
Certified	Yes	NJ	WPP06.02240	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Tetrachloroethane (1,1,2,2-)
Certified	Yes	NJ	WPP06.02250	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Tetrachloroethene
Certified	Yes	NJ	WPP06.02260	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Toluene
Certified	Yes	NJ	WPP06.02270	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Trichloroethane (1,1,1-)
Certified	Yes	NJ	WPP06.02280	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Trichloroethane (1,1,2-)
Certified	Yes	NJ	WPP06.02290	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Trichloroethene
Certified	Yes	NJ	WPP06.02300	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Trichlorofluoromethane
Certified	Yes	NJ	WPP06.02310	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Vinyl chloride
Certified	Yes	NJ	WPP06.02312	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Xylenes (total)

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP05 -- Organic Parameters, Chromatography

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP05.09050	NPW	Extract/GC (ECD)	[EPA 608]	Lindane (gamma BHC)
Certified	Yes	NJ	WPP05.09060	NPW	Extract/GC (ECD)	[EPA 608]	Chlordane
Certified	Yes	NJ	WPP05.09070	NPW	Extract/GC (ECD)	[EPA 608]	DDD (4,4'-)
Certified	Yes	NJ	WPP05.09080	NPW	Extract/GC (ECD)	[EPA 608]	DDE (4,4'-)
Certified	Yes	NJ	WPP05.09090	NPW	Extract/GC (ECD)	[EPA 608]	DDT (4,4'-)
Certified	Yes	NJ	WPP05.09100	NPW	Extract/GC (ECD)	[EPA 608]	Dieldrin
Certified	Yes	NJ	WPP05.09110	NPW	Extract/GC (ECD)	[EPA 608]	Endosulfan I
Certified	Yes	NJ	WPP05.09120	NPW	Extract/GC (ECD)	[EPA 608]	Endosulfan II
Certified	Yes	NJ	WPP05.09130	NPW	Extract/GC (ECD)	[EPA 608]	Endosulfan sulfate
Certified	Yes	NJ	WPP05.09140	NPW	Extract/GC (ECD)	[EPA 608]	Endrin
Certified	Yes	NJ	WPP05.09150	NPW	Extract/GC (ECD)	[EPA 608]	Endrin aldehyde
Certified	Yes	NJ	WPP05.09160	NPW	Extract/GC (ECD)	[EPA 608]	Endrin ketone
Certified	Yes	NJ	WPP05.09170	NPW	Extract/GC (ECD)	[EPA 608]	Heptachlor
Certified	Yes	NJ	WPP05.09180	NPW	Extract/GC (ECD)	[EPA 608]	Heptachlor epoxide
Certified	Yes	NJ	WPP05.09190	NPW	Extract/GC (ECD)	[EPA 608]	Methoxychlor
Certified	Yes	NJ	WPP05.09200	NPW	Extract/GC (ECD)	[EPA 608]	Toxaphene
Certified	Yes	NJ	WPP05.11010	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1016
Certified	Yes	NJ	WPP05.11020	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1221
Certified	Yes	NJ	WPP05.11030	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1232
Certified	Yes	NJ	WPP05.11040	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1242
Certified	Yes	NJ	WPP05.11050	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1248
Certified	Yes	NJ	WPP05.11060	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1254
Certified	Yes	NJ	WPP05.11070	NPW	Extract/GC (ECD)	[EPA 608]	PCB 1260

Category: WPP06 -- Organic Parameters, Chromatography/MS

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP06.02010	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Benzene
Certified	Yes	NJ	WPP06.02020	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Bromodichloromethane
Certified	Yes	NJ	WPP06.02030	NPW	GC/MS, P & T, Capillary Column	[EPA 624]	Bromoform

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New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP04 -- Inorganic Parameters, Metals

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP04.02000	NPW	Digestion, ICP	[EPA 200.7]	Aluminum
Certified	Yes	NJ	WPP04.04500	NPW	Digestion, ICP	[EPA 200.7]	Antimony
Certified	Yes	NJ	WPP04.05600	NPW	Digestion, ICP	[EPA 200.7]	Arsenic
Certified	Yes	NJ	WPP04.08000	NPW	Digestion, ICP	[EPA 200.7]	Barium
Certified	Yes	NJ	WPP04.11000	NPW	Digestion, ICP	[EPA 200.7]	Beryllium
Certified	Yes	NJ	WPP04.13500	NPW	Digestion, ICP	[EPA 200.7]	Cadmium
Certified	Yes	NJ	WPP04.15000	NPW	0.45u Filter, Colorimetric DPC	[SM 3500-Cr D]	Chromium (VI)
Certified	Yes	NJ	WPP04.18000	NPW	Digestion, ICP	[EPA 200.7]	Chromium
Certified	Yes	NJ	WPP04.19500	NPW	Digestion, ICP	[EPA 200.7]	Cobalt
Certified	Yes	NJ	WPP04.21500	NPW	Digestion, ICP	[EPA 200.7]	Copper
Certified	Yes	NJ	WPP04.26500	NPW	Digestion, ICP	[EPA 200.7]	Iron
Certified	Yes	NJ	WPP04.28000	NPW	Digestion, ICP	[EPA 200.7]	Lead
Certified	Yes	NJ	WPP04.31000	NPW	Digestion, ICP	[EPA 200.7]	Manganese
Certified	Yes	NJ	WPP04.33000	NPW	Manual Cold Vapor	[EPA 245.1]	Mercury
Certified	Yes	NJ	WPP04.35000	NPW	Digestion, ICP	[EPA 200.7]	Molybdenum
Certified	Yes	NJ	WPP04.37500	NPW	Digestion, ICP	[EPA 200.7]	Nickel
Certified	Yes	NJ	WPP04.45500	NPW	Digestion, ICP	[EPA 200.7]	Selenium
Certified	Yes	NJ	WPP04.48000	NPW	Digestion, ICP	[EPA 200.7]	Silver
Certified	Yes	NJ	WPP04.50000	NPW	Digestion, ICP	[EPA 200.7]	Thallium
Certified	Yes	NJ	WPP04.51100	NPW	Digestion, ICP	[EPA 200.7]	Tin
Certified	Yes	NJ	WPP04.54000	NPW	Digestion, ICP	[EPA 200.7]	Vanadium
Certified	Yes	NJ	WPP04.56500	NPW	Digestion, ICP	[EPA 200.7]	Zinc

Category: WPP05 -- Organic Parameters, Chromatography

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP05.09010	NPW	Extract/GC (ECD)	[EPA 608]	Aldrin
Certified	Yes	NJ	WPP05.09020	NPW	Extract/GC (ECD)	[EPA 608]	Alpha BHC
Certified	Yes	NJ	WPP05.09030	NPW	Extract/GC (ECD)	[EPA 608]	Beta BHC
Certified	Yes	NJ	WPP05.09040	NPW	Extract/GC (ECD)	[EPA 608]	Delta BHC

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: WPP02 -- Inorganic Parameters, Nutrients and Dema

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP02.15500	NPW	Distillation, Spectrophotometric (Auto)	[EPA 335.4]	Cyanide
Certified	Yes	NJ	WPP02.16000	NPW	Manual Distillation, Titrimetr/Spectro	[SM 4500-CN C,G]	Cyanide - amenable to Cl2
Certified	Yes	NJ	WPP02.18100	NPW	Ion Chromatography	[EPA 300.0]	Fluoride
Certified	Yes	NJ	WPP02.20100	NPW	Ca + Mg Carbonates, ICP	[EPA 200.7]	Hardness - total as CaCO3
Certified	Yes	NJ	WPP02.22500	NPW	Digestion, Distillation, Semiautomated Digestor	[EPA 351.2]	Kjeldahl nitrogen - total
Certified	Yes	NJ	WPP02.24000	NPW	Digestion, ICP	[EPA 200.7]	Magnesium
Certified	Yes	NJ	WPP02.26100	NPW	Ion Chromatography	[EPA 300.0]	Nitrate
Certified	Yes	NJ	WPP02.27000	NPW	Cadmium Reduction, Automated	[EPA 353.2]	Nitrate - nitrite
Applied	No	NJ	WPP02.28600	NPW	Ion Chromatography	[EPA 300.0]	Nitrite
Certified	Yes	NJ	WPP02.29100	NPW	Gravimetric, Hexane Extractable Material-LL	[EPA 1664A]	Oil & grease - hem-LL
Certified	Yes	NJ	WPP02.30000	NPW	Combustion or Oxidation	[SM 5310 B, C or D]	Total organic carbon (TOC)
Certified	Yes	NJ	WPP02.31500	NPW	Ascorbic Acid, Manual Single Reagent	[SM 4500-P, E]	Orthophosphate
Certified	Yes	NJ	WPP02.32500	NPW	Manual Distillation, Colorimetric 4AAP	[EPA 420.1]	Phenols
Certified	Yes	NJ	WPP02.33000	NPW	Manual Distillation, Colorimetric Auto	[EPA 420.1 + .2]	Phenols
Certified	Yes	NJ	WPP02.34000	NPW	Persulfate Digestion + Manual	[SM 4500-P B5 + E]	Phosphorus (total)
Certified	Yes	NJ	WPP02.38000	NPW	Gravimetric, 103-105 Degrees C	[SM 2540 B]	Residue - total
Certified	Yes	NJ	WPP02.38500	NPW	Gravimetric, 180 Degrees C	[SM 2540 C]	Residue - filterable (TDS)
Certified	Yes	NJ	WPP02.39000	NPW	Gravimetric, 103-105 Degrees C, Post Washing	[SM 2540 D]	Residue - nonfilterable (TSS)
Certified	Yes	NJ	WPP02.44000	NPW	Digestion, ICP	[EPA 200.7]	Sodium
Certified	Yes	NJ	WPP02.45500	NPW	Wheatstone Bridge	[EPA 120.1]	Specific conductance
Dropped	No	NJ	WPP02.46500	NPW	Turbidimetric	[EPA 375.4]	Sulfate
Certified	Yes	NJ	WPP02.47100	NPW	Ion Chromatography	[EPA 300.0]	Sulfate
Certified	Yes	NJ	WPP02.47500	NPW	Titrimetric, Iodine	[SM 4500-S E or F]	Sulfides
Certified	Yes	NJ	WPP02.48500	NPW	Colorimetric (Methylene Blue)	[SM 5540 C]	Surfactants
Certified	Yes	NJ	WPP02.50000	NPW	Nephelometric	[EPA 180.1]	Turbidity

Category: WPP03 -- Analyze-Immediately Inorganic Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP03.09000	NPW	Electrometric	[SM 4500-H B]	pH

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National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

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Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW04 -- Inorganic Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW04.01000	NPW	Acid Digestion/Surface and Groundwater, ICP, FLAA	[SW-846 3005A, Rev. 1, 7/92]	Metals, Total Rec and Dissolved
Certified	Yes	NJ	SHW04.01500	NPW	Acid Digestion/Aqueous Samples, ICP, FLAA	[SW-846 3010A, Rev. 1, 7/92]	Metals, Total

Category: SHW05 -- Organic Parameters, Prep. / Screening

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW05.01000	NPW	Separatory Funnel Extraction	[SW-846 3510C, Rev. 3, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.02000	NPW	Continuous Liquid-Liquid Extraction	[SW-846 3520C, Rev. 3, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.02100	NPW	Solid Phase Extraction (SPE)	[SW-846 3535, Rev. 0, 12/96]	Semivolatile organics
Certified	Yes	NJ	SHW05.07000	NPW	Purge & Trap Aqueous	[SW-846 5030B, Rev. 2, 12/96]	Volatile organics

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW09.06000	NPW	Combustion, Titration	[SW-846 9020B, Rev. 2, 9/94]	Total organic halides (TOX)

Category: WPP02 -- Inorganic Parameters, Nutrients and Dema

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	WPP02.01500	NPW	Electrometric or Color Titration	[SM 2320 B]	Alkalinity as CaCO3
Certified	Yes	NJ	WPP02.04000	NPW	Distillation, Automated Phenate	[SM 4500-NH3 B+G (20th ed.)]	Ammonia
Certified	Yes	NJ	WPP02.05000	NPW	Dissolved Oxygen Depletion	[SM 5210 B]	Biochemical oxygen demand
Certified	Yes	NJ	WPP02.09500	NPW	Dissolved Oxygen Depletion, Nitrification Inhibition	[SM 5210 B]	Carbonaceous BOD (CBOD)
Certified	Yes	NJ	WPP02.10500	NPW	Spectrophotometric Manual/Auto	[EPA 410.4]	Chemical oxygen demand
Dropped	No	NJ	WPP02.12500	NPW	Colorimetric, Automated (Ferricyanide)	[EPA 325.1 OR .2]	Chloride
Certified	Yes	NJ	WPP02.12600	NPW	Ion Chromatography	[EPA 300.0]	Chloride
Certified	Yes	NJ	WPP02.13500	NPW	Colorimetric (Platinum-Cobalt)	[SM 2120 B]	Color

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

State of New Jersey
Department of Environmental Protection

Certifies That

Empirical Laboratories, LLC

Laboratory Certification ID #: TN473

having duly met the requirements of the

Regulations Governing The Certification Of
Laboratories And Environmental Measurements N.J.A.C. 7:18 et. seq.

and

having been found compliant with the standard approved by the

National Environmental Laboratory Accreditation Conference

is hereby approved as a

Nationally Accredited Environmental Laboratory

to perform the analyses as indicated on the Annual Certified Parameter List
which must accompany this certificate to be valid

Expiration Date June 30, 2008

Joseph F. Aiello, Chief
Office of Quality Assurance

NJDEP is a NELAP Recognized Accrediting Authority

THIS CERTIFICATE IS TO BE CONSPICUOUSLY DISPLAYED AT THE LABORATORY WITH THE ANNUAL CERTIFIED PARAMETER LIST IN A LOCATION ON THE PREMISES VISIBLE TO THE PUBLIC

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

Office of Quality Assurance
9 Ewing Street, 2nd Floor, P.O. Box 424
Trenton, New Jersey 08625
Telephone: (609) 292-3950
Facsimile: (609) 777-1774

AUG 2 2007

EMPIRICAL LABORATORIES, LLC
227 FRENCH LNDG DR
NASHVILLE, TN 37228
ATTN: RANDY D WARD
LAB ID # TN473

Dear Laboratory Manager:

A Certificate and an Annual Certified Parameter List (ACPL) that reflects the current status of your facility are enclosed. If there are any discrepancies, please contact your Laboratory Certification Officer to verify information and make arrangements for a new ACPL. Effective with the receipt of this letter, your facility's certification status is valid through June 30, 2008. Both the ACPL and Certificate should be conspicuously displayed at your facility in a location on the premises that is visible to the public.

As always, we are available to discuss any comments or questions. Please do not hesitate to contact your Laboratory Certification Officer or me.

Sincerely,

Joseph F. Aiello, Chief

Enclosure(s)

TABLE D-19. LCS CONTROL LIMITS FOR METALS SW-846 METHODS 6010 AND 7471 SOLID MATRIX[29]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Aluminum	95	5	80	120	75	120
Antimony	96	5	80	120	75	120
Arsenic	95	4	80	120	80	120
Barium	98	3	80	120	80	120
Beryllium	99	4	80	120	80	120
Cadmium	97	4	80	120	80	120
Calcium	97	4	80	120	80	120
Chromium	99	5	80	120	80	120
Cobalt	98	4	80	120	80	120
Copper	97	3	80	120	80	120
Iron	100	4	80	120	80	120
Lead	95	4	80	120	80	120
Magnesium	96	3	80	120	80	120
Manganese	97	4	80	120	80	120
Mercury	100	6	80	120	No ME	No ME
Molybdenum	96	5	80	120	75	120
Nickel	97	4	80	120	80	120
Potassium	96	4	80	120	80	120
Selenium	93	4	80	120	75	120
Silver	96	7	75	120	70	125
Sodium	96	4	80	120	80	120
Thallium	94	4	80	120	80	120
Vanadium	99	3	80	120	80	120
Zinc	95	5	80	120	75	120

[29] Some as-generated limits have been adjusted to reflect method requirements and acceptable calibration uncertainty. A number of sporadic marginal exceedances of the control limits are allowed for method 6010, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits.

TABLE D-18. LCS CONTROL LIMITS FOR METALS SW-846 METHODS 6010 AND 7470 WATER MATRIX[28]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Aluminum	97	5	80	120	80	120
Antimony	98	4	80	120	80	120
Arsenic	98	4	80	120	80	120
Barium	99	4	80	120	80	120
Beryllium	99	4	80	120	80	120
Cadmium	100	4	80	120	80	120
Calcium	98	4	80	120	80	120
Chromium	100	4	80	120	80	120
Cobalt	99	3	80	120	80	120
Copper	99	3	80	120	80	120
Iron	102	4	80	120	80	120
Lead	99	4	80	120	80	120
Magnesium	98	4	80	120	80	120
Manganese	100	4	80	120	80	120
Mercury	100	5	80	120	No ME	No ME
Molybdenum	95	5	80	120	75	120
Nickel	100	4	80	120	80	120
Potassium	98	4	80	120	80	120
Selenium	98	6	80	120	75	120
Silver	97	5	80	120	75	120
Sodium	99	4	80	120	80	120
Thallium	97	4	80	120	80	120
Vanadium	99	4	80	120	80	120
Zinc	100	4	80	120	80	120

[28] The as-generated limits have been adjusted to reflect method requirements and acceptable calibration uncertainty. A number of sporadic marginal exceedances of the control limits are allowed for method 6010, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits.

TABLE D-15. LCS CONTROL LIMITS FOR ORGANOCHLORINE PESTICIDES SW-846 METHOD 8081 SOLID MATRIX[26]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
4,4'-DDD	81	18	30	135	10	155
4,4'-DDE	97	10	70	125	60	135
4,4'-DDT	92	16	45	140	30	155
Aldrin	93	16	45	140	30	155
alpha-BHC	93	10	60	125	50	135
alpha-Chlordane	92	10	65	120	55	130
beta-BHC	95	11	60	125	50	135
delta-BHC	94	12	55	130	45	145
Dieldrin	96	10	65	125	55	135
Endosulfan I	74	20	15	135	10	155
Endosulfan II	89	17	35	140	20	160
Endosulfan sulfate	99	12	60	135	50	145
Endrin	97	12	60	135	50	145
Endrin aldehyde	92	18	35	145	20	165
Endrin ketone	100	11	65	135	55	145
gamma-BHC	91	11	60	125	50	135
gamma-Chlordane	96	10	65	125	55	135
Heptachlor	96	15	50	140	35	155
Heptachlor epoxide	98	11	65	130	55	140
Methoxychlor	100	14	55	145	45	155

TABLE D-16. LCS CONTROL LIMITS FOR POLYCHLORINATED BIPHENYLS SW-846 METHOD 8082 WATER MATRIX[27]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
Aroclor 1016	85	20	25	145
Aroclor 1260	87	19	30	145

TABLE D-17. LCS CONTROL LIMITS FOR POLYCHLORINATED BIPHENYLS SW-846 METHOD 8082 SOLID MATRIX[27]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
Aroclor 1016	90	16	40	140
Aroclor 1260	96	12	60	130

[26] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Hexachlorobenzene, Hexachlorocyclopentadiene, and Toxaphene, although these compounds do appear on the target analyte list for method 8081 (Table C-8 in Appendix DoD-C). Sufficient data were not received for those analytes during the LCS study to perform statistically significant analyses. Additional limits for surrogate compounds can be found in section D.6.

[27] LCS control limits are not available for Aroclors 1221, 1232, 1242, 1248, 1254, 1262, and 1268, although those compounds do appear on the target analyte list for method 8082 (Table C-9 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for surrogate compounds can be found in section D.6.

TABLE D-14. LCS CONTROL LIMITS FOR ORGANOCHLORINE PESTICIDES SW-846 METHOD 8081 WATER MATRIX[24]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
4,4'-DDD	88	20	25	150	10	170
4,4'-DDE	87	18	35	140	15	160
4,4'-DDT	92	15	45	140	30	155
Aldrin	83	19	25	140	10	155
alpha-BHC	94	11	60	130	50	140
alpha-Chlordane	93	10	65	125	55	135
beta-BHC	96	10	65	125	55	135
delta-BHC	91	15	45	135	30	150
Dieldrin	95	11	60	130	50	140
Endosulfan I[25]	80	10	50	110	40	120
Endosulfan II	79	17	30	130	10	150
Endosulfan sulfate	96	14	55	135	40	150
Endrin	95	13	55	135	45	145
Endrin aldehyde	96	14	55	135	40	150
Endrin ketone	102	8	75	125	70	135
gamma-BHC	82	18	25	135	10	155
gamma-Chlordane	94	11	60	125	50	135
Heptachlor	87	15	40	130	30	145
Heptachlor epoxide	96	11	60	130	50	140
Methoxychlor	103	16	55	150	40	165

[24] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Hexachlorobenzene and Toxaphene, although those compounds do appear on the target analyte list for method 8081 (Table C-8 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for surrogate compounds can be found in section D.6.

[25] Provisional limits – outlier analyses during the LCS study resulted in LCS-CLs generated with data from fewer than four laboratories. Limits may be adjusted in the future as additional data becomes available.

TABLE D-12. LCS CONTROL LIMITS FOR EXPLOSIVES SW-846 METHOD 8330 WATER MATRIX[21]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,3,5-Trinitrobenzene	102	13	65	140	50	150
1,3-Dinitrobenzene	103	18	45	160	30	175
2,4-Dinitrotoluene	98	12	60	135	50	145
2,6-Dinitrotoluene	99	13	60	135	50	150
2,4,6-Trinitrotoluene (TNT)	98	15	50	145	35	160
2-Amino-4,6-dinitrotoluene[22]	101	17	50	155	35	170
2-Nitrotoluene	88	15	45	135	30	150
3-Nitrotoluene	90	14	50	130	35	145
4-Amino-2,6-dinitrotoluene[22]	104	16	55	155	40	170
4-Nitrotoluene	90	14	50	130	35	145
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	106	18	50	160	35	180
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)[22]	98	25	20	175	10	200
Nitrobenzene	94	15	50	140	35	155
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	99	6	80	115	75	120

TABLE D-13. LCS CONTROL LIMITS FOR EXPLOSIVES SW-846 METHOD 8330 SOLID MATRIX[23]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,3,5-Trinitrobenzene	99	9	75	125	65	135
1,3-Dinitrobenzene	102	8	80	125	70	135
2,4-Dinitrotoluene	102	7	80	125	75	130
2,6-Dinitrotoluene	100	7	80	120	70	130
2,4,6-Trinitrotoluene (TNT)	99	14	55	140	45	155
2-Amino-4,6-dinitrotoluene	102	7	80	125	75	130
2-Nitrotoluene	101	7	80	125	70	130
3-Nitrotoluene	100	7	75	120	70	130
4-Amino-2,6-dinitrotoluene	101	7	80	125	75	130
4-Nitrotoluene	101	8	75	125	70	135
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	103	10	70	135	65	145
Nitrobenzene	100	8	75	125	70	130
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	100	9	75	125	65	135

[21] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits were generated with data using solid phase extraction with acetonitrile only, without removing outliers from the data set (see section D.1 for further explanation).

[22] Provisional limits – LCS-CLs were generated with data from fewer than four laboratories. Limits may be adjusted in the future as additional data become available.

[23] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. Additional limits for poor performing compounds can be found in section D.5.

TABLE D-10. LCS CONTROL LIMITS FOR POLYNUCLEAR AROMATIC HYDROCARBONS SW-846 METHOD 8310 WATER MATRIX[18]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Acenaphthene	70	11	35	105	25	115
Acenaphthylene	74	13	35	115	20	125
Anthracene	77	12	40	110	30	125
Benz[a]anthracene	81	11	50	110	40	125
Benzo[a]pyrene	79	11	45	115	35	125
Benzo[b]fluoranthene	82	10	50	110	40	125
Benzo[k]fluoranthene	79	10	50	110	40	120
Benzo[g,h,i]perylene	77	14	35	120	20	135
Chrysene	83	11	50	115	40	125
Dibenz[a,h]anthracene	64	15	20	110	10	125
Fluoranthene	82	11	50	115	35	125
Fluorene	69	11	35	105	25	115
Indeno[1,2,3-cd]pyrene	80	11	45	110	35	125
Naphthalene	68	12	35	105	20	115
Phenanthrene	80	13	40	120	25	135
Pyrene	80	9	50	110	45	115

TABLE D-11. LCS CONTROL LIMITS FOR POLYNUCLEAR AROMATIC HYDROCARBONS SW-846 METHOD 8310 SOLID MATRIX[19]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Acenaphthene	71	12	35	110	20	120
Acenaphthylene	73	13	35	115	20	125
Anthracene	86	13	45	125	35	140
Benz[a]anthracene	78	9	50	105	40	115
Benzo[a]pyrene	86	15	40	135	25	150
Benzo[b]fluoranthene	89	11	55	120	45	130
Benzo[k]fluoranthene	84	12	50	120	35	135
Benzo[g,h,i]perylene[20]	85	10	55	115	45	125
Chrysene	87	11	55	120	45	130
Dibenz[a,h]anthracene	81	11	45	115	35	125
Fluoranthene	88	16	40	135	25	150
Fluorene	76	10	45	105	35	115
Indeno[1,2,3-cd]pyrene	95	13	55	135	45	145
Naphthalene	80	11	50	110	40	120
Phenanthrene	91	12	55	125	45	135
Pyrene	82	11	50	115	40	125

[18] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits.

[19] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits.

[20] Provisional limits – outlier analyses during the LCS study resulted in LCS-CLs generated with data from fewer than four laboratories. Limits may be adjusted in the future as additional data become available.

TABLE D-9. LCS CONTROL LIMITS FOR CHLORINATED HERBICIDES SW-846 METHOD 8151 SOLID MATRIX[17]

Analyte	Median	Lower Control Limit	Upper Control Limit
2,4-D	88	35	145
2,4-DB	108	50	155
2,4,5-T	86	45	135
2,4,5-TP (Silvex)	90	45	125
Dicamba	90	55	110
Dichloroprop	99	75	140

[17] LCS control limits were generated using non-parametric statistics (see section D.1 for further explanation). LCS control limits are not available for Dalapon, MCPA, and MCPP, although those compounds do appear on the target analyte list for method 8151 (Table C-5 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for poor performing compounds can be found in section D.5.

TABLE D-7. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 SOLID MATRIX[15]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Hexachlorobutadiene	78.2	12.9	40	115	25	130
Hexachloroethane	71.9	12.6	35	110	20	120
Halogenated Aromatics						
1,2,4-Trichlorobenzene	77.4	11.2	45	110	30	120
1,2-Dichlorobenzene	70.9	8.7	45	95	35	105
1,3-Dichlorobenzene	69.7	10.3	40	100	30	110
1,4-Dichlorobenzene	69.0	11.4	35	105	25	115
2-Chloronaphthalene	75.2	9.9	45	105	35	115
4-Bromophenyl phenyl ether	81.7	11.8	45	115	35	130
4-Chlorophenyl phenyl ether	79.6	10.7	45	110	35	120
Hexachlorobenzene	82.5	11.7	45	120	35	130
Nitroaromatics						
2,4-Dinitrotoluene	82.0	11.4	50	115	35	130
2,6-Dinitrotoluene	80.2	10.7	50	110	35	125
2-Nitroaniline	81.0	12.2	45	120	30	130
3-Nitroaniline	68.8	13.8	25	110	15	125
4-Nitroaniline	73.6	13.1	35	115	20	125
Nitrobenzene	77.2	11.9	40	115	30	125
Neutral Aromatics						
Carbazole	80.4	12.3	45	115	30	130
Dibenzofuran	77.1	8.8	50	105	40	110
Others						
Benzyl alcohol	70.9	17.4	20	125	10	140
Isophorone	77.0	11.4	45	110	30	125

TABLE D-8. LCS CONTROL LIMITS FOR CHLORINATED HERBICIDES SW-846 METHOD 8151 WATER MATRIX[16]

Analyte	Median	Lower Control Limit	Upper Control Limit
2,4-D	88	35	115
2,4-DB	99	45	130
2,4,5-T	83	35	110
2,4,5-TP (Silvex)	87	50	115
Dalapon	62	40	110
Dicamba	86	60	110
Dichloroprop	91	70	120
Dinoseb	65	20	95
MCPA	93	60	145

[16] LCS control limits were generated using non-parametric statistics (see section D.1 for further explanation). LCS control limits are not available for MCPP, although the compound does appear on the target analyte list for method 8151 (Table C-5 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for the analyte during the LCS study.

TABLE D-7. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 SOLID MATRIX[15]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Benz[a]anthracene	81.6	9.8	50	110	40	120
Benzo[a]pyrene	80.7	10.3	50	110	40	120
Benzo[b]fluoranthene	79.7	11.4	45	115	35	125
Benzo[k]fluoranthene	83.8	12.9	45	125	30	135
Benzo[g,h,i]perylene	81.8	14.7	40	125	25	140
Chrysene	82.6	9.9	55	110	45	120
Dibenz[a,h]anthracene	82.9	13.9	40	125	25	140
Fluoranthene	83.9	10.1	55	115	45	125
Fluorene	78.3	9.8	50	110	40	115
Indeno[1,2,3-cd]pyrene	79.7	13.8	40	120	25	135
Naphthalene	73.4	11.1	40	105	30	120
Phenanthrene	80.1	10.0	50	110	40	120
Pyrene	84.4	12.8	45	125	35	135
Phenolic/Acidic						
2,4,5-Trichlorophenol	80.1	10.4	50	110	40	120
2,4,6-Trichlorophenol	76.3	11.0	45	110	30	120
2,4-Dichlorophenol	77.2	10.9	45	110	35	120
2,4-Dimethylphenol	67.3	11.9	30	105	20	115
2,4-Dinitrophenol	72.6	20.0	15	130	10	150
2-Chlorophenol	74.7	10.3	45	105	35	115
2-Methylphenol	71.7	10.6	40	105	30	115
2-Nitrophenol	76.2	11.5	40	110	30	120
3-Methylphenol/4-Methylphenol	73.9	10.9	40	105	30	120
4,6-Dinitro-2-methylphenol	83.1	18.0	30	135	10	155
4-Chloro-3-methylphenol	79.5	11.1	45	115	35	125
4-Nitrophenol	77.0	20.2	15	140	10	160
Pentachlorophenol	71.9	15.6	25	120	10	135
Phenol	69.7	10.2	40	100	30	110
Phthalate Esters						
Bis(2-ethylhexyl) phthalate	87.4	13.3	45	125	35	140
Butyl benzyl phthalate	86.4	12.3	50	125	35	135
Di-n-butyl phthalate	83.2	9.1	55	110	45	120
Di-n-octyl phthalate	86.4	15.2	40	130	25	145
Diethyl phthalate	82.2	10.6	50	115	40	125
Dimethyl phthalate	79.6	10.2	50	110	40	120
Nitrosoamines						
N-Nitrosodi-n-propylamine	76.8	12.3	40	115	30	125
N-Nitrosodimethylamine	66.1	15.9	20	115	10	130
N-Nitrosodiphenylamine	82.4	11.1	50	115	40	125
Chlorinated Aliphatics						
Bis(2-chlorethoxy)methane	75.5	10.9	45	110	30	120
Bis(2-chloroethyl) ether	71.1	11.2	40	105	25	115
Bis(2-chloroisopropyl) ether	68.4	15.7	20	115	10	130

TABLE D-6. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 WATER MATRIX[14]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Halogenated Aromatics						
1,2,4-Trichlorobenzene	71.7	11.6	35	105	25	120
1,2-Dichlorobenzene	67.3	11.4	35	100	20	115
1,3-Dichlorobenzene	64.8	10.9	30	100	20	110
1,4-Dichlorobenzene	64.8	10.9	30	100	20	110
2-Chloronaphthalene	76.5	9.3	50	105	40	115
4-Bromophenyl phenyl ether	82.9	10.2	50	115	40	125
4-Chlorophenyl phenyl ether	80.6	10.3	50	110	40	120
Hexachlorobenzene	82.3	10.0	50	110	40	120
Nitroaromatics						
2,4-Dinitrotoluene	84.3	11.2	50	120	40	130
2,6-Dinitrotoluene	82.7	11.3	50	115	35	130
2-Nitroaniline	81.8	11.2	50	115	35	125
3-Nitroaniline	72.6	17.7	20	125	10	145
4-Nitroaniline	77.2	13.7	35	120	20	130
Nitrobenzene	76.8	10.8	45	110	35	120
Neutral Aromatics						
Carbazole	82.5	11.4	50	115	35	130
Dibenzofuran	80.3	8.8	55	105	45	115
Others						
1,2-Diphenylhydrazine	84.8	9.4	55	115	45	120
Benzyl alcohol	71.0	13.8	30	110	15	125
Isophorone	81.0	10.5	50	110	40	125

TABLE D-7. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 SOLID MATRIX[15]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Polynuclear Aromatics						
2-Methylnaphthalene	77.3	10.0	45	105	35	115
Acenaphthene	77.3	10.3	45	110	35	120
Acenaphthylene	75.7	10.4	45	105	35	115
Anthracene	79.9	9.0	55	105	45	115

[15] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spike in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Benzidine, 2,6-Dichlorophenol, 1,2-Diphenylhydrazine, and N-nitrosopyrrolidine, although those compounds do appear on the target analyte list for method 8270 (Table C-2 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for poor performing compounds can be found in section D.5.

TABLE D-6. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 WATER MATRIX[14]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Benzo[g,h,i]perylene	80.5	14.1	40	125	25	135
Chrysene	82.1	8.9	55	110	45	120
Dibenz[a,h]anthracene	84.7	14.1	40	125	30	140
Fluoranthene	85.2	10.4	55	115	45	125
Fluorene	80.6	10.3	50	110	40	120
Indeno[1,2,3-cd]pyrene	84.3	13.6	45	125	30	140
Naphthalene	70.8	10.5	40	100	30	115
Phenanthrene	84.0	11.0	50	115	40	130
Pyrene	88.6	13.2	50	130	35	140
Phenolic/Acidic						
2,4,5-Trichlorophenol	79.7	10.3	50	110	40	120
2,4,6-Trichlorophenol	80.7	10.7	50	115	40	125
2,4-Dichlorophenol	76.3	9.6	50	105	40	115
2,4-Dimethylphenol	68.8	13.5	30	110	15	125
2,4-Dinitrophenol	75.8	20.6	15	140	10	160
2-Chlorophenol	71.3	11.4	35	105	25	115
2-Methylphenol	73.3	11.7	40	110	25	120
2-Nitrophenol	75.8	12.4	40	115	25	125
3-Methylphenol/4-Methylphenol	71.3	13.0	30	110	20	125
4,6-Dinitro-2-methylphenol	84.9	15.0	40	130	25	145
4-Chloro-3-methylphenol	78.6	10.7	45	110	35	120
Pentachlorophenol	77.6	13.3	40	115	25	130
Basic						
3,3'-Dichlorobenzidine	65.2	15.3	20	110	10	125
4-Chloroaniline	62.2	15.6	15	110	10	125
Phthalate Esters						
Bis(2-ethylhexyl) phthalate	84.2	14.0	40	125	30	140
Butyl benzyl phthalate	81.1	11.7	45	115	35	130
Di-n-butyl phthalate	84.8	10.3	55	115	45	125
Di-n-octyl phthalate	87.4	16.6	35	135	20	155
Diethyl phthalate	79.2	12.9	40	120	30	130
Dimethyl phthalate	75.9	16.9	25	125	10	145
Nitrosoamines						
N-Nitrosodi-n-propylamine	80.9	15.7	35	130	20	145
N-Nitrosodimethylamine	67.9	14.1	25	110	10	125
N-Nitrosodiphenylamine	79.6	10.6	50	110	35	120
Chlorinated Aliphatics						
Bis(2-chlorethoxy)methane	76.2	10.2	45	105	35	115
Bis(2-chloroethyl) ether	73.3	12.3	35	110	25	120
Bis(2-chloroisopropyl) ether	78.2	17.5	25	130	10	150
Hexachlorobutadiene	65.2	12.6	25	105	15	115
Hexachloroethane	60.9	11.1	30	95	15	105

TABLE D-5. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 SOLID MATRIX[12]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
cis-1,2-Dichloroethene	96	10	65	125	55	135
cis-1,3-Dichloropropene	99	9	70	125	65	135
Dibromomethane	100	9	75	130	65	135
Dichlorodifluoromethane[13]	85	17	35	135	15	155
Ethylbenzene	101	9	75	125	65	135
Hexachlorobutadiene	98	15	55	140	40	155
Isopropylbenzene	103	9	75	130	70	140
m,p-Xylene	102	8	80	125	70	135
Methylene chloride	97	14	55	140	40	155
Naphthalene	84	14	40	125	25	140
n-Butylbenzene	101	12	65	140	50	150
n-Propylbenzene	99	12	65	135	50	145
o-Xylene	101	8	75	125	70	135
p-Isopropyltoluene	104	10	75	135	65	140
sec-Butylbenzene	97	11	65	130	50	145
Styrene	101	9	75	125	65	135
tert-Butylbenzene	99	11	65	130	55	145
Tetrachloroethene	103	12	65	140	55	150
Toluene	99	9	70	125	60	135
trans-1,2-Dichloroethene	100	11	65	135	55	145
trans-1,3-Dichloropropene	96	10	65	125	55	140
Trichloroethene	101	8	75	125	70	130
Trichlorofluoromethane	106	27	25	185	10	215
Vinyl chloride	92	11	60	125	45	140

TABLE D-6. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 WATER MATRIX[14]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Polynuclear Aromatics						
2-Methylnaphthalene	75.0	9.5	45	105	35	115
Acenaphthene	77.6	10.1	45	110	35	120
Acenaphthylene	78.5	9.4	50	105	40	115
Anthracene	83.0	9.7	55	110	45	120
Benz[a]anthracene	82.7	8.9	55	110	45	120
Benzo[a]pyrene	81.3	9.5	55	110	45	120
Benzo[b]fluoranthene	81.8	12.1	45	120	35	130
Benzo[k]fluoranthene	84.6	13.2	45	125	30	135

[14] A number of sporadic marginal exceedances of the control limits are allowed depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Benzidine, 2,6-Dichlorophenol, and N-nitrosopyrrolidine, although those compounds do appear on the target analyte list for method 8270 (Table C-2 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for poor performing compounds can be found in section D.5.

TABLE D-5. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 SOLID MATRIX[12]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	100	9	75	125	65	135
1,1,1-Trichloroethane	101	11	70	135	55	145
1,1,2,2-Tetrachloroethane	93	13	55	130	40	145
1,1,2-Trichloroethane	95	11	60	125	50	140
1,1-Dichloroethane	99	9	75	125	65	135
1,1-Dichloroethene	100	12	65	135	55	150
1,1-Dichloropropene	102	11	70	135	60	145
1,2,3-Trichlorobenzene	97	12	60	135	50	145
1,2,3-Trichloropropane	97	11	65	130	50	140
1,2,4-Trichlorobenzene	98	11	65	130	55	140
1,2,4-Trimethylbenzene	100	12	65	135	55	145
1,2-Dibromo-3-chloropropane	87	16	40	135	25	150
1,2-Dibromoethane	97	9	70	125	60	135
1,2-Dichlorobenzene	97	7	75	120	65	125
1,2-Dichloroethane	104	11	70	135	60	145
1,2-Dichloropropane	95	8	70	120	65	125
1,3,5-Trimethylbenzene	99	11	65	135	55	145
1,3-Dichlorobenzene	98	9	70	125	65	135
1,3-Dichloropropane	100	8	75	125	70	130
1,4-Dichlorobenzene	98	9	70	125	65	135
2,2-Dichloropropane	101	11	65	135	55	145
2-Butanone	94	22	30	160	10	180
2-Chlorotoluene	98	10	70	130	60	140
2-Hexanone	97	16	45	145	30	160
4-Chlorotoluene	100	9	75	125	65	135
4-Methyl-2-pentanone	97	17	45	145	30	165
Acetone	88	23	20	160	10	180
Benzene	99	9	75	125	65	135
Bromobenzene[13]	93	9	65	120	55	130
Bromochloromethane	99	9	70	125	60	135
Bromodichloromethane	100	9	70	130	60	135
Bromoform	96	13	55	135	45	150
Bromomethane	95	21	30	160	10	180
Carbon disulfide	103	19	45	160	30	180
Carbon tetrachloride	100	11	65	135	55	145
Chlorobenzene	99	8	75	125	65	130
Chlorodibromomethane	98	11	65	130	55	140
Chloroethane	98	20	40	155	20	175
Chloroform	98	9	70	125	65	135
Chloromethane	90	13	50	130	40	140

[12] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Methyl tert-butyl ether and Total Xylene although those compounds do appear on the target analyte list for method 8260 (Table C-1 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for MTBE during the LCS study. Xylene may be reported on a project-specific basis as a total number; however, for the purposes of the DoD QSM, it will be analyzed and reported as m,p-Xylene and o-Xylene. Additional limits for poor performing compounds can be found in section D.5 and for surrogate compounds in section D.6.

[13] Provisional limits – outlier analyses during the LCS study resulted in LCS-CLs generated with data from fewer than four laboratories. Limits may be adjusted in the future as additional data become available.

TABLE D-4. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 WATER MATRIX[11]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,3,5-Trimethylbenzene	102	10	75	130	65	140
1,3-Dichlorobenzene	100	8	75	125	65	130
1,3-Dichloropropane	100	9	75	125	65	135
1,4-Dichlorobenzene	99	8	75	125	65	130
2,2-Dichloropropane	103	11	70	135	60	150
2-Butanone	91	20	30	150	10	170
2-Chlorotoluene	100	9	75	125	65	135
2-Hexanone	92	12	55	130	45	140
4-Chlorotoluene	101	9	75	130	65	135
4-Methyl-2-pentanone	96	13	60	135	45	145
Acetone	91	17	40	140	20	160
Benzene	102	7	80	120	75	130
Bromobenzene	100	8	75	125	70	130
Bromochloromethane	97	11	65	130	55	140
Bromodichloromethane	98	8	75	120	70	130
Bromoform	99	10	70	130	60	140
Bromomethane	88	19	30	145	10	165
Carbon disulfide	100	21	35	160	15	185
Carbon tetrachloride	102	12	65	140	55	150
Chlorobenzene	102	7	80	120	75	130
Chlorodibromomethane	96	13	60	135	45	145
Chloroethane	99	12	60	135	50	145
Chloroform	100	12	65	135	50	150
Chloromethane	83	15	40	125	25	140
cis-1,2-Dichloroethene	99	9	70	125	60	135
cis-1,3-Dichloropropene	100	10	70	130	60	140
Dibromomethane	101	8	75	125	65	135
Dichlorodifluoromethane	93	21	30	155	10	175
Ethylbenzene	100	9	75	125	65	135
Hexachlorobutadiene	97	15	50	140	35	160
Isopropylbenzene	101	9	75	125	65	135
m,p-Xylene	102	9	75	130	65	135
Methyl tert-butyl ether	94	10	65	125	55	135
Methylene chloride	96	14	55	140	40	155
Naphthalene	96	14	55	140	40	150
n-Butylbenzene	103	11	70	135	55	150
n-Propylbenzene	101	9	70	130	65	140
o-Xylene	100	7	80	120	75	130
p-Isopropyltoluene	102	10	75	130	65	140
sec-Butylbenzene	100	9	70	125	65	135
Styrene	100	11	65	135	55	145
tert-Butylbenzene	99	10	70	130	60	140
Tetrachloroethene	96	18	45	150	25	165
Toluene	100	7	75	120	70	130
trans-1,2-Dichloroethene	99	13	60	140	45	150
trans-1,3-Dichloropropene	98	15	55	140	40	155
Trichloroethene	99	9	70	125	60	135
Trichlorofluoromethane	103	15	60	145	45	160
Vinyl chloride	99	16	50	145	35	165

D.7 In-House LCS Control Limits

The acceptability of LCS results within any preparatory batch shall be based on project specified limits or the following DoD-specified LCS control limits, if project-specific limits are not available. If DoD limits are not available, the laboratory must use its in-house limits for batch acceptance.

DoD strongly believes that it is important for laboratories to maintain their own in-house LCS limits. These in-house limits must be consistent with the DoD limits (project-specific, if available; otherwise the following LCS-CLs). The laboratory in-house limits shall be calculated from the laboratory's historical LCS data in accordance with a documented procedure (e.g., SOP) that is consistent with good laboratory practice. That document must describe the process for establishing and maintaining LCS limits and the use of control charts.

The laboratory in-house limits are to be used for several purposes:

- Laboratories are expected to utilize their in-house limits as part of their quality control system, and to evaluate trends and monitor and improve performance.

- When laboratories' in-house limits are outside the DoD control limits (upper and/or lower), they must report their in-house limits in the laboratory report (see Appendix DoD-A) even if the LCS associated with the batch in fact fell within the DoD limits. In this manner, DoD will be able to evaluate how laboratory performance affects the quality of the environmental data.

- DoD may review the laboratory in-house limits and associated trends, as reflected in control charts, to determine whether the laboratory's overall performance is acceptable. If deemed unacceptable, this may be a basis on which DoD makes a decision to not use the laboratory again until substantial improvement has occurred.

TABLE D-4. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 WATER MATRIX[11]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	105	8	80	130	75	135
1,1,1-Trichloroethane	100	11	65	130	55	145
1,1,2,2-Tetrachloroethane	96	11	65	130	55	140
1,1,2-Trichloroethane	100	8	75	125	65	135
1,1-Dichloroethane	101	11	70	135	60	145
1,1-Dichloroethene	99	10	70	130	55	140
1,1-Dichloropropene	102	10	75	130	65	140
1,2,3-Trichlorobenzene	99	14	55	140	45	155
1,2,3-Trichloropropane	98	9	75	125	65	130
1,2,4-Trichlorobenzene	100	11	65	135	55	145
1,2,4-Trimethylbenzene	103	10	75	130	65	140
1,2-Dibromo-3-chloropropane	91	14	50	130	35	145
1,2-Dibromoethane	100	7	80	120	75	125
1,2-Dichlorobenzene	96	9	70	120	60	130
1,2-Dichloroethane	100	10	70	130	60	140
1,2-Dichloropropane	100	8	75	125	65	135

[11] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Total Xylene. Xylene may be reported on a project-specific basis as a total number; however, for the purposes of the DoD QSM, it will be analyzed and reported as m,p-Xylene and o-Xylene. Additional limits for poor performing compounds can be found in section D.5 and for surrogate compounds in section D.6.

The lower control limit generated for alternative or modified methods must be greater than 10% to be considered acceptable.

D.6 Surrogates

The surrogate compounds for each method are added to all samples, standards, and blanks to assess the ability of the method to recover specific non-target analytes from a given matrix and to monitor sample-specific recovery. Control limits for these compounds were calculated in the same study as the other analytes on the target analyte lists. Below are the limits for some of the surrogates of Methods 8260, 8270, 8081, and 8082, based on 3 standard deviations around the mean (Table D-3). Control limits are not available for some surrogates that appear on the target analyte lists in Appendix DoD-C. Sufficient data were not received for those analytes during the LCS study to perform statistically significant analyses. No ME limits are presented as marginal exceedances are not acceptable for surrogate spikes. Note: DoD prefers the use of those surrogates not identified as poor performing analytes in Table D-2 above.

TABLE D-3. SURROGATES

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
8260 Water:				
1,2-Dichloroethane-d_4	95	8	70	120
4-Bromofluorobenzene	98	7	75	120
Dibromofluoromethane	100	5	85	115
Toluene-d_8	102	6	85	120
8260 Solid:				
4-Bromofluorobenzene	101	6	85	120
Toluene-d_8	100	5	85	115
8270 Water:				
2-Fluorobiphenyl	79	10	50	110
Terphenyl-d_{14}	92	14	50	135
2,4,6-Tribromophenol	82	13	40	125
2-Fluorophenol	63	14	20	110
Nitrobenzene-d_5	76	11	40	110
8270 Solid:				
2-Fluorobiphenyl	72	10	45	105
Terphenyl-d_{14}	78	15	30	125
2,4,6-Tribromophenol	80	15	35	125
2-Fluorophenol	70	11	35	105
Phenol-d_5/d_6	71	10	40	100
Nitrobenzene-d_5	69	10	35	100
8081 Water:				
Decachlorobiphenyl	83	17	30	135
TCMX	81	19	25	140
8081 Solid:				
Decachlorobiphenyl	94	13	55	130
TCMX	97	9	70	125
8082 Water:				
Decachlorobiphenyl	88	15	40	135
8082 Solid:				
Decachlorobiphenyl	91	11	60	125

EMPLOYEE SIGNATURE & INITIAL DOCUMENTATION 2007

NAME(*Signature*)	INITIALS
Barnett, Amy	
Boyd, Bob	
Burr, Roger	
Davis, Rick	
Dawson, Barbara	
Deville, Betty	
Dillard, Brian	
Gordon, Sonya	
Hallquist, Gwen	
~~Halter, Mary~~	
Holliman, Jade	
Hughes, John	
Johnson, Herbie	
Johnson, Yolanda	
Kim, Andrew	
Latham, Michael	
Little, Josh	
McCoy, Natasha	
McGinnity, Marcia	
Monteiro, Antonio	
Moore, Chrisie	
Powers, Brenton	
Richard, Brian	
Robbins, Bethany	
Robinson, Andy	
Taylor, Ted	
Thompson, Christy	
Tolbert, Binta	
Vogel, Renee	
Ward, Randy	
Weber, Delia	

APPENDIX E

EMPLOYEE SIGNATURE
&
INITIAL DOCUMENTATION

APPENDIX D

CERTIFIED ANALYTE LIST

CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CRI	Contract Required Detection Limit standard
CS	TCLP extract soil or other matrix
CW	TCLP extract water (water as original matrix)
DCV	Distilled Check Standard Verification (for cyanide only)
DUP	Sample duplicate
DW	Dissolved analyte in water matrix
FCB	Final Calibration Blank (used for mercury and cyanide)
FCV	Final Calibration Verification (used for mercury)
ICB	Initial Calibration Blank
ICSA	Interference Check Standard A
ICSAB	Interference Check Standard AB
ICV	Initial Calibration Verification
LCSS	Laboratory Control Sample Soil
LCSW	Laboratory Control Sample Water
MSD	Matrix spike duplicate
PBS	Preparation Blank Soil
PBW	Preparation Blank Water
PDS	Post digestion spike
TS	Total analyte in Soil/Sediment
TW	Total analyte in Water

APPENDIX C

GLOSSARY OF QC ABBREVIATIONS

TABLE B-2 (Continued)

ORGANIZATION OF THE PESTICIDE/PCB/HERBICIDE ORGANIC PACKAGE

Data Package	Summary Package
Written Case Narrative (basic)	Written Case Narrative (basic)
Chain of Custody (basic)	Chain of Custody (basic)
Parameters Requested Listing (basic)	Parameters Requested Listing (basic)
Data Summary Report	Data Summary Reports
Form II	Form I (not including Method Blank or LCS/MS/MSD)
Form III (LCS/MS/MSD)	Form II.
Form IV	Form III (LCS/MS/MSD)
Sample Form I with corresponding Quant Report and Chromatogram	Form IV followed by the corresponding Method Blank Form I
Form VI – organized by column in chronological order	
Form VII (PEM) – organized by column in chronological order (pesticides only)	
Form VII (CCV)– organized by column in chronological order	
Form VIII - organized by column in chronological order	
Form X – organized by sample number (Pest/Herb and sometimes PCB)	
PEM Data – organized by column in chronological order (pesticide only)	
Curve Data – organized by column in chronological order	
CCV Data – organized by column in chronological order	
Form I for Method Blank with corresponding Quant Report and Chromatogram	
Laboratory Control Sample Form I with corresponding Quant Report and Chromatogram	
Matrix Spike Form I with corresponding Quant Report and Chromatogram	
Matrix Spike Duplicate Form I with corresponding Quant Report and Chromatogram	
Internal Chain of Custody Logs including: Sample Storage Refrigerator Extract Storage Refrigerator Extraction Log Analytical Run Log	
% Solid Sheet (Only for Soil/Sediment Samples)	

TABLE B-2

ORGANIZATION OF THE VOLATILE/SEMIVOLATILE ORGANIC PACKAGE

Data Package	Summary Package
Written Case Narrative (basic) Chain of Custody (basic) Parameters Requested Listing (basic) Data Summary Report Form II Form III (LCS/MS/MSD) Form IV Form V Form VIII Form I with corresponding: - Library Search Form I (if requested) - Quant Report with Chromatogram - Library Search Quant Report - Spectra for target compounds - Spectra for the library search compounds (if requested) Form VI with corresponding Quant Reports, Chromatograms and Manual Integrations Form VII with corresponding Quant Report, Chromatogram and Manual Integrations BFB (for volatiles) or DFTPP (for semi-volatiles) Raw Data with the corresponding Mass Listing and Chromatogram Form I for Method Blank with corresponding: - Library Search Form I (if requested) – Quant Report with Chromatogram - Library Search Quant Report – Spectra for target compounds – Spectra for library search compounds (if requested) Laboratory Control Sample Form I's with corresponding Quant Report, Chromatogram and Manual Integrations Matrix Spike Form I with corresponding Quant Report, Chromatogram and Manual Integrations Matrix Spike Duplicate Form I with corresponding Quant Report, Chromatogram and Manual Integrations Internal Chain of Custody Logs including: Sample Storage Refrigerator Extract Storage Refrigerator Extraction Log Analytical Run Log % Solid Sheet (Only for Soil/Sediment Samples)	Written Case Narrative (basic) Chain of Custody (basic) Parameters Requested Listing (basic) Data Summary Reports Form I (not including Method Blank or LCS/MS/MSD) followed by the corresponding Library Search Form I (if requested). Form II. Form III (LCS/MS/MSD) Form IV followed by the corresponding Method Blank Form I Form VIII NOTE: When more than one Organic Fraction has been requested all of the Similar Forms go together in the order of Volatile, Semivolatile, Pesticide, and Herbicide. Example: Volatile Form I's will be followed by the Form I's of Semivolatiles, Pesticides, and Herbicides. The Form II's will follow in the same fraction order, etc.

TABLE B-1 (CONTINUED)

DELIVERABLE FORM DESCRIPTION AND VALIDATION CHECKS FOR ORGANICS

Form Type	Form Name/Description	When needed	Validation Checks
Quant Report	Quant Report w/ Chromatogram (and detected analyte spectra for GC/MS)	one report for each sample analyzed	a quant report and a chromatogram should be printed for each sample, LCS/MS/MSD, method blank, calibration check, dilution, and replicate. GC/MS spectra must be printed for each analyte identified in a sample, dilution, replicate or method blank.
GC/MS Performance Standard – BFB/DFTPP	Acceptance criteria listing with graphic mass spectrum, tabular mass spectrum and chromatogram	one needed for each day the instrument was running (samples or calibration standards)	Verify that every date a sample was analyzed the GC/MS Performance Standard data is present
Library Searches (optional)	List of Hits for compounds not on the target analyte list	dependent on the analytical results of the sample	Library Search Form I will go with each form I even if there were no hits. There are no Library Searches for LCS/MS/MSDs. The samples that have compounds listed must have spectra to confirm the hit. Samples with two dilutions require library search only on the most concentrated analysis.

TABLE B-1

DELIVERABLE FORM DESCRIPTION AND VALIDATION CHECKS FOR ORGANICS

Form Type	Form Name/Description	When needed	Validation Checks
Form I	Analysis Data Sheet	one needed per sample analyzed including method blanks, duplicates, dilutions and LCS/MS/MSD	The numbers and flags on the Form I should correspond to the numbers on the Summary Report
Form II	Surrogate Recovery Sheet	each sample analyzed must be listed on a Form II including QC samples	verify that each sample is represented on a Form II
Form III	Laboratory Control Sample (LCS)	one needed per sample batch	verify that each LCS has a Form III
Form III	Matrix Spike/Matrix Spike Duplicate Recovery (MS/MSD)	one needed per sample that had a MS/MSD performed (at least one per batch)	verify that each MS/MSD has a Form III
Form IV	Method Blank Summary	each sample analyzed must be listed on a Form IV to show which method blank corresponds with the sample	verify that each sample is listed on a Form IV including LCS/MS/MSD, Dilutions, etc.
Form V	GC/MS Tuning & Mass Calibration- Bromofluorobenzene (BFB) for Volatiles Decafluorotriphenylphosphine (DFTPP) for Semivolatiles	there must be a Form V for each day the instrument was run for the batch including initial calibrations, continuing calibrations and samples	verify that each sample is listed on a Form V including LCS/MS/MSD, Dilutions, Calibrations, etc.
Form VI	Initial Calibration Data (ICAL)	to determine which Form VI's should appear in the batch, look at the Form VII's and see which ICAL it refers to for its calculations/comparison	verify that the Form VI that is referred to by a Form VII appears in the package
Form VII (pesticide Only)	Continuing Calibration Verification (performance evaluation mix)	One needed for each day a sample was analyzed	verify that every date a sample was run, a performance evaluation mix was also analyzed with acceptable breakdown.
Form VII	Continuing Calibration Verification	One needed for each day a sample was analyzed (Minimum of two needed for each GC analysis data)	verify that every date a sample was run, a Form VII was also produced and that every Form VI that is reference on a Form VII is included
Form VIII (GC/MS Only)	Internal Standard Area Summary	each sample analyzed must be listed on a Form VIII	verify that each sample is listed on a Form VIII including LCS/MS/MSD, Dilutions, etc.
Form VIII (GC Only)	Analytical Sequence Summary	each sample analyzed must be listed on a Form VIII	verify that each sample is listed on a Form VIII including LCS/MS/MSD, Dilutions, etc.
Form X (GC Only)	Dual Column Analyte Identification Form	each sample with a dual column reported analyte concentration must have a Form X	verify that each sample with reported concentrations has a Form X including LCS/MS/MSD, Dilutions, etc.

1.2 Volatiles

Once the analyst supplies all of the raw data and forms, the next step is to separate the information according to the form type. All of the chromatograms should remain with their appropriate report (e.g., the sample chromatogram should stay with the sample quant report and the BFB chromatogram should stay with the BFB listings). When the Form I's are separated, they must be arranged by sample number order. If there was a rerun arrange the forms for the same sample number according to the date analyzed; however, if a sample has several dilutions, place the lowest dilution in front of the others. Separate the Form I's that go to LCS/MS/MSD and Method Blanks from the sample Form I's. Arrange the Method Blank Form I's according to the date analyzed and arrange the other forms (Forms II-VIII, BFB) according to the dates analyzed. If there is an uncertainty to the date analyzed look at the name of the method blank that appears on the form and arrange the forms according to the number name of the method blank.

Table 1-1 describes the different forms to be included in a volatiles package and gives items to review in the preliminary validation process. Table 1-2 indicates which forms appear in each of the two packages and the order in which they appear. Notice that the Form V's, VI's, VII's, BFB, LCS/MS/MSD Form I's and Quant Reports only appear in the Raw Data Package. The remaining forms (Form I's for the samples and method blanks, and all Forms II, III, IV, and VIII) will require photocopying since they appear in both packages. After making a copy of these forms, bind the original copies with a paper clip and label the stack to be the volatile summary package. The summary package will not be assembled until all organic parameter deliverables are assembled and validated, since it is a composite of all organic fractions.

Prior to assembling the data package it helps to separate the stack of quant reports and arrange them according to samples number with the lowest number on top of the stack. Placing sequential quant reports perpendicular to the previous report will aide in quick assembly. Once all of the needed pages are photocopied, match the quant report with the corresponding Form I.

STANDARD OPERATING PROCEDURES FOR ASSEMBLY OF ORGANIC DELIVERABLE PACKAGES AND PRELIMINARY VALIDATION OF ORGANIC DELIVERABLE PACKAGES

Before assembling a deliverables package you must first obtain a copy of the chain of custody record from the Empirical Laboratories, LLC log-in personnel. You will also need to generate a parameters requested list of the organic tests required for each work order withthe organic report generator macro located at L:\archive\archives\organic\parameters requested MDB\organic report generator.mdb. Lastly, you will need to obtain a copy of the summary report that was created from the data.

Once all of the samples are analyzed the forms will be generated and the raw data copied to be included in the deliverables package. The following sections will describe the items to be included in the deliverables package, the order in which the pieces are to be assembled, and preliminary validation procedures.

1.0 PACKAGE

The Organic parameters include volatiles, semivolatiles (base neutral/acids), pesticides, PCBs (often pest/PCB together), and herbicides. Two types of packages will be created - a data summary package which is a composite of all of the organic fractions analyzed and a raw data package for the organic fraction in the order 1) basic information, 2) volatiles, 3) semi-volatiles, 4) pest/PCBs and 5) herbicides.

1.1 Basic Information

Information that is common to all fractions and included at the beginning of both the summary package and main data package includes 1) Chain of Custody, 2) Cooler Receipt Form (if available), 3) Parameters Requested Listing and 4) Case Narrative (generated by Organic Supervisor – notes from preliminary package validation are helpful.

APPENDIX B

STANDARD OPERATING PROCEDURES FOR ASSEMBLY OF ORGANIC DELIVERABLE PACKAGES AND PRELIMINARY VALIDATION OF ORGANIC DELIVERABLE PACKAGES

TABLE A-1 (Cont'd)

SUMMARY OF ANALYTICAL METHODS AND DETECTION LIMITS

Inorganics	Analytical Method		Method Detection Limits	
	Water	Soil	Water (µg/L)	Soil (mg/kg)
Aluminum	6010	6010	15	2.0
Antimony	6010	6010	2.0	0.50
Arsenic	6010	6010	1.5	0.45
Barium	6010	6010	1.0	0.04
Beryllium	6010	6010	1.0	0.02
Cadmium	6010	6010	0.2	0.050
Calcium	6010	6010	50	1.0
Chromium(total)	6010	6010	1.0	0.10
Chromium VI	7196	3060/7196	10	0.5
Cobalt	6010	6010	0.5	0.05
Copper	6010	6010	0.5	0.20
Iron	6010	6010	20	2.5
Lead	6010	6010	1.0	0.20
Magnesium	6010	6010	20	1.0
Manganese	6010	6010	0.5	0.10
Mercury	7470/245.1	7471/245.5	0.050	0.005
Molybdenum	6010	6010	1.0	0.15
Nickel	6010	6010	0.5	0.10
Potassium	6010	6010	50	10
Selenium	6010	6010	2.0	0.30
Silver	6010	6010	0.5	0.050
Sodium	6010	6010	150	20
Thallium	6010	6010	0.5	0.25
Vanadium	6010	6010	0.5	0.10
Zinc	6010	6010	2.0	0.10
Cyanide	335.3/9012	9012	2.0	0.10
Chloride	325.2/300.1	NA	0.5/0.02(mg/L)	NA
Fluoride	340.2/300.1	NA	0.02 (mg/L)	NA
Nitrate	353.2/300.1	NA	0.02 (mg/L)	NA
Perchlorate	314.0	314.0	1.0(mg/L)	0.010
Phenol	420.2/9066	9066	10	5.0
Sulfate	375.4/300.1	NA	1.0/0.05 (mg/L)	NA

MDLs are in-house, Empirical Laboratories, LLC, generated limits except where otherwise stated. MDLs are updated frequently and the limits indicated here are generic but consistent with method performance in our laboratory.

TABLE A-1 (Continued)

SUMMARY OF ANALYTICAL METHODS AND DETECTION LIMITS

Method Water: 3510/8270 Soil: 3540/8270 **Semi-Volatiles (continued)**	Method Detection Limits Water (µg/L)	 Soil (µg/Kg)
Hexachlorocyclopentadiene	1	100
Hexachloroethane	1	100
Indeno(1,2,3-cd)pyrene	2	100
Isophorone	2	100
2-Methylnaphthalene	2	100
Naphthalene	2	100
2-Nitroaniline	2	100
3-Nitroaniline	2	100
4-Nitroaniline	2	100
Nitrobenzene	1	100
N-Nitroso-di-methylamine	1	100
N-Nitroso-di-n-propylamine	2	100
N-Nitrosodiphenylamine	2	100
Phenanthrene	2	100
Pyrene	2	100
1,2,4-Trichlorobenzene	2	100
Benzoic acid	2	100
4-Chloro-3-methylphenol	2	100
2-Chlorophenol	2	100
2,4-Dichlorophenol	2	100
2,4-Dimethylphenol	2	100
4,6-Dinitro-2-methylphenol	4	100
2,4-Dinitrophenol	7	700
2-Methylphenol	2	100
4-Methylphenol	4	100
2-Nitrophenol	1	100
4-Nitrophenol	3	100
Pentachlorophenol	5	500
Phenol	1	100
2,4,5-Trichlorophenol	2	100
2,4,6-Trichlorophenol	2	100

MDLs are in-house, Empirical Laboratories, LLC, generated limits except where otherwise stated. MDLs are updated frequently and the limits indicated here are generic but consistent with method performance in our laboratory.

TABLE A-1 (Continued)

SUMMARY OF ANALYTICAL METHODS AND DETECTION LIMITS

Method Water: 3510/8270 Soil: 3540/8270	Method Detection Limits	
Semi-Volatiles	Water (µg/L)	Soil (µg/Kg)
Acenaphthene	2	100
Acenaphthylene	2	100
Anthracene	2	100
Benzo(a)anthracene	2	100
Benzo(a)pyrene	2	100
Benzo(b)fluoranthene	2	100
Benzo(g,h,i)perylene	2	100
Benzo(k)fluoranthene	2	100
Benzyl alcohol	2	100
bis(2-Chloroethoxy)methane	1	100
bis(2-Chloroethyl)ether	2	100
bis(2-Chloroisopropyl)ether	1	100
bis(2-Ethylhexyl)phthalate	2	1300
4-Bromophenyl-phenylether	2	100
Butylbenzylphthalate	2	100
Carbazole	2	100
4-Chloroaniline	1	100
2-Chloronaphthalene	2	100
4-Chlorophenyl-phenylether	2	100
Chrysene	1	100
Dibenz(a,h)anthracene	2	100
Dibenzofuran	2	100
1,2-Dichlorobenzene	2	100
1,3-Dichlorobenzene	2	100
1,4-Dichlorobenzene	2	100
3,3'-Dichlorobenzidine	2	500
Diethylphthalate	1	100
Dimethylphthalate	2	100
Di-n-butylphthalate	2	100
2,4-Dinitrotoluene	2	100
2,6-Dinitrotoluene	1	100
Di-n-octylphthalate	2	100
1,2-Diphenylhydrazine	1	100
Fluoranthene	2	100
Fluorene	1	100
Hexachlorobenzene	2	100
Hexachlorobutadiene	2	100

MDLs are in-house, Empirical Laboratories, LLC, generated limits except where otherwise stated. MDLs are updated frequently and the limits indicated here are generic but consistent with method performance in our laboratory.

TABLE A-1

SUMMARY OF ANALYTICAL METHODS AND DETECTION LIMITS

Method Water: 5030/8260 Soil: 5035/8260 Volatiles	Method Detection Limits Water – 5mL (µg/L)	 Soil (µg/Kg)
Acetone	5	5
Benzene	1	1
Bromodichloromethane	1	1
Bromoform	2	1
Bromomethane	2	2
2-Butanone	10	10
Carbon disulfide	1	1
Carbon tetrachloride	1	1
Chlorobenzene	1	1
Chloroethane	2	3
Chloroform	1	1
Chloromethane	2	2
Dibromochloromethane	1	1
1,2-Dichlorobenzene	1	1
1,3-Dichlorobenzene	1	1
1,4-Dichlorobenzene	1	1
Dichlorodifluoromethane	2	2
1,1-Dichloroethane	1	1
1,2-Dichloroethane	1	1
1,1-Dichloroethene	1	1
cis-1,2-Dichloroethene	1	1
trans-1,2-Dichloroethene	1	1
1,2-Dichloropropane	1	1
cis-1,3-Dichloropropene	1	1
trans-1,3-Dichloropropene	1	1
Ethylbenzene	1	1
2-Hexanone	3	2
4-Methyl-2-pentanone	2	2
Methylene chloride	2	3
Styrene	1	1
1,1,2,2-Tetrachloroethane	1	1
Tetrachloroethene	1	1
Toluene	1	1
1,1,1-Trichloroethane	1	1
1,2,4-Trichlorobenzene	2	1
1,1,2-Trichloroethane	1	1
Trichloroethene	1	1
Trichlorofluoromethane	2	2
Vinyl acetate	1	1
Vinyl chloride	2	2
Xylene(total)	1	1

MDLs are in-house, Empirical Laboratories, LLC, generated limits except where otherwise stated. MDLs are updated frequently and the limits indicated here are generic but consistent with method performance in our laboratory.

APPENDIX A

SUMMARY OF MDLS AND ANALYTICAL METHOD REFERENCE

12.4 DATA QUALITY ASSESSMENT

Many projects require some form of a data package. These packages differ in content depending on the specific clients request. They range in design from containing sample data results and portions of QC documentation to a full CLP style package. These packages will include a formal assessment of the quality of data. The data quality assessment report (General Discussion / Report Narrative) is submitted by the laboratory management in the laboratory data package (LDP) for management personnel (Project Manager, Project QC Coordinator, and Laboratory Director) to review.

The data quality assessment report is generated after the laboratory management completes evaluation and/or validation of the LDP. The Laboratory Director reviews case narrative reports submitted by Section Managers to assist in the determination of data quality. The report will assess the usability of the data in light of analytical performance and whether project data quality objectives have been met by the reported data.

External on-site system audits and performance evaluation studies (WP and WS) are conducted routinely by city, state and federal agencies or major client representatives. The audit report is submitted to the Quality Assurance Officer/Laboratory Director by the external audit source. The audit report is forwarded to the Section Managers for evaluation and response to any deficiencies sited. The response to deficiencies discovered by external audits are dependent upon the auditors requirements. The response is submitted to the Quality Assurance Officer and Laboratory Director by the Department Manager for review before implementation of the corrective action plan is initiated. The information of the external audit is maintained by the laboratory.

12.3 LABORATORY MANAGEMENT REVIEW

The management of the laboratory will conduct an annual review of the overall quality systems and to ensure it's stability and effectiveness and to consider any operational changes that would improve quality. The review will include an assessment of all reports from management, internal and external audits, proficiency tests, blind sample results, any feedback from customers, correction action reports and any other relevant materials. Management will document and maintain records of the review and corrective action taken.

Initiation of a new QA/QC program or changes to an existing QA/QC program are submitted in written form to the Laboratory Director by laboratory management (Quality Assurance Officer or Department Manager). Notification in writing by city, state or federal agencies of change in QA/QC requirement or certification status will be forwarded in writing to all interested parties (affected clients, other state or federal regulatory authorities and laboratory personnel) as soon as possible.

Control charting evaluation reports are submitted by the Quality Assurance Officer to the Laboratory Director and upper management. The report details specific QC assessment throughout the laboratory. The control chart report evaluates laboratory performance based upon QA/QC samples. This information is discussed with specific Department Managers to evaluate system trends and potential problems.

12.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Formal quality assurance reports from the Laboratory Quality Assurance Officer will be submitted to the appropriate management personnel (Project Quality Assurance Officer, Department Manager, or Laboratory Director) as needed if a change in the QA/QC Program occurs, or to document the results of a corrective action.

12.1 RESULTS OF CORRECTIVE ACTIONS

System performance that is deemed out-of-control in comparison with method expectations or unusual events worthy of notation require a Corrective Action Report (CAR). Detailed information concerning corrective action procedures and requirements for generating a CAR are presented in Section 11.

The CARs are promptly reviewed by laboratory management to assure proper decisions are made to resolve quality control issues. Each CAR is maintained in the laboratory and may be submitted with data as part of a deliverables package.

12.2 RESULTS OF INTERNAL AND PERFORMANCE EVALUATION AUDITS

An audit report will be submitted to the Laboratory Director as a result of either an internal or external laboratory audit. Detailed information concerning these audits is presented in Section 8.

There are several types of internal audits performed during the year. At least one complete system audit is scheduled each year along with a random number of method audits. Internal blind quality control samples are dispersed into various areas of the laboratory to evaluate specific analyses performance. Internal audit reports are submitted by the Quality Assurance Officer to the Laboratory Director for initial review. Audit reports are then forwarded to the appropriate Section Manager for their evaluation and to respond to any documented deficiencies. The response is submitted in the form of a CAR, by the Department Manager to the Quality Assurance Officer and Laboratory Director. The CAR is maintained in the laboratory and available for review by external auditors.

Empirical Laboratories, LLC has a corrective action system in place, which includes documentation of out-of-control situations with corrective action reports (CARs). Each functional area (such as, sample receiving, GC, GC/MS, Metals, wet chemistry) generates CARs to document any observed deviation from normal processes or expectations. These CARs must be generated, reviewed, and approved by the section manager, and copies distributed to the laboratory Quality Assurance Officer and Laboratory Director. Each CAR contains the following information: date the problem was observed; identity of person completing the CAR; lab number(s) of the sample(s) involved; analytical parameter(s) involved; statement of the problem; description of the corrective action taken; description of action taken to prevent reoccurrence of the problem; additional comments (if any) and a listing of those persons to whom copies were sent. The copies maintained in file by each Section Manager are considered the original "archivable" versions.

This system was started to document out of control situations, but, in years of use, has become a very effective means to identify and communicate any excursions from the norm in all phases of laboratory operation. The immediate review feature has allowed many opportunities for correcting analytical problems before expiration of sample holding times.

To the extent possible, sample data should only be reported if all QA/QC requirements have been met. If any QA/QC requirements are found to be out of control, all samples associated with the failed measurements will be re-analyzed or reported with the appropriate data qualifications.

11.0 ANALYTICAL CORRECTIVE ACTIONS

Corrective actions are undertaken at any time during the analytical process when deemed necessary based on the judgement of the analyst or when established QC data or documented protocols indicate a need for action. (Specific limits are addressed in Section 2.) Generally, corrective action is triggered by poor analysis replication, poor recovery, instrument calibration problems, blank contamination, etc. (Previous sections outline specifics.)

Nonconformances associated with the statistical analysis and review of data are, in general, easy to identify. The analyst is responsible for assessment of QC sample information. If data outlie accepted limits, the analyst immediately notifies the responsible Department Manager and/or Quality Assurance Officer. The Managers and/or Quality Assurance Officer are responsible for identifying the source of the nonconformance and initiating corrective action. Completion of corrective action should be evidenced by data returning to prescribed acceptable limits or by documented resolution that validates data being reported to the client. If the situation is not corrected so that an out-of-control condition may occur, or is expected to, the Laboratory Director is notified.

Corrective actions may include, but are not necessarily limited to: reanalysis, calculation checks, instrument recalibration, preparation of new standards/blanks, reextraction/digestion, dilution, application of another analysis method, additional training, etc. Many of these corrective actions are initiated by the analyst at the time of analysis. However, some corrective actions are initiated subsequently based on evaluations performed by management personnel.

Nonconformances which do not readily result in an observed impact on data quality are more difficult to identify. Such events can sometimes be tracked to samples stored at an incorrect temperature or held beyond prescribed holding times, or improper maintenance of records. The entire staff is responsible for reporting "system" nonconformances. Analysts report nonconformances to their Section Manager, the Section Managers in turn to the Quality Assurance Officer and/or Laboratory Director. Corrective action is again the responsibility of the Section Managers. They will, in most instances, review and approve the action(s) taken.

10.3 COMPLETENESS

Completeness is defined as follows for all measurements:

$$\%C = 100 \times \left[\frac{v}{n}\right] \quad (6)$$

where:

%C	=	percent completeness
v	=	number of measurements judged valid
n	=	total number of measurements necessary to achieve a specified level of confidence in decision making

10.4 METHOD DETECTION LIMIT (MDL)

MDL is defined as follows for all measurements:

$$MDL = (n-1, 1-a = 0.99)\,(S)$$

where:

MDL	=	method detection limit
S	=	standard deviation of the replicate analyses
$t_{(n-1,\ 1-a = 0.99)}$	=	student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

where:

s	=	standard deviation
y_i	=	measured value of the *i*th replicate
$\bar{y}$	=	mean of replicate measurements
n	=	number of replicates

10.2 ACCURACY

For measurements where matrix spikes are used, calculate the percent recovery as follows:

$$\%R = 100 \times \left[\frac{S-U}{C_{sa}}\right] \quad (4)$$

where:

%R	=	percent recovery
S	=	measured concentration in spiked aliquot
U	=	measured concentration in unspiked aliquot
C_{sa}	=	actual concentration of spike added.

When a standard reference material (SRM) is used:

$$\%R = 100 \times \left[\frac{C_m}{C_{srm}}\right] \quad (5)$$

where:

%R	=	percent recovery
C_m	=	measured concentration of SRM
C_{srm}	=	actual concentration of SRM

10.0 CALCULATION OF DATA QUALITY INDICATORS

This section describes how common data quality indicators are calculated and reported.

10.1 PRECISION

If calculated from duplicate measurements, relative percent difference is the normal measure of precision:

$$RPD = \frac{(C_1 - C_2)x100}{\frac{(C_1 + C_2)}{2}} \quad (1)$$

where:

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	smaller of the two observed values

If calculated from three or more replicates, use relative standard deviation rather than RPD:

$$RSD = (s / \bar{y})\ x100 \quad (2)$$

where:

RSD	=	relative standard deviation
s	=	standard deviation
$\bar{y}$	=	mean of replicate analyses

Standard deviation is defined as follows:

$$S = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})^2}{n-1}} \quad (3)$$

- All information necessary to produce unequivocal, accurate records that document the laboratory activities associated with sample receipt, preparation, analysis and reporting

- Common carrier documents

- The COC records shall identify individuals who physically handled individual samples

- The COC records are not limited to a single form or document

- Legal COC begins at the point established by the federal or state oversight program. This may begin at the point that cleaned sample containers are provided by the laboratory or the time sample collection occurs

- The COC forms shall remain with the samples during transport or shipment

- If shipping containers and/or individuals sample containers are submitted with sample custody seals, and any seals are not intact, the lab will note this on the chain of custody

- Mailed packages should be registered with return receipt requested. If packages are sent by common carrier, receipts should be retained as part of the permanent COC documentation

- Once received by the laboratory, laboratory personnel are responsible for the care and custody of the sample

9.8 INFORMATION IN CUSTODY RECORDS

In addition to the information specified above, tracking records shall include, by direct entry or linkage to other records:

- Time of day and calendar date of each transfer or handling procedure

- Signatures of all personnel who physically handle the sample(s)

- Records of demonstration of capability for each analyst

- A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record

9.7 LEGAL/EVIDENTIARY CUSTODY

The use of legal chain of custody (COC) protocols may be required by some programs. In addition to the records and the performance standards outlined above, the following protocols will be incorporated if legal COC is implemented by the regulatory body.

9.7.1 Basis Requirements

The legal COC records establish an intact, continuous record of the physical possession, storage and disposal of sample containers, collected samples, samples aliquots, and sample extracts or digestates. For ease of discussion, the above-mentioned items shall be referred to as samples:

- It is in one's actual physical possession

- It is in one's view, after being in one's physical possession

- It is in one's physical possession and then locked up so that no one can tamper with it

- It is kept in a secure area, restricted to authorized personnel only

- The COC records shall account for all time periods associated with the samples

computational steps used to translate the data into a reportable analytical value.

- Copies of final reports
- Archived standard operating procedures
- Correspondence relating to laboratory activities for a specific project
- Corrective action reports, audits and audit responses
- Proficiency test results
- Data review and cross checking

9.5 ANALYTICAL RECORDS

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs include:

- Laboratory sample ID
- Date and time of analysis
- Analysis type
- Manual calculations
- Analyst's or operator's initials/signature

9.6 ADMINISTRATIVE RECORDS

The following records are maintained within the laboratory.

- Personnel qualifications, experience and training records

- Standard Operating Procedures (SOP's) issued to laboratory personnel are reviewed and approved for use by authorized personnel before issue. A master list of SOP's is kept showing effective date and last review date. SOP's are periodically reviewed and revised if needed. Obsolete SOP's are removed from use and archived.

- Access to archived information is documented with an access log of items sent to the Iron Mountain storage site. These records are protected against fire, theft, loss, environmental deterioration, vermin and in the case of electronic records, electronic or magnetic sources.

- The laboratory will have the responsibility to implement a plan to ensure that the records are maintained or transferred according to the client's instructions in the event that the laboratory transfers ownership or goes out of business.

9.4 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, the following are retained.

- All original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts work sheets and data output records (chromatograms, strip charts, and other instrument response readout records).

- A written description, included in the appropriate SOP, or reference to the specific test method used which includes a description of the specific

- All generated data except those that are generated by automated data collection systems, will be recorded directly, promptly and legibly in permanent ink.

- Entries in records are not obliterated by methods such as erasures, overwritten files. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall sign (or initial) and date the correction. These criteria also will apply to electronically maintained records.

- Refer to Section 7.3 for Computer and Electronic Data.

9.3 RECORDS MANAGEMENT AND STORAGE

- All records, certificates and reports are safely stored, held secure and in confidence to the client.

- All records are to be retained for a minimum of seven years from last use. All information necessary for the historical reconstruction of data will be maintained by the laboratory. Records which are stored only on electronic media will be supported by the hardware and software necessary for their retrieval.

- Records that are stored or generated by computers will have a hard copy or write-protected backup copies.

- The laboratory has begun implementation of a record management system with a master list of logbooks for control of laboratory notebooks, instrument logbooks, standard logbooks, and records for data reduction. Old logbooks are kept in the QAO's office until boxed and sent off-site to Iron Mountain to be stored.

9.0 LABORATORY DOCUMENTS

9.1 LABORATORY RECORDS

The laboratory maintains a record system to meet its particular circumstances and comply with any applicable regulations. The system produces accurate records, which document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the test report for a minimum of seven years.

9.2 RECORD KEEPING SYSTEM

The system is designed to allow for historical reconstruction of all laboratory activities that produce the reported sample analytical data. The history of the sample will be readily understood through the documentation. This includes interlaboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, preparation, calibration or testing.

- Information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification will be documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes.

- Documentation entries will be signed or initialed by responsible staff.

- Checking that record-keeping procedures, including notebooks, logsheets, bench sheets, and tracking forms are properly maintained.

- Verification that the appropriate chain of command is followed in responding to variances and implementing corrective action.

8.3 AUDIT REVIEW

All audit and review findings and any corrective actions will be documented. Laboratory management will ensure that all corrective actions are implemented within an agreed time schedule.

8.4 LABORATORY MANAGEMENT REVIEW

Annually, the management of the laboratory will review its quality systems to ensure the stability and effectiveness of the system. The review will be focused on reports from managerial and supervisory staff. The outcome of internal audits, external audits, the results from interlaboratory comparisons or proficiency tests, feedback from customers, corrective action reports, and any other revelent factors. This document will be reviewed by management and distributed to the appropriate managers and supervisory staff. This document will be kept in the laboratory files and available for review.

samples (duplicates and blanks) submitted to the laboratory from the field also form an important element of the performance audit process. In addition, all analytical processes are tested through the analysis of commercially available (or in-house generated) performance audit samples.

The laboratory will make available to any appropriate persons, upon request, information on any certification performance samples analyzed for the past two years.

8.2 INTERNAL AUDITS

A systems audit consists of a review of the total data production process, including on-site reviews of field and laboratory operational systems and physical facilities for sampling, calibration, and measurement protocols. To the extent possible, these audits should not be conducted by persons who are directly involved in the measurement process. These audits must be conducted at least annually.

Systems audits are conducted on sampling/analysis under the direction of the Quality Assurance Officer.

As appropriate, the audits will consist of all or any of the following items:

- Review of the organization and responsibilities to determine the functional operation of the quality assurance program.
- Check on whether or not standard operating procedures are available and implemented as written.
- Assessment of the traceability of samples and data.
- Validation that the appropriate QC checks are being made and that appropriate documentation is maintained.
- Determination of whether or not the specified equipment is available, calibrated, and in proper working condition for specific projects.

8.0 LABORATORY AUDITS

Performance and systems audits are essential elements of every quality assurance program. These audits are usually conducted at the beginning of a program to ascertain that the groups involved have the capability and understanding to perform the sampling and analysis according to the requirements and procedures set forth in the project work plans and SAP. In addition, for large projects, one or more audits are usually performed during a project to document that established procedures and the associated laboratory Standard Operating Procedures are being implemented.

The personnel listed below are responsible for all performance and system audits:

- Laboratory Director
- Quality Assurance Officer

The laboratory participates in the following certification programs which require performance evaluation samples to be analyzed bi-annually and annually and on site internal audits to be performed at specified intervals.

- NELAP/New Jersey Department of Environmental Protection
- NELAP/Florida Department of Health
- U.S. Army Corps of Engineers – Missouri River Region, MRR, HTRW-CX
- Department of the Navy – Naval Facility Engineering Service Center, NFESC
- Arkansas Department of Environmental Quality
- California Department of Health Services
- North Carolina Department of Environment and Natural Resources
- Commonwealth of Massachusetts Department of Environmental Protection
- Commonwealth of Kentucky Department of Environmental Protection
- Tennessee Department of Health and Environment

8.1 PERFORMANCE AUDITS

A performance audit independently collects measurement data using performance evaluation samples. The data which a multi-state certified laboratory generates by analyzing blind performance evaluation samples provided by the certifying agency serve as an ongoing performance audit of the laboratory analytical process. The blind QC

TABLE 7-7

CONSUMABLES SUPPLIER LIST

1. AbsoluteStandards, Inc
2. AccuStandard, Inc.
3. Agilent Technologies
4. ANL Compressed Gases
5. APG (Analytical Products Group)
6. Chem Service Inc
7. ERA (Environmental Resource Associates)
8. Fisher Scientific Company
9. High- Purity Standards
10. Innovative
11. NSI Environmental Solutions, Inc
12. Perkin Elmer
13. Phenomenex
14. Plastic Supply
15. QEC (Quality Environmental Containers)
16. Restek Corporation
17. RTC (Resource Technology Corporation)
18. SPEX CertiPrep Inc
19. Supelco (Sigma-Aldrich family of companies)
20. TJA (Thermo Jarrell Ash)
21. Ultra Scientific, Inc
22. VWR Scientific

TABLE 7-6

QUALITY ASSURANCE PROGRAM OUTLINE
ORGANIC ANALYSIS
LIQUID CHROMATOGRAPHY (EXPLOSIVES)

A) Standard Curves for each analytical parameter

1) Five calibration standards (minimum) are prepared and analyzed at the concentration of interest.

2) A second source standard is analyzed for calibration verification.

3) A calibration curve or calibration factor is generated from the above data for each compound of interest.

B) Control procedures for each analytical batch, 20 sample maximum[a]

1) Midpoint calibration verification standard analyzed singly after every 10 samples(or client specified) with less than 15% difference back to the first midpoint calibration verification standard for the sequence. Retention time windows are adjusted for each analyte to reflect "real time" stability of the system based on the latest midpoint calibration verification. If 15% difference criteria is not met, the sequence is stopped and maintenance performed before recalibrating and proceeding with sample analysis.

2) Method Blank

3) Matrix Spike/Matrix Spike Duplicate (Spike concentration is generally at the mid range of the calibration curve.)

4) Laboratory control samples are analyzed according to project requirements, or at a rate of 5% the total number of samples, or at a minimum of one per month.

C) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.

2) Participation in performance evaluation and method studies available from NVLAP accredited providers.

3) Split samples between laboratories.

4) Blind field duplicates, blanks and spikes.

[a] These procedures are to be used as guidelines in the absence of project specific criteria.

TABLE 7-5 (Continued)

QUALITY ASSURANCE PROGRAM OUTLINE
ORGANIC ANALYSIS
GAS CHROMATOGRAPHY/MASS SPECTROMETRY

C) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.
2) Participation in performance evaluation and method studies available from NVLAP accredited providers.
3) Split samples between laboratories.
4) Blind field duplicates, blanks and spikes.

[a] These procedures are to be used as guidelines in the absence of project specific criteria.

TABLE 7-5

QUALITY ASSURANCE PROGRAM OUTLINE
ORGANIC ANALYSIS
GAS CHROMATOGRAPHY/MASS SPECTROMETRY

A) Standard Curves for each analytical parameter

1) Each GC/MS system is tuned to meet USEPA criteria.

2) Five calibration standards (minimum) are prepared and analyzed at the concentration of interest.

3) A second source standard is analyzed for calibration verification.

4) A calibration curve or average response factor is generated from the above data for each compound of interest. The percent RSD for each CCC (calibration check compound) must be less than 30%.

5) The SPCCs (system performance check compounds) for BNA's must have an average response factor greater than 0.050. The SPCCs for VOA's must have an average response factor greater than 0.10 or 0.30, depending on the compound, as specified in the method. SPCCs typically have low response factors and tend to decrease in response as the system begins to deteriorate. They are normally the first compounds to show poor performance.

6) The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units.

B) Control procedures for each analytical batch, 20 sample maximum[a]

1) GC/MS system is tuned to meet USEPA requirements, these criteria must be met before each analytical run.

2) A continuing calibration standard is analyzed. The SPCCs must meet the same criteria as the initial calibration and the CCCs must have a percent difference of less than 20% back to the initial calibration curve. If any of these criteria are not met, corrective action must be taken in the form of maintenance or a new calibration curve.

3) The internal standard responses and retention times in the calibration check standard must be evaluated during or immediately after data acquisition. Retention times should not vary more than 30 seconds from the midpoint standard of the most recent initial calibration. The EICP (extracted ion current profile) area for any of the internal standards should not change by more than a factor of two (- 50% to +100%) from the midpoint standard of the most recent initial calibration. If either criteria is not met, the system must be inspected for malfunctions and corrections made.

4) Method Blank

5) Matrix Spike/Matrix Spike Duplicate

6) Laboratory control samples are analyzed according to project requirements, or at a rate of 5% the total number of samples, or at a minimum of one per month.

TABLE 7-4

QUALITY ASSURANCE PROGRAM OUTLINE
ORGANIC ANALYSIS
GAS CHROMATOGRAPHY

A) Standard Curves for each analytical parameter

1) Evaluation check standard for DDT and Endrin breakdown. If degradation of either DDT of Endrin exceeds 15%, corrective action will be taken in the form of cleaning the injection port. (Pesticide only)

2) Five calibration standards (minimum) are prepared and analyzed at the concentration of interest.

3) A second source standard is analyzed for calibration verification.

4) A calibration curve or calibration factor is generated from the above data for each compound of interest.

B) Control procedures for each analytical batch, 20 sample maximum[a]

1) Evaluation check standard for DDT and Endrin at the beginning of each run. (Pesticides)

2) Continuing calibration verification (CCV) standard every 12 hours (and every 10- 20 samples based on method) with less than 15% difference back to the original calibration curve. Retention time windows are adjusted for each analyte to reflect "real time" stability of the system based on the first midpoint calibration verification for the sequence. If 15% difference criteria is not met, two options are available:

- Stop the sequence, perform maintenance, recalibrate and proceed with analysis; or
- Allow the sequence to proceed and evaluate the impact on the data. If the CCV recoveries are high and the analyte is not detected in a sample, the analysis would be acceptable. If CCV recoveries are low or the analyte is detected in a sample, that sample would have to be reanalyzed or flagged.

3) Method Blank

4) Matrix Spike/Matrix Spike Duplicate

5) Laboratory control samples are analyzed according to project requirements, or at a rate of 5% the total number of samples, or at a minimum of one per month.

C) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.

2) Participation in performance evaluation and method studies available from NVLAP accredited providers.

3) Split samples between laboratories.

4) Blind field duplicates, blanks and spikes.

[a] These procedures are to be used as guidelines in the absence of project specific criteria.

TABLE 7-3 (Continued)

QUALITY ASSURANCE PROGRAM OUTLINE
METALS - ICAP (Trace)

D) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.

2) Participation in performance evaluation and method studies available from NVLAP accredited providers.

3) Split samples between laboratories.

4) Blind field duplicates, blanks, and spikes.

[a]These procedures are to be used as guidelines in the absence of project-specific criteria.

TABLE 7-3

QUALITY ASSURANCE PROGRAM OUTLINE
METALS - ICAP (Trace)

A) Standard Curve for each analytical parameter

B) New Standard Curve for each analytical run

1) Three concentration levels/one concentration level (Program dependent)

(Some agencies require a standard to be analyzed at the reporting limit)

2) One Initial Calibration Verification standard (ICV)

3) Initial calibration blank

4) One interference check standard at the beginning and end of the run or at least every eight hours.

5) One standard at two times the USEPA contract required detection limit (CRDL) at the beginning and end of the run. (Program Dependent)

6) Quarterly, a Linear Range Standard is run for each metal. This standard must agree within 5 percent of original concentration.

7) Annually, Interference element corrections are analyzed and correction factors calculated; sensitive IEC's are checked daily.

C) Control procedures for each analytical batch, 20 sample maximum[a]

1) One method blank

2) Calibration verification standard

a) After every tenth sample and/or at the end of each run

b) Concentration of check standard must agree with original curve within 5 to 10 percent (depending on method)

3) Continuing Calibration Blank

a) After every 10th sample and/or at the end of each run.

b) Concentrations must be below the specific method tolerance limits.

4) One Laboratory Control Sample (LCS)

5) One Matrix Spike (MS)

6) One Matrix Spike Duplicate (MSD) or One Duplicate

7) Serial Dilution on new or unusual matrix

8) Post Digestion Spike for out-of-control MS/MSD situations

9) Method of Standard Addition as required

TABLE 7-2

QUALITY ASSURANCE PROGRAM OUTLINE
MERCURY - CVAA

A) Standard Curve for each run

B) Initial Calibration Curve

1) Four to five concentration levels (varies with each method/program)
2) One standard may be required at the method reporting limit (Regulatory agency driven)
3) One reagent-water blank
4) One Laboratory Control Sample (LCS)

C) Control procedures for each analytical batch, 20 sample maximum[a]

1) One method blank

2) Calibration verification standard

a) After every tenth sample and/or at the end of each run

b) Concentration of check standard must agree with original curve within 15 percent (Method/Program dependent)

3) One Matrix Spike

4) One Matrix Spike Duplicate or One Duplicate

5) One Laboratory Control Sample (LCS)

D) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.

2) Participation in performance evaluation and method studies available from NVLAP accredited providers.

3) Split samples between laboratories.

4) Blind field duplicates, blanks, and spikes.

[a]These procedures are to be used as guidelines in the absence of project-specific criteria.

TABLE 7-1

QUALITY ASSURANCE PROGRAM OUTLINE
CONVENTIONAL CHEMISTRY

A) Initial calibration for each analytical parameter

B) Initial calibration for each new set of reagents

1) Four to five concentration levels (Method/Program dependent)
2) One standard may be required at the method reporting limit (Regulatory agency driven)
3) One reagent-water blank
4) One Laboratory Control Sample

C) Control procedures for each analytical batch, 20 sample maximum[a]

1) One method blank
2) Calibration verification standard[b]

a) Run initially, then every 10 samples (assumes more than 20 samples are processed in one day)

b) Concentration of check standard must agree with original curve within 10 percent

3) One Matrix Spike[b]

4) One Matrix Spike Duplicate[b] or One Duplicate

5) One Laboratory Control Sample (LCS) where applicable

D) Inter-laboratory quality control

1) Reference samples provided by NVLAP accredited providers and NIST.

2) Participation in performance evaluation and method studies available from NVLAP accredited providers.

3) Split samples between laboratories.

4) Blind field duplicates, blanks, and spikes.

[a]These procedures are to be used as guidelines in the absence of project-specific criteria.
[b]Does not apply to some parameters like BOD, TS, TSS, specific conductance, etc.

- Procedures are established and implemented for protecting the integrity of data; such procedures should include, but not be limited to, integrity of data entry or capture, data storage, data transmission and data processing.

- Computer and automated equipment are maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain the integrity of calibration and test data.

- The laboratory uses appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.

7.2 DOCUMENTATION AND LABELING OF STANDARDS AND REAGENTS

Procedures exist for the purchase, reception and storage of consumable materials used for the technical operations of the laboratory

- The laboratory retains records 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 after which the materials shall not be used unless it is verified by the laboratory.

- Original containers (such as provided by the manufacturer or vendor) are labeled with an expiration date.

- Records are maintained on reagent and standard preparation. These records indicate traceability to purchase stocks or neat compounds, reference to the method of preparation, date of preparation, expiration date and preparer's initials.

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

7.3 COMPUTERS AND ELECTRONIC DATA RELATED REQUIREMENTS

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

- Sections 8.1 through 8.11 of the EPA Document "2185 - Good Automated Laboratory Practices" (1995), will be followed as the standard for employing microprocessors, computers as well as laboratories employing Laboratory Information Management Systems.

- Computer software is documented and adequate for use.

7.0 INTERNAL QUALITY CONTROL CHECKS

The overall effectiveness of a quality control program depends upon operating in the field and the laboratory in accordance with a program that systematically controls the precision and accuracy of analyses by detecting errors and preventing their recurrence, or measuring the degree of error inherent in the methods applied.

Internal QC checks are accomplished through standard programs involving the analysis of various types of samples and standards, such as, replicate, spiked, and split samples; method and reagent blanks; internal, surrogate, and matrix spikes; QC check samples and calibration standards. Such QC programs are shown in Tables 7-1 through 7-6.

The blank, analytical replicate, and spiked quality control samples are analyzed in the same way as field samples and are interspersed with the field samples. The analytical results of these samples are used to document the validity and control the quality of data within predetermined tolerance limits.

7.1 OUTSIDE SUPPORT SERVICES AND SUPPLIES

- When the laboratory procures outside services and supplies, other than those referred to in this document in support of tests, the laboratory will use only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests.

- Where there is no independent assurance of the quality of outside support services or supplies is available, the laboratory will ensure that purchased equipment, materials and services comply with specified requirements. The laboratory should, whenever possible, ensure that purchased equipment and consumable materials are not used until they have been inspected, calibrated or otherwise verified as complying with any standard specifications relevant to the calibrations or test concerned.

- The laboratory maintains records of all suppliers from whom it obtains support services or supplies required for tests. Table 7-7 and 7-8 are lists of suppliers and subcontractors that are used by the laboratory.

- Foot note any subcontracted work
- After the initial issuance of the laboratory report, the report shall remain unchanged. Changes or revisions can only be made in the form of another report form. The only exception to this would be for typographical errors in regard to things such as sample identification.
- The laboratory must notify customers promptly if a defective measuring system was found to be present causing erroneous results.
- Laboratory shall certify that the results reported meet NELAC standards.

Table 6-2 (Continue)
ANALYTICAL REPORT TERMS AND QUALIFIERS

EQL: The estimated quantitation limit (EQL) is defined as the estimated concentration above which quantitative results can be obtained with a specific degree of confidence. ELAB defines the EQL to be at or near the lowest calibration standard.

B: The presence of a "B" to the right of an analytical value indicates that this compound was also detected in the method blank and the data should be interpreted with caution. One should consider the possibility that the most accurate sample result might be less than the reported value and, perhaps, zero. The qualifier will be placed on the analyte according to "National Functional Guidelines." The 10x rule will be applied.

D: When a sample (or sample extract) is rerun diluted because one of the compound concentrations exceeded the highest concentration range for the standard curve, all of the values obtained in the dilution run will be flagged with a "D".

E: The concentration for any compound found which exceeds the highest concentration level on the standard curve for that compound will be flagged with an "E". Usually the sample will be rerun at a dilution to quantitate the flagged compound.

J: The presence of a "J" to the right of an analytical result indicates that the reported result is estimated. The chromatographic data pass the identification criteria showing that the compound is present, but the calculated result is less than the EQL.

P: The associated numerical value is an estimated quantity. There is greater than a 40% difference between the two GC columns for the detected concentrations. The higher of the two values is reported.

Table 6-2 (continued)

(SAMPLE OF A SUMMARY REPORT)

Client:
Date Reported:

ELAB SAMPLE NUMBER			V3BLK0310	V3BLK0310	V2BLK0311	0103119-01D	0103119-02
DATE SAMPLED			NA	NA	NA	03/02/04	03/02/04
DATE RECEIVED			NA	NA	NA	03/08/04	03/08/04
DATE ANALYZED			03/10/04	03/10/04	03/11/04	03/10/04	03/11/04
CLIENT SAMPLE DESCRIPTION			M.BLANK	M.BLANK	M.BLANK	MW-16DR	FB-030204
VOLATILE ORGANICS BY USEPA METHOD 8260	MDL	EQL	CONC	CONC	CONC	40 X(1) CONC	CONC
cis-1,3-Dichloropropene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
trans-1,3-Dichloropropene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Ethylbenzene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
2-Hexanone	2.0	20	< 2.0	< 2.0	< 2.0	< 80 D	< 2.0
Methylene chloride	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
4-Methyl-2-pentanone	2.0	20	< 2.0	< 2.0	< 2.0	< 80 D	< 2.0
Styrene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,1,2,2-Tetrachloroethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Tetrachloroethene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Toluene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,2,4-Trichlorobenzene	1.0	10	< 1.0	< 1.0	< 1.0	130 JD	< 1.0
1,1,1-Trichloroethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,1,2-Trichloroethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Trichloroethene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Vinyl acetate	5.0	50	< 5.0	< 5.0	< 5.0	< 200 D	< 5.0
Vinyl chloride	2.0	20	< 2.0	< 2.0	< 2.0	< 80 D	< 2.0
Xylene(total)	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0

ALL COMPOUNDS EXPRESSED IN MICROGRAMS/LITER UNLESS OTHERWISE NOTED.

ALL NON-DETECT VALUES ARE REPORTED AS <MDL (MODIFIED TO REFLECT DILUTIONS/SAMPLE VOLUME).

SEE ATTACHED PAGE FOR DEFINITIONS OF TERMS AND QUALIFIERS.

(1) = SAMPLES WERE DILUTED BY THE NUMERICAL VALUE DISPLAYED.
DETECTION LIMITS HAVE BEEN INCREASED BY THE SAME FACTOR.

ELAB of Tennessee, LLC

D. Rick Davis
Vice President

Table 6-2

(SAMPLE OF A SUMMARY REPORT)

Client:
Date Reported:

ELAB SAMPLE NUMBER			V3BLK0310	V3BLK0310	V2BLK0311	0103119-01D	0103119-02
DATE SAMPLED			NA	NA	NA	03/02/04	03/02/04
DATE RECEIVED			NA	NA	NA	03/08/04	03/08/04
DATE ANALYZED			03/10/04	03/10/04	03/11/04	03/10/04	03/11/04
CLIENT SAMPLE DESCRIPTION			M.BLANK	M.BLANK	M.BLANK	MW-16DR	FB-031504
VOLATILE ORGANICS BY USEPA METHOD 8260	MDL	EQL	CONC	CONC	CONC	40 X(1) CONC	CONC
Acetone	5.0	50	< 5.0	< 5.0	< 5.0	< 200 D	< 5.0
Benzene	1.0	10	< 1.0	< 1.0	< 1.0	420 D	< 1.0
Bromodichloromethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Bromoform	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Bromomethane	3.0	30	< 3.0	< 3.0	< 3.0	< 120 D	< 3.0
2-Butanone	10	100	< 10	< 10	< 10	< 400 D	< 10
Carbon disulfide	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Carbon tetrachloride	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
Chlorobenzene	1.0	10	< 1.0	< 1.0	< 1.0	7500 D	< 1.0
Chloroethane	2.0	20	< 2.0	< 2.0	< 2.0	< 80 D	< 2.0
Chloroform	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	2.0 J
Chloromethane	2.0	20	< 2.0	< 2.0	< 2.0	< 80 D	< 2.0
Dibromochloromethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,2-Dichlorobenzene	1.0	10	< 1.0	< 1.0	< 1.0	540 D	< 1.0
1,3-Dichlorobenzene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,4-Dichlorobenzene	1.0	10	< 1.0	< 1.0	< 1.0	1200 D	< 1.0
1,1-Dichloroethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,2-Dichloroethane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,1-Dichloroethene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
cis-1,2-Dichloroethene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
trans-1,2-Dichloroethene	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0
1,2-Dichloropropane	1.0	10	< 1.0	< 1.0	< 1.0	< 40 D	< 1.0

ALL COMPOUNDS EXPRESSED IN MICROGRAMS/LITER UNLESS OTHERWISE NOTED.

ALL NON-DETECT VALUES ARE REPORTED AS <MDL (MODIFIED TO REFLECT DILUTIONS/SAMPLE VOLUME).

SEE ATTACHED PAGE FOR DEFINITIONS OF TERMS AND QUALIFIERS.

(1) = SAMPLES WERE DILUTED BY THE NUMERICAL VALUE DISPLAYED.
DETECTION LIMITS HAVE BEEN INCREASED BY THE SAME FACTOR.

Empirical Laboratories, LLC, 227 French Landing Drive, Nashville, TN 37228 Phone (615) 345-1115

Organic draft reports are created by the use of HP Chemstation in conjunction with Target/Envision computer software. The draft reports are then reviewed and sent forward for the creation of the final summary report. Table 6-2 presents an example of the Empirical Laboratories, LLC standard report for the VOC analysis of a water sample by USEPA Method 8260. As can be seen in the example, the final summary report is in Report Writer. The standard report includes client name, date sampled, date received, date analyzed, date reported, laboratory sample number, field id, method detection limits, dilution factors, constituents being reported, analytical results, concentration units, and QC qualifier flags. A separate page for definition of terms and qualifiers is attached to the summary report when required. If there were any problems with the sample matrix, data or analytical methods a separate narrative will accompany the report.

The laboratory maintains a complete set of the raw analytical data on site for approximately one year after the completion of sample analysis, followed by off site storage for at least six years.

6.4 REPORTING REQUIREMENTS

Each analytical summary report may include the following information:

- Title, e.g. "Certificate of Results", or laboratory results
- Name and address of laboratory
- Unique identification of the report and of each page, and the total number of pages
- Clear identification of sample (customer code)
- Date/time of report, sample preparation and/or analysis if the required holding time for either activity is <48 hours
- Clear identification of test method
- Clear statement if lab performed sampling
- Clear statement of any QA/QC qualifiers that may have an impact on the data user
- A signature and title of person(s) accepting responsibility for the control of the report

6.2 DATA VALIDATION

Data validation involves a series of steps taken within an analytical laboratory to ensure that reported results correctly represent the analyses performed, that all instrument systems are in control, and that QA objectives for precision, accuracy, and method detection limits are being met. All analytical data produced at the Empirical Laboratories laboratory are validated against the criteria set forth in this manual or project specific criteria where applicable.

Typically, data validation begins with the primary analyst and continues through several levels of review until the data are reported. The primary analyst verifies that all of the QA objectives are met by comparing the information provided by the various internal quality control checks to the required QC limits, and prepares a draft report. A second analyst experienced with the method then performs a complete check of all steps of data reduction beginning with the raw data. This analyst also signs and dates the time of this data validation check.

The draft reports and supporting data are reviewed and evaluated by the appropriate analytical Section Manager. At this level, the data validation process is reviewed and any necessary additional data qualifiers attached to the report after consultation with the laboratory Quality Assurance Officer, if necessary. The final reports are reviewed for completeness and compliance with overall project goals by the Laboratory Director.

The flow of this data validation process is shown in Figure 6-1. As shown, when projects require a full, CLP-style data validation, data deliverables packages are assembled and data validation performed by the Department Managers or designee. This process is detailed in the SOP included in Appendix B of this manual.

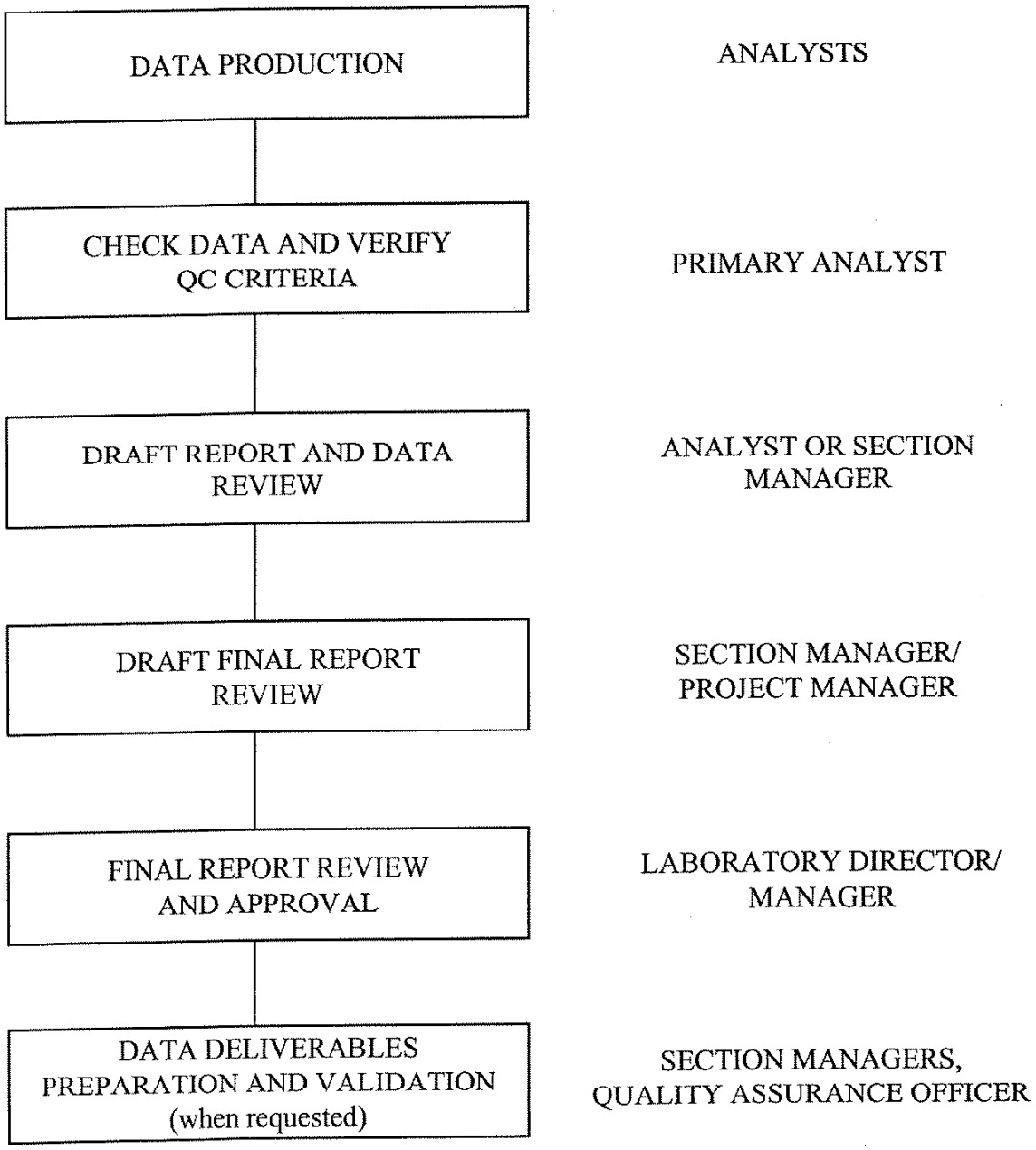
6.3 DATA REPORTING

The flow of information from the initial production of the data to the final report is shown in the flow chart depicted in Figure 6-1. The final, fully reviewed and validated data will be displayed in report form in summary tables separated according to analysis type. After samples have been analyzed and the data reviewed and second checked by the analysts, and the Department Manager, inorganic data are entered into the LIMS and a draft report is printed from the LIMS.

FIGURE 6-1

DATA REDUCTION AND VALIDATION FLOW

SCHEMATIC AT EMPIRICAL LABORATORIES, LLC



K:\qaqc\qam\NELAP2001\fig7-1.ppt

TABLE 6-1 (Continued)

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Parameter	Equations	Reporting Units	
		Water	Soil/Sediment
Metals	Water concentration (mg/L or µg/L)	µg/L (or mg/L)	mg/kg

Read the metal concentration value in µg/L or mg/L directly from the calibration curve.

If dilution of the sample was required:

$$\text{mg/L or µg/L} = \frac{A\,(C + B)}{C}$$

A = mg/L or µg/L in diluted aliquot from calibration curve
B = acid blank matrix used for dilution, mL
C = sample aliquot, mL

For soil and sediments (mg/kg) dry weight

$$= \frac{A_x V}{W_x P}$$

A_X = mg/L in sample from calibration curve
V = final volume of sample, mL
W = weight of sample, grams
P = % solids x 0.01

TABLE 6-1 (Continued)

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Parameter	Equations	Reporting Units: Water	Reporting Units: Soil/Sediment
Volatile Organics/ Pesticides - PCBs (Gas Chromatography)		µg/L	µg/kg

Calibration Factor (CF) = $\frac{A}{A_s}$

A = amount of standard injected or purged, ng
A_s = Response for external standard, units may be in area counts or peak height

Water Concentration (µg/L) = $\frac{(A_x)(V_T)(D)}{(\overline{CF})(V_i)(V_s)}$

A_x = response for the analyte in the sample, units may be in area counts or peak height
V_i = Volume extract injected, µL. For purge-and-trap analysis, V_i is not applicable and therefore = 1
D = dilution factor
V_t = volume of total extract, µL. For purge-and-trap analysis, V_t is not applicable and therefore = 1
V_s = Volume of sample extracted or purged, mL

Soil/Sediment concentration (ng/g) = $\frac{(A_x)(V_T)(D)}{(\overline{CF})(V_i)(W_s)}$

A_x = response for the analyte in the sample, units may be in area counts or peak height.
V_t = Volume of total extract, µL. For purge-and-trap analysis V_t is not applicable and therefore = 1
D = dilution factor
V_i = Volume extract injected, µL. For purge-and-trap analysis, V_i is not applicable and therefore = 1
W_s = Weight of sample extracted or purged, grams. The wet weight or dry weight may be used, depending upon the specific application of the data.

TABLE 6-1 (Continued)

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Parameter	Equations	Reporting Units: Water	Reporting Units: Soil/Sediment
BN/A Extractables, Volatile Organics, Soil/Sediment (GC/MS)	Sediment Concentration (ug/kg) $= \frac{(A_x)\ (I_s)\ (V_t)\ (D)}{(A_{is})\ (\overline{RF})\ (V_i)\ (W_s)}$ A_x = area of the characteristic ion for compound from the sample I_s = amount of the internal standard (ng) V_t = Volume of total extract. For purge and trap analysis, V_t is not applicable and therefore = 1 A_{is} = area of characteristic ion of the internal standard $\overline{RF}$ = average response factor for compound V_i = Volume of extract injected (µL). For purge and trap analysis, V_i is not applicable and therefore = 1. W_s = weight of sample extracted or purged in grams. The wet weight or dry weight may be used, depending upon the specific application of the data. D = dilution factor		
Nutrients and other colorimetric procedures	Water Concentration (mg/L) = mg/L (from calibration curve) x dilution factor	mg/L	mg/kg
	Sediment Concentration (mg/kg) dry = mg/L (from calibration curve) x $\frac{\text{liters of leachate (or digestate)}}{(\text{kg of sample})\,(\%\ \text{solids} \times 0.01)}$		

TABLE 6 -1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Parameter	Equations	Reporting Units	
		Water	Soil/Sediment
BN/A Extractables and Volatile Organics (GC/MS)		ug/L	ug/kg

$$\text{Response Factor (RF)} = \frac{A_x\, C_{is}}{A_{is}\, C_x}$$

A_X = area of the characteristic ion for the compound from the calibration standard
A_{is} = area of the characteristic ion for the internal standard
C_X = concentration of standard (ng/µL)
C_{is} = concentration of the internal standard (ng/µL)

$$\text{Water Concentration (ug/L)} = \frac{(A_x)\ (I_s)\ (V_t)\ (D)}{(A_{is})\ (\overline{RF})\ (V_o)\ (V_i)}$$

A_X = area of the characteristic ion for compound from the sample
I_S = amount of the internal standard (ng)
A_{is} = area of characteristic ion of the internal standard
$\overline{RF}$ = average response factor for compound
V_o = volume extracted or purged (Mls)
V_i = Volume of extract injected (µL). For purge and trap analysis, V_i is not applicable and therefore = 1.
V_t = Volume of total extract. For purge and trap analysis, V_t is not applicable and therefore = 1.
D = dilution factor

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 DATA REDUCTION

In general, data will be reduced by an analyst in one of the following ways:

- Manual computation of results directly on the laboratory bench sheet or on calculation pages attached to the data sheets.
- Input of raw data for computer processing.
- Electronic acquisition and processing of data.

If data are manually processed by an analyst, all steps in the computation are provided including the equations used and the source of input parameters such as response factors, dilution factors, and calibration constants. If calculations are not performed directly on the data sheet, calculations are done on standard calculation paper and attached to the data sheets. Table 6-1 summarizes the equations used for calculations of results and reporting units.

If data are input and processed using a computer, a copy of the input is kept and uniquely identified with the project number and other information as needed. The samples analyzed shall be evident and the input signed and dated by the analyst.

If data are directly acquired from instrumentation and processed, the analyst verifies that the following are correct: project and sample numbers, calibration constants and response factors, output parameters such as units,sample volumes/weights/%solids and numerical values used for detection limits (if a value is reported as less than). The analyst signs and dates the resulting output.

The data reduction/validation flow chart is shown as Figure 6-1.

Table 5-2

EMPIRICAL LABORATORIES, LLC

STANDARD OPERATING PROCEDURES

SOP-430	Procedure for Handling PT Samples, **Rev. 0, Effective Date 02/08/06; Date of Last Review 02/08/06**
SOP-431	Environmental Laboratory Definitions, **Rev. 0, Effective Date 07/18/06; Date of Last Review 07/18/06**

Table 5-2
EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SOP NUMBER	SECTION 4 QA/SAMPLE LOG-IN/ADMINISTRATIVE/VARIOUS
SOP-400	Laboratory Administrative Assistant SOP for the Purchasing, **Rev. 3, Effective Date 01/27/05; Date of Last Review 01/27/05**
SOP-401	Laboratory Administrative Assistant SOP for the Generation of Analytical Reports **Rev. 3, Effective Date 06/28/01; Date of Last Review 01/09/04**
SOP-402	Laboratory Administrative Assistant SOP for Filing Laboratory Documents, **Rev. 3, Effective Date 06/28/01; Date of Last Review 01/09/04**
SOP-403	Correcting Analytical Reports for Erroneously Reported Data, **Rev. 2, Effective Date 02/01/06; Date of Last Review 02/01/06**
SOP-404	Laboratory Sample Receiving Log-In and Storage Standard Operating Procedures **Rev. 10, Effective Date 07/20/06; Date of Last Review 07/20/06**
SOP-405	Analytical Laboratory Waste Disposal, **Rev. 4, Effective Date 09/26/03; Date of Last Review 04/13/05**
SOP-406	Standard Operation Procedure (SOP) for Sub Contracting Laboratory Samples, **Rev. 3, Effective Date 02/16/05; Date of Last Review 07/05/06**
SOP-407	Standard Operating Procedure for Sample Kit Preparation, **Rev. 6, Effective Date 02/10/06; Date of Last Review 02/10/06**
ATSD 408	**Deleted** per Rick Davis 2/6/00
SOP-410	Standard Operating Procedures for Laboratory Sample Storage, Secure Areas and Sample Custody, **Rev. 4, Effective Date 02/10/06; Date of Last Review 02/10/06**
SOP-411	Sample Tracking/Work Performed, **Rev. 4, Effective Date 02/01/06; Date of Last Review 02/01/06**
SOP-413	Training of Laboratory Personnel, **Rev. 5, Effective Date 05/01/02; Date of Last Review 01/17/06**
SOP-414	MDL/IDL Determinations (FR Part 136, Appendix B), **Rev. 6, Effective Date 07/05/06; Date of Last Review 07/05/06**
SOP-415	The Laboratory Sample Custodian's Duties and Responsibilities, **Rev. 3, Effective Date 02/13/06; Date of Last Review 02/13/06**
SOP-416	Determination of Statistical Outliers, **Rev. 2, Effective Date 01/09/04; Date of Last Review 03/21/05**
SOP-417	Traceability and Expiration Dates of Test-Related Chemicals for Inorganic/Wet Chemistry Methods, **Rev. 2, Effective Date 03/29/02; Date of Last Review 01/12/04**
SOP-418	North Carolina Samples SOP, **Rev. 3, Effective Date 08/14/03; Date of Last Review 08/14/03**
SOP-419	Standard Operating Procedures for Controlling and Changing Laboratory Standard Operating Procedures, **Rev. 3, Effective Date 01/14/04; Date of Last Review 01/30/06**
SOP-420	Laboratory Invoicing Standard Operating Procedures, **Rev. 0, Effective Date 05/04/00; Date of Last Review 01/09/04**
SOP-421	Deleted 02/01/06 per MKM
SOP-422	ELAB Laboratory Servers/Data Integrity, **Rev. 2, Effective Date 09/18/03; Date of Last Review 03/17/05**
SOP-423	Respirator Program, **Rev. 0, Effective Date 01/02/03; Date of Last Review 01/17/06**
SOP-424	Laboratory Administrative Assistant/Project Assistant SOP for Data Storage Boxes, **Rev. 1, Effective Date 03/14/03; Date of Last Review 01/09/04**
SOP-425	Control Charts and Limits, **Rev. 1, Effective Date 01/16/06; Date of Last Review 01/16/06**
SOP-426	Internal Audits, **Rev. 0, Effective Date 01/08/04; Date of Last Review 01/16/06**
SOP-427	Customer Complaint Resolution Procedure, **Rev. 0, Effective Date 01/13/04; Date of Last Review 01/16/06**
SOP-428	Preparation of Trip Blanks Procedure and Storage Blanks Procedure, **Rev.1, Effective Date 4/05/05; Date of Last Review 4/05/05**
SOP-429	Standard Process for Submitting Requests for IT Assistance, **Rev.0, Effective Date 02/04/05; Date of Last Review 02/04/05**

Table 5-2
EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES
SECTION 3 (Continued)

SOP NUMBER	ORGANICS – EXTRACTION/ SAMPLE PREPARATION
SOP-329	Soxhlet Extraction - BNA and Pest/PCB Using SW846 Method 3541, **Rev. 14, Effective Date 10/04/06; Date of Last Review 10/04/06**
SOP-330	GPC Cleanup SW-846 Method 3640A, **Rev. 3, Effective Date 05/23/03; Date of Last Review 04/15/05**
SOP-331	Silica Cartridge Cleanup SW-846 Method 3630C, **Rev. 3, Effective Date 08/21/06; Date of Last Review 08/21/06**
SOP-332	**Deleted** 04/13/07 by RDW
SOP-333	Acid-Base Partitioning Cleanup SW-846 Method 3650B, **Rev. 4, Effective Date 08/21/06; Date of Last Review 08/21/06**
SOP-334	**Deleted** 04/13/07 by RDW
SOP-335	Massachusetts EPH (Extractable Petroleum Hydrocarbons) MADEP-EPH-98-1 Aqueous Matrix, **Rev. 1, Effective Date 05/23/00; Date of Last Review 01/12/04**
SOP-336	Process for Handling Methylene Chloride, **Rev. 0, Effective Date 05/18/00; Date of Last Review 04/15/05**
SOP-337	Modified Low-Level Non-Aqueous Matrix PCB Extraction Using SW-846 Method 3550B, **Rev. 1, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP-338	FLPRO (Extractable Petroleum Hydrocarbons) Aqueous and Solid Matrix, **Rev. 4, Effective Date 04/11/05; Date of Last Review 02/07/06**
SOP-339	PCB Continuous Liq-Liq Extraction Using EPA Method 608 and SW846 Method 3520C, **Rev.1, Effective Date 08/22/06; Date of Last Review 08/22/06**
SOP 340	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC) Method 8330B, **Rev. 0, Effective Date 02/13/07; Date of Last Review 02/13/07**

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EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SECTION 3

SOP NUMBER	ORGANICS - EXTRACTION/ SAMPLE PREPARATION
SOP-300	GC/MS-Semi-Volatile BNA-Aqueous Matrix Extraction Using SW-846 Method 3510C for 8270C/625 Analysis, **Rev 14, Effective Date 03/17/05; Date of Last Review 03/17/05**
SOP-301	**Deleted** by RDW 01/12/04
SOP-302	Pesticide/PCBs – Aqueous Matrix Extraction for EPA Method 608 and SW846 Method 8081A/8082 Using SW846 Method 3510C, **Rev. 13, Effective Date 03/17/05; Date of Last Review 03/17/05**
ATSD-303	**Deleted** 01/98 per MKM
SOP-304	Herbicides Aqueous Matrix by Methods EPA SW-846 Method 8151A, **Rev. 9, Effective Date 08/22/06; Date of Last Review 08/22/06**
ATSD-305	**Deleted** 08/06/98 per MKM
SOP-306	Glassware Cleanup SW-846 Chapter 4 Organic Analytes 4.1.4 Cleaning of Glassware, **Rev. 3, Effective Date 05/23/00; Date of Last Review 04/15/05**
SOP-307	Sulfur Cleanup Method SW-846 3660B, **Rev. 5, Effective Date 09/09/03; Date of Last Review 02/07/06**
SOP -308	Acid Cleanup SW-846 Method 3665A, **Rev 5, Effective Date 08/22/06; Date of Last Review 08/22/06**
SOP -309	Florisil Cartridge Cleanup CLP Statement of Work (OLM01.0) and SW-846 Method3620B, **Rev 5, Effective Date 02/15/05; Date of Last Review 02/07/06**
SOP-310	Herbicides – Non-Aqueous Matrix by SW-846 Method 8150B/8151A, **Rev. 9, Effective Date 08/23/06; Date of Last Review 08/23/06**
SOP-311	Waste Dilution for BNA and Pest/PCB by SW-846 Method 3580A, **Rev. 5, Effective Date 05/23/00; Date of Last Review 01/18/06**
ATSD-312	**Deleted** - Combined with ATSD-311 per MKM 2/9/99
SOP -313	Biological Tissue Extractions for Pest/PCB EPA Method OB 10/90, **Rev. 5, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP-314	Biological Tissue Extractions for BNA, **Rev. 4, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP -315	PCB (Puffs) Method SW-846 8081A/8082 Method 3540C and TO4, **Rev. 4, Effective Date 05/29/02; Date of Last Review 01/09/04**
SOP-316	Medium Level Non-Aqueous Matrix BNA and Pesticide/PCB using SW846 Method 3550B, **Rev. 9, Effective Date 4/10/04; Date of Last Review 1/18/06**
ATSD-317	**Deleted** - Combined with ATSD-316 per MKM 2/9/99
SOP-318	Low Level Non-Aqueous Matrix BNA and Pesticide/PCB Extraction using SW846 Method 3550B, **Rev 16, Effective Date 08/21/06; Date of Last Review 08/21/06**
ATSD-319	**Deleted** - Combined with ATSD-318 per MKM 2/9/99
SOP-320	TPH (Total Petroleum Hydrocarbons) Non-Aqueous Matrix (Low Level) by USEPA SW-846 Method 8015B, **Rev. 6, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP -321	TPH (Total Petroleum Hydrocarbon), **Rev. 4, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP-322	TPH (Total Petroleum Hydrocarbons) Aqueous Matrix by USEPA SW846 Method 8015A, **Rev. 5, Effective Date 04/15/05; Date of Last Review 04/15/05**
SOP -323	Wipes (PCB), **Rev. 6, Effective Date 05/29/02; Date of Last Review 04/15/05**
ATSD -324	**Deleted** 04/25/95 by DFC
SOP 327	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC) Method 8330A, **Rev. 10, Effective Date 02/27/07; Date of Last Review 02/27/07**
SOP -328	Generation of Diazomethane for Herbicide Esterification, **Rev. 3, Effective Date 11/11/02; Date of Last Review 04/15/05**

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EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SECTION 2 (Continued)

SOP-228	**Deleted** 04/13/07 by RDW
SOP-229	GC/MS Volatiles in Drinking Water by EPA Method 524.2, **Rev. 3, Effective Date 03/22/05; Date of Last Review 03/22/05**
SOP-230	GC/MS Volatiles Extraction from Biological Tissue Using USEPA Region IV Method for 8260B Analysis, **Rev. 0, Effective Date 10/29/01; Date of Last Review 01/09/04**
SOP-231	GC/MS Low Level PAH'S By EPA Method 625 and SW-846 Method 8270C, **Rev. 0, Effective Date 07/24/03; Date of Last Review 01/09/04**
SOP-232	TNRCC, Total Pertroleum Hydrocarbons Method 1005, **Rev. 0, Effective Date 09/23/03; Date of Last Review 01/09/04**
SOP-233	Nitroguanidine in Soil and Water By High Performance Liquid Chromatography, **Rev.0, Effective Date 12/30/04; Date of Last Review 12/30/04**
SOP-234	Analysis of Nitrocellulose in Aqueous and Non-aqueous Samples By Basic Hydrolysis and Measurement of Nitrate and Nitrite(Modified 353.2), **Rev.0, Effective Date 1/7/05, Date of Last Review 1/7/05**
SOP-235	Total Organic Halides(TOX) Method 9020B, **Rev 1, Effective Date 05/05/06 ,Date of Last Review 05/05/06**
SOP-236	Methane, Ethane, Ethene in Aqueos Samples by Modified RSK-175 (Automated Headspace), **Rev.0, Effective Date 02/08/07, Date of Last Review 02/08/07**
OLM01.3	Organic CLP Ammendments, **Rev. 0, Effective Date 07/09/98; Date of Last Review 01/09/04**
OLM03.2	Organic CLP Ammendments, **Rev. 1, Effective Date 06/07/02; Date of Last Review 01/09/04**
OLM04.1	Organic CLP Ammendments, **Rev. 1, Effective Date 06/07/02; Date of Last Review, 01/09/04**

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EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SOP NUMBER	SECTION 2 ORGANICS – QUANTITATION
SOP-200	GC/MS Data and Report Check, **Rev. 9, Effective Date 08/03/05; Date of Last Review 08/03/05**
SOP-201	GC/MS Semivolatiles by EPA Method 625 and SW846 Method 8270C, **Rev. 16, Effective Date 07/05/06; Date of Last Review 07/05/06**
SOP-202	GC/MS Volatiles by EPA Method 624 and SW846 Method 8260B, **Rev. 19, Effective Date 09/29/06; Date of Last Review 09/29/06**
ATSD-203	**Deleted** on 11/13/97 per MKM
SOP-204	Standard Operating Procedures for Assembly of Organic Deliverable Packages and Preliminary Validation of Organic and Inorganic Deliverable Packages, **Rev. 4, Effective Date 02/15/01; Date of Last Review 01/09/04**
SOP-205	**Deleted** 04/13/07 by RDW
SOP-206	**Deleted** 04/13/07 by RDW
SOP-207	**Deleted** 01/12/04 by RDW
SOP-208	GC/ECD Chlorinated Acid Herbicides by SW-846, Method 8150B/8151A, **Rev. 12, Effective Date 08/23/06; Date of Last Review 08/23/06**
SOP-209	**Deleted** 04/13/07 by RDW
SOP-210	**Deleted** 04/13/07 by RDW
SOP-211	GC/ECD Organochlorine Pesticides/PCBs by EPA Method 608 and SW846 Method 8081A/8082, **Rev. 17, Effective Date 10/04/06; Date of Last Review 10/04/06**
ATSD-212	**Deleted** 01/23/97 per MKM
SOP-213	Organic Raw Data Filing, **Rev. 1, Effective Date 05/02/02; Date of Last Review 01/09/04**
ATSD-214	**Deleted** per Marcia McGinnity 1/21/00
ATSD-215	**Deleted** per Marcia McGinnity 2/2/99
SOP-216	GC Data and Report Check, **Rev. 8, Effective Date 08/03/05; Date of Last Review 08/03/05**
SOP-217	**Deleted** 04/13/07 by RDW
SOP-218	GC/ECD 1,2-Dibromoethane and 1,2-Dibromo-3-Chloropropane by Method 8011 **Rev. 4, Effective Date 1/09/07; Date of Last Review 01/09/07**
SOP-219	GC/FID Nonhalogenated Volatile Organics And TPH by Method 8015B, **Rev. 9, Effective Date 08/22/06; Date of Last Review 08/22/06**
ATSD-220	**Deleted** per MKM 2/9/99
SOP-221	Total Organic Carbon SM5310C, USEPA Method 415.1 and SW846 Method 9060 and Lloyd Kahn Method, **Rev. 5, Effective Date 11/29/06; Date of Last Review 11/29/06**
SOP -222	GC/ECD Routine Maintenance, **Rev. 3, Effective Date 04/10/04; Date of Last Review 01/16/06**
SOP-223	**Deleted** 04/13/07 by RDW
SOP-224	Manual Integration of a Chromatographic Peak, **Rev. 4, Effective Date 07/07/06; Date of Last Review 07/07/06**
SOP-225	GC/MS Volatile Non-Aqueous Matrix Extraction Using SW-846 Method 5035 for 8260B Analysis, **Rev. 6, Effective Date 11/20/03; Date of Last Review 03/16/05**
SOP-226	Method for the Determination of Extractable Hydrocarbons (EPH) MADEP– EPH-98-1, **Rev. 2, Effective Date 05/02/02; Date of Last Review 01/09/04**
SOP-227	Method for the Determination of Volatile Petroleum Hydrocarbons (VPH) MADEP– VPH-98-1, **Rev. 1, Effective Date 05/02/02; Date of Last Review 01/09/04**

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EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SECTION 1 (Continued)

SOP-175	Post-Distillation Analysis for Cyanide By the LACHAT Methods 335.4;SW846 9012A;USEPA-CLP 4.1;Addendum for USEPA CLP ILM 05.2 Aqueous & Soil/Sediment , **Rev. 9, Effective Date 07/18/06; Date of Last Review 07/18/06**
SOP-176	Ammonia (Phenolate) Potable and Surface Waters Method 10-107-06-1-A 0.1 to 20 mg N/L as NH_3 USEPA Method 350.1, **Rev. 3, Effective Date 11/26/06; Date of Last Review 11/26/06**
SOP-177	Chloride in Waters QuikChem Method 10-117-07-1-B 1 to 100 mg Cl^-/L by USEPA Method 325.2/9251, **Rev. 3, Effective Date 11/30/06; Date of Last Review 11/30/06**
SOP-178	**Deleted** 04/13/07 per Betty DeVille
SOP-179	Nitrate/Nitrite, Nitrite in Surface Water, Wastewater 0.02 to 2.0 mg N/L and NO_3- or NO_2- USEPA Method 353.2, **Rev. 4, Effective Date 11/29/06; Date of Last Review 11/29/06**
ATSD-180	**Deleted** 2/18/02 per Betty DeVille
SOP-181	Phenol and Phenolic Materials Distilled Water Samples Method SW846 9066 Lachat 10-210-00-1-A, **Rev. 5, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-182	Total Kjeldahl Nitrogen in Waters Method 10-107-06-2-D 0.02 to 20.0 mg N/L by USEPA Method 351.2, **Rev. 5, Effective Date 01/24/07; Date of Last Review 01/24/07**
ATSD-183	**Deleted** per Betty DeVille on 1/13/00
SOP-184	Specific Conductance Methods SW846 9050A USEPA 120.1, **Rev. 7, Effective Date 11/29/06; Date of Last Review 11/29/06**
SOP-185	Nitrogen, Nitrite Method 354.1 (Spectrophotometric), **Rev. 3, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-186	Filterable Residue Total Dissolved Solids and Total Dissolved Volatile Solids by Method 160.1 (Gravimetric, Dried at 180°C), **Rev. 2, Effective Date 01/04/02; Date of Last Review 02/08/06**
SOP-187	Electrometric Determination of pH, Methods 150.1 and 9040B for Waters, Liquids and Liquid Wastes, 9045C for Soils and Solid Wastes, **Rev. 6, Effective Date 09/05/06; Date of Last Review 09/05/06**
SOP-191	Paint Filter Liquids Test Standard Operational Procedure (SOP) by SW846 Method 9095, **Rev. 1, Effective Date 01/09/04; Date of Last Review 01/28/06**
SOP-193	Verification of Eppendorf Calibration (Methods: Not Applicable), **Rev. 3, Effective Date 01/12/04; Date of Last Review 01/17/06**
SOP-194	Inorganic Glassware Cleaning (Methods: Not Applicable), **Rev. 2, Effective Date 03/14/03; Date of Last Review 03/23/05**
SOP-195	Inorganic Electronic Data Archival (Methods: Not Applicable), **Rev. 1, Effective Date 01/12/00; Date of Last Review 01/12/04**
SOP-196	Verification of Balance Calibration (Methods: Not Applicable), **Rev. 3, Effective Date 09/03/03; Date of Last Review 01/17/06**
SOP-197	Alkaline Digestion for Hexavalent Chromium in Soil and Sediment (Method 3060A) **Rev. 6, Effective Date 01/09/04; Date of Last Review 02/03/06**
SOP-198	Toxicity Characteristic Leaching Procedure (Method 1311), **Rev. 5, Effective Date 02/09/06; Date of Last Review 02/09/06**
SOP-199	Inorganic Data Entry and Reporting, **Rev. 1, Effective Date 03/10/03; Date of Last Review 03/10/03**

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EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES
SECTION 1 (Continued)

SOP-149	Flashpoint Ignitability Method SW846-1010, **Rev. 1, Effective Date 02/25/02; Date of Last Review 01/28/06**
ATSD-150	**Deleted** 8/24/01 per Betty DeVille
ATSD-151	**Deleted** 2/18/02 per Betty DeVille
ATSD-152	**Deleted** 8/24/01 by Betty DeVille
SOP-153	Sulfide Method 376.1 (Titrimetric, Iodine) with Sample Pretreatment to Remove Interfering Substances or to Concentrate the Sulfide, **Rev. 2, Effective Date 08/14/01; Date of Last Review 01/28/06**
SOP-154	Alkalinity by EPA Method 310.1, SM2320B, **Rev. 2, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-155	**Deleted** 04/13/07 per Betty DeVille
SOP-156	Reactive Sulfide Method SW-846, Chapter 7, Section 7.3.4, **Rev. 3, Effective Date 03/07/02; Date of Last Review 01/28/06**
ATSD-157	**Deleted** 2/18/02 per Betty DeVille
SOP-158	Turbidity Method 180.1 (Nephelometric), **Rev. 2, Effective Date 01/08/03; Date of Last Review 01/28/06**
SOP-159	Acidity by EPA Method 305.1 and SW846 Method 2310, **Rev. 1, Effective Date 01/09/04; Date of Last Review 03/22/05**
SOP-160	**Deleted** 04/13/07 per Betty DeVille
SOP-161	Methylene Blue Active Substances (MBAS) by EPA Method 425.1 (Colorimetric) **Rev. 4, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-162	Sulfate Methods SW846 9038 (USEPA) 375.4 (Turbidimetric), **Rev. 4, Effective Date 04/11/05; Date of Last Review 04/11/05**
SOP-163	Chemical Oxygen Demand (High & Low) (USEPA) Method 410.4 (Colormetric, Manual), **Rev. 5, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-164	Distillation of Aqueous/Solid Samples for Total and Non-Amenable Cyanide Analysis Methods 335.1/335.4 (SW846) 9012A/USEPA CLP ILMO 4.1, **Rev. 12, Effective Date 11/29/06; Date of Last Review 11/29/06**
SOP-165	Phosphorous, Total and Ortho (USEPA) Method 365.2 (Colorimetric, Ascorbic Acid, Single Reagent), **Rev. 4, Effective Date 01/09/07; Date of Last Review 01/09/07**
SOP-166	Hexavalent Chromium (Cr^{+6}) Manual Method by SW846-7196A/Standard Methods 3500 CrD, **Rev. 6, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-167	Nitrogen, Ammonia (USEPA) Method 350.2 (Potentiometric,Titrimetirc- Distillation Procedure), **Rev. , Effective Date 09/08/06; Date of Last Review 09/08/06**
SOP-168	Phenolics, Total Recoverable (USEPA) Method 420.1 and 420.2 (Spectrophotometric, Manual and Automated 4-AAP with Distillation), **Rev. 5, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-169	Biochemical Oxygen Demand (BOD) Method 405.1 (5 days, 20°C), **Rev. 6, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-170	Threshold Odor Test Method 2150B, **Rev. 1, Effective Date 01/12/04; Date of Last Review 03/22/05**
SOP-171	Color – Standards, Methods 19th Edition 2120B, **Rev. 2, Effective Date 11/27/06; Date of Last Review 11/27/06**
SOP-172	Solids - Total and Volatile in Bottom Sediments % Volatile Solids Method by USEPA Methods 160.3 and 160.4, **Rev. 1, Effective Date 01/12/04; Date of Last Review 02/08/06**
SOP-173	Total Residue Total Solids (TS) Total Volatile Solids (TVS) also known as Percent Solids USEPA Method 160.1 (Gravimetric, Dried at 103 to 105°C), **Rev. 4, Effective Date 07/19/06; Date of Last Review 07/19/06**
SOP-174	Residue, Non-Filterable Total Suspended Solids and Volatile Suspended Solids by EPA Method 160.2 (Gravimetric, Dried at 103 to 105°C), **Rev. 2, Effective Date 01/04/02; Date of Last Review 02/08/06**

Table 5-2
EMPIRICAL LABORATORIES, LLC
STANDARD OPERATING PROCEDURES

SOP NUMBER	SECTION 1
	METALS/CONVENTIONAL CHEMISTRY
SOP-100	Metals Digestion/Preparation Methods 3005A, 3010A, 3020A, 3030, 3040A, 3050B USEPA CLPILMO 04.1 AQUEOUS & Soil/Sediment USEPA CLPILMO 05.2 Aqueous & Soil/Sediment, USEPA Method 200.7 (Standard Methods) 3030C **Rev. 19 Effective Date 07/25/06; Date of Last Review 07/25/06**
SOP-101	N-Hexane Extractable Material (HEM) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry (Oil and Grease and total Petroleum Hydrocarbons), Methods (SW846) 1664, **Rev. 5 Effective Date 11/29/06; Date of Last Review 11/29/06**
SOP-102	Color (ADMI) Method 110.1, **Rev. 1, Effective Date 07/31/01; Date of Last Review 02/03/06**
SOP-103	Mercury Analysis in Water by Manual Cold Vapor Technique Methods USEPA SW846 7470S & 245.1 CLP-M 4.1, **Rev. 13, Effective Date 07/20/06; Date of Last Review 07/20/06**
SOP-104	Mercury Analysis in Soil/Sediment by Manual Cold Vapor Technique Methods SW846 7471A , 245.5 & CLPILM 04.1, **Rev. 14, Effective Date 07/21/06; Date of Last Review 07/21/06**
SOP-105	Metals Analysis by ICP Technique Methods 200.7, (SW846) 6010B (SM 19th Edition 2340B) USEPA CLP ILMO 4.1, **Rev. 12, Effective Date 07/24/06; Date of Last Review 07/24/06**
SOP-106	ICP Instrument Operation, **Rev. 5, Effective Date 03/08/04; Date of Last Review 03/17/05**
ATSD-107	**Deleted** 03/20/95 per Rick Davis
ATSD-108	**Deleted** 08/10/00 per Betty DeVille
ATSD-109	**Deleted** 08/10/00 per Betty DeVille
ATSD-110	**Deleted** 08/10/00 per Betty DeVille
ATSD-111	**Deleted** 08/10/00 per Betty DeVille
ATSD-112	**Deleted** 08/10/00 per Betty DeVille
ATSD-113	**Deleted** 08/10/00 per Betty DeVille
ATSD-114	**Deleted** 08/10/00 per Betty DeVille
ATSD-115	**Deleted** 01/20/00 per Betty DeVille
SOP-116	Metals Digestion/Preparation Biological Tissue USEPA Region IV, **Rev. 0, Effective Date 10/25/01; Date of Last Review 03/21/05**
SOP-117	Mercury Analysis in Biological Tissue by Manual Cold Vapor Techniques USEPA Region IV Method, **Rev. 0, Effective Date 10/26/01; Date of Last Review 03/23/05**
SOP-118	Inorganic Raw Data and Report Check, **Rev. 1, Effective Date 12/05/03; Date of Last Review 01/17/06**
	CONVENTIONAL CHEMISTRY/GENERAL
SOP-143	Determination of Ferrous Iron by Standard Methods 3500-Fe D Phenanthroline Method Using HACH AccuVac Ampuls from Method 8146, **Rev.0, Effective Date 02/08/07, Date of Last Review 02/08/07**
SOP-144	Acid Soluble Sulfide Method SW846 9030B for distillation & Method SW846 9034 for the titration. **Rev 0, Effective Date 10/13/03; Date of Last Review 10/13/03**
SOP-145	Determination of Inorganic Anions in water by ION Chromatography using Dionex DX-500 Ion Chromatograph with Hydroxide Eluent And Dionex Column AS18, Method 300.0 Guidance, **Rev. 4, Effective Date 11/28/06; Date of Last Review 11/28/06**
SOP-146	Easily Oxidisable Carbon/Total Oxidisable Carbon Walkley Black TOC, **Rev. 0, Effective Date 05/13/03; Date of Last Review 03/21/05**
SOP-147	Synthetic Precipitation Leaching Procedure Method 1312, **Rev. 0, Effective Date 10/22/02; Date of Last Review 01/09/04**
SOP-148	Determination of Perchlorate using the Dionex DX-500 ION Chromatograph Method 314.0, **Rev. 1, Effective Date 08/22/02; Date of Last Review 11/04/05**

5.2 VARIANCE FROM STATED ANALYTICAL METHODS

Analyses will be performed in accordance with the methods cited herein unless specific project requirements or needs dictate adoption of an alternative method or modification of the cited methods. If an alternate method or modification is required the customer will be required to give written approval for such action. Standard operating procedures(SOP) are detailed in the laboratory's SOP Manual. The table of contents to our laboratory SOP Manual is listed in Table 5-2.

5.3 PROCEDURES FOR CALIBRATION, VERIFICATION, AND MAINTENANCE OF EQUIPMENT

Equipment is maintained, inspected, and cleaned according to the manufactures specifications. Any defective equipment is taken out of service until it has been shown to perform satisfactorily.
Equipment and reference material records include the following:

- Name of item
- Manufacturer, identification, serial number
- Date received and placed in service
- Copy of manufacture's instructions or manuals
- Details of maintenance carried out to date
- History of any damage, malfunction, modification, or repair

Service of equipment is performed by quality service organizations. All records and certificates from service calls are retained. Instruments are tagged when they are out of service.

General laboratory support equipment are calibrated/verified at least annually using NIST traceable references over the range of use. Balances, ovens, refrigerators, freezers, incubators, and water baths are checked with NIST traceable references (where possible) and recorded. Additional monitoring as prescribed by the test method SOP is recorded. Mechanical volumetric dispensing devices are checked for accuracy at least quarterly and recorded. Mercury thermometers are calibrated annually. Digital thermometers are calibrated quarterly. Both are calibrated at their range of use.

TABLE 5-1(Continued)

CALIBRATION FREQUENCY AND CRITERIA

Method	Instrument	Calibration Frequency	Calibration Points	Criteria for Passing
Metals by ICP 6010 (SW-846)	Thermal Jarrell-Ash ICP (TRACE)	Calibration at the beginning of each analytical series	Blank and one standard	Check standard within 10% of true value
Mercury by Cold Vapor 7470 (SW-846)	Perkin Elmer FIMS	Calibration check every 10 samples Calibration check at the end of the analytical sequence	5 initial calibration standards + blank	Check standard within 20% of true value
7000 Series (SW-846)				Check standard within 10% of true value
Cyanide 335.4/9012	Lachat Quikchem AE	Calibrate every 3 months for all except IC Method 300.0 calibrate every 6 months. Calibration check at beginning and every 10 samples Calibration check at the end of the analytical sequence	5 initial calibration standards	Check standard within 10% of true value
Total Phenolics (4AAP) Method 420.2/9065	Lachat Quickchem AE		3 calibration standards + blank	
TOC (Aqueous) Method 415.1/SM5310C/9060	OI Model 1500 OIC Model 1010		3 calibration standards + blank	
Chloride 325.2/9251 300.0	Lachat Quikchem AE Dionex Model DX 500		9 calibration standards + blank; 8 Calibration standards	
Fluoride(Non-distilled) 300.0	Orion-407A- ISE Dionex Model DX 500		8 Calibration standards	
Perchlorate 314.0	Dionex Model DX 500		8 Calibration standards	
Sulfates 375.4/9038 300.0	Hach Turbidimeter Model 2100A Dionex Model DX 500		3 calibration standards + blank 8 Calibration standards	
Hexavalent Chromium 7196 (SW-846)	Bausch and Lomb UV/VIS Spec. 2000		5 calibration standards + blank	
pH Measurement 9040 (SW-846)	Orion pH Meter Model 420A	With each analytical series	At least 2 buffers bracketing sample pH	Buffer reading within 0.05 pH units of true value
TVS in Soil	Balance Muffle Furnace	Balance calibration daily	None	None

TABLE 5-1

CALIBRATION FREQUENCY AND CRITERIA

Method	Instrument	Calibration Frequency	Calibration Points	Criteria for Passing
Volatile Organics 8260 (SW-846)	HP 5971 GC/MS HP 5972 GC/MS HP 5972 GC/MS Agilent 5973 GC/MS	BFB tune and calibration check every 12 hours	A minimum of 5 initial calibration standards Continuing calibration standard (method specific)	Initial: CCC RF's Method specified SPCC RRF Method specified Continuing: CCC Method specified SPCC RRF Method specified
Semivolatile Organics 8270 (SW-846)	HP 5971 GC/MS Agilent 5973 GC/MS	DFTPP tune and calibration check every 12 hours	A minimum of 5 initial calibration standards Continuing calibration 50 ppb standard	Initial: CCC RF's Method specified SPCC RRF Method specified Continuing: CCC Method specified SPCC RRF Method specified
Chlorinated Herbicides 8151 (SW-846)	Hewlett Packard 5890 capillary GC-ECD	Calibration check every 10 samples	5 calibration standards at concentration of interest	Initial: <20% RSD Check: <15%D
Pesticides and PCB's 8081 & 8082 (SW-846)	Hewlett Packard 5890 Agilent 6890 capillary GC-ECDs	Calibration check every 20 samples or 12 hours	5 calibration standards at concentration of interest	Initial: <20% RSD Check: <15% D
Explosives (HPLC) 8330 (SW-846)	2- HP 1050/UV	Calibration check every 20 samples	5 calibration standards at concentration of interest	Initial: <20% RSD Check: <15%D
TPH(DRO) Project specified method MOD-8015 (SW-846)	HP 5890 GC/FID	Calibration check every 20 samples	5 initial calibration standards	Initial: Method specified Check: Method specified
FLPRO	HP 5890 GC/FID	Calibration check every 10 samples	5 calibration standards at concentration of interest	Initial: <25% RSD Check: <25% D
GRO TNGRO, 8015 (SW-846)	HP 5890 GC/FID	TNGRO-Calibration check at the beginning and end. 8015-Calibration check every 12 hrs	5 calibration standards at concentration of interest	Initial: Method specified Check: Method specified
Volatile/Semivolatile Organics (Screening)	Hewlett Packard 5890 capillary GC-FID	Calibration daily	1 calibration standard and blank	None

10. Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, Pennsylvania.

11. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA 600\4-89-017, EPA Atomospheric Research and Exposure Assessment Laboratory, RTP, North Carolina, June 1988.

12. NIOSH Manual of Analytical Methods, Third Edition, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Division of Physical Science and Engineering, Cincinnati, Ohio, February 1984.

13. "Determination of Metals in Fish Tissue by Inductively Coupled Plasma - Atomic Emission Spectrometry," Theodore P. Martin, Eleanor R. Martin, and Larry B. Lobring; Inorganic Chemistry Branch, Chemistry Research Division, USEPA Office of Research and Development, EMSL, Cincinnati, Ohio, December 1989.

14. "Extraction and Analysis of Priority Pollutants in Biological Tissue," USEPA, S&A Division, Region IV, Laboratory Services Branch, Athens, Georgia.

5.1 LABORATORY INSTRUMENTS

The laboratory calibrates its analytical instrumentation at a frequency consistent with the methodologies referenced above. Calibration criteria for laboratory instrumentation for the methodologies most commonly used are summarized in Table 5-1. Calibration standards are obtained from several commercial suppliers. The formulations of calibration standards are documented in logbooks including information for traceability such as the supplier, lot number, and expiration date where traceability to national standards of measurement is not applicable, the laboratory has evidence of correlation of data, for example the participation in interlaboratory comparisons, proficiency testing or independent evaluations.

5.0 PROCEDURES AND CALIBRATION

Most of the analytical procedures performed by Empirical Laboratories, LLC are directed by the regulatory sector. Hence, most of the methodologies used begin with state and federal agencies. The laboratory will generally utilize only those methods that USEPA has recognized as "approved" analytical procedures. The following is a list of analytical references that the laboratory uses routinely. This list is not intended to be all inclusive.

1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition, Update III (promulgated 6/13/97).

2. Methods for Chemical Analysis of Water and Wastes (MCAWW), EPA 600/4-79-020.

3. Other available USEPA methods, e.g., methods described in the Statement of Work (SOW) for EPA's Contract Laboratory Program (CLP).

4. Standard Methods for the Examination of Water and Wastewater (SM), 20th Edition (APHA, AWWA, and WPCF 1992).

5. "Guidelines Establishing Test Procedures for the Analysis of Pollutants," Code of Federal Regulations Vol. 40, Part 136.

6. SW846 - Method 1311: Toxicity Characteristic Leaching Procedure (TCLP), included in reference 1.

7. Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples, EPA 600/8-80-038, June 1980.

8. "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," USEPA, Environmental Monitoring and Support Laboratory - Cincinnati, Ohio, September 1986.

9. Analytical Procedures for Determining Organic Priority Pollutants in Municipal Sludges, EPA 600/2-80-030, MERL, March 1980.

TABLE 4-1

LIST OF SUBCONTRACTORS

1. Beaver Engineering, Nashville, TN.
2. ELAB, Inc., Ormond Beach, FL.
3. Environmental Science Corp., Mt. Juliet, TN.
4. Florida Radiochemistry, Orlando, FL.
5. Kemron, Marietta, OH.
6. Microseeps, Pittsburg, PA.
7. SGS, Wilmington, N.C.
8. PDR Environmental Labs, Nashville,TN.
9. PEL Laboratories, Inc., Tampa, FL.
10. STL, Denver, CO.
11. STL, West Sacramento, CA.
12. Terracon, Nashville, TN.
13. TestAmerica, Nashville, TN.

- Highly contaminated or product samples which could jeopardize the integrity of other samples in the walk in cooler will be stored under a hood at room temperature.

Any person removing samples for processing from the walk in refrigerator or quarantined storage areas must sign them out on a laboratory custody sheet. The individual performing the processing becomes responsible for the samples at this point. The samples are maintained in the secure possession of the individual processing the samples. When the processing is completed, the samples are returned and signed back into the appropriate storage area. It must be noted if the entire sample volume was used and the container discarded. The generation of any sample extracts and/or digests and their movement through the laboratory will also be tracked on a laboratory custody sheet.

After the analytical results have been reported, the samples, sample extracts, and digests will remain in secure storage until they are disposed of in accordance with the Empirical Laboratories, LLC's Waste Disposal Standard Operating Procedure.

4.7 SUBCONTRACTING LABORATORY SAMPLES

The Project Manager will advise the customer (if regulatory compliance is involved) in writing of its intention to subcontract any portion of the sample to another lab. The subcontracting laboratory must be certified to perform that work under the appropriate accrediting authority (state, federal, local or third party). The laboratory must have records to document that the above requirement was followed when required.

changes or make the corrections directly on the chain-of-custody records. Any errors on the chain of custody should be deleted with a one line strike on the chain of custody and the changes must be initialed and dated. If no chain-of-custody record is received, the samples will be temporarily placed on hold and will not undergo processing until a chain of custody has been received. All attempts to resolve any discrepancies should be made as quickly as possible to avoid possible holding time conflicts.

A corrective action report (CAR) form will be completed in order to keep a written record of any deficiencies associated with sample receiving. The problem(s) will be outlined as well as the action taken to resolve the problem. If any of the project team is contacted, the person's name, time of contact, date, and resolution must be recorded. Each sample receiving CAR will have a unique number and will be attached directly to the chain of custody. Copies of the CAR will be distributed to all appropriate personnel.

4.6 LABORATORY SAMPLE CUSTODY

Empirical Laboratories, LLC is located on the fifth floor of a building which is locked and monitored by a guard after normal working hours. During working hours, the only access (without building keys) to the fifth floor is via elevators which discharge within view of a reception desk which is occupied continuously. No unauthorized personnel are permitted within the facility without a proper escort and a visitor's badge.

Samples are maintained in the sample log-in or sample storage room. All samples (excluding the following exceptions) are stored in a walk-in refrigerator in the sample storage room.

- Soils quarantined by the US Department of Agriculture must be segregated from other soil samples. These are stored in a side by side refrigerator in the sample storage room. Quarantined soils are defined as:

    1. Soil taken from much of the southeastern U.S. and parts of New York and Maryland at an area of three feet or less. Soils from three feet or more are not regulated provided they are stored separately. A map of the regulated areas is posted in the sample receiving room.

    2. All soils taken from foreign sources, U.S. territories and Hawaii.

- Assign laboratory identification numbers to the samples; write these numbers on the sample containers and on the chain-of-custody sheets. Color coded tape is placed on each container to designate a particular group of testing.

- Place the samples in appropriate storage.

- Place the completed chain-of-custody sheets in the project file.

- Enter the following information for the samples into the computer-based laboratory information management system:

  - Billing information (quotations, purchase order numbers, etc.)
  - Project identification number
  - Date and time received
  - Name of person receiving
  - Method of shipment
  - Date and time collected
  - Name of sampler(s)
  - Sample identification
  - Temperature upon receipt
  - Number and types of containers and preservative
  - Matrix of samples
  - Note if VOA headspace is present, if applicable
  - Note if correct containers were used
  - Note if any breakage or spillage occurred
  - Note any information concerning hazards (known or suspected), project specific requirements, rush turnaround, etc.

4.5 CORRECTIVE ACTION

Any problems with the samples (e.g., damaged or improper containers, improper cooling or preservation, etc.),or discrepancies between the chain of custody and the samples, will be documented and brought to the attention of the Project Manager. If necessary, the Project Manager will contact the customer and/or field personnel. The samples may be temporarily placed on hold until all discrepancies are resolved. If significant changes are required, the customer and/or field personnel should submit written confirmation of these

the Sample Receiving Department and appropriate Department Managers of the incoming samples.

Upon sample receipt, the Sample Receiving Department follows the procedure described below:

- Visually inspect the shipping containers for any signs of tampering, intact custody seals, and to make sure there is no damage or leakage to the outside of the shipping container.

- Check to make sure that proper temperature has been maintained during shipment. The temperature is recorded directly on the chain-of-custody sheets.

- Unpack and remove all samples. Sort and inventory the samples against the chain of custody. Any samples suspected to be hazardous and evolving gas will be inspected under a hood. Personal protective equipment is also available for any hazardous samples.

- Visually inspect the individual containers for signs of tampering and to make sure the containers are intact with no damage or leakage. If samples have been damaged during shipment, the remaining samples are carefully examined to determine whether they were affected.

- Verify that sample holding times have not been exceeded.

- Check samples to verify that they were collected in the correct containers and that there is adequate volume for all the parameters requested.

- Check samples to verify preservation techniques. Check pH of preserved samples.

- Sign and date the chain-of-custody forms attaching shipping documents (if appropriate). Certain projects also require that a cooler receipt form be completed.

- Be sure the lids on all bottles are tight (will not leak). In some instances, leakage will be minimized by the use of internal bagging.

- Place 2 to 4 inches of vermiculite in the bottom of the cooler and then place the sample containers in the cooler with sufficient space to allow for the addition of more vermiculite between the containers. Vermiculite will absorb any spillage that could occur, as well as provide cushioning and insulation for cooling.

- Put "blue ice" (or ice that has been properly sealed in heavy-duty polyethylene bags) on top of or between the samples. Fill all remaining space between the sample containers with vermiculite. Securely fasten the top of the garbage bag with tape (preferably plastic electrical tape).

- Place the chain-of-custody record into a plastic bag, tape the bag to the inner side of the cooler lid, close the cooler and securely tape the top shut (preferably with fiber tape). Chain-of-custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seals.

- Place a label containing the name and address of the shipper on the outside of the cooler. The coolers must be marked "THIS END UP," and arrow labels which indicate the proper upward position of the cooler affixed to the sides. Labels used in the shipment of hazardous materials (such as Cargo Only Aircraft, Flammable Solids, etc.) are not permitted to be on the outside of containers used to transport environmental samples and shall not be used.

All samples determined to be hazardous, according to the US Department of Transportation regulations (US DOT 49 CFR Section 172.1 or 49 CFR 173.3), will be labeled and shipped in strict accordance with the US DOT regulations.

4.4 SAMPLE RECEIPT

The first step in the receipt of samples is obtaining the necessary project specific sample information. In general, this information is organized by the Project Manager and passed on to the appropriate staff. The Project Manager who is expecting the shipment, notifies

Figure 4-2
EMPIRICAL LABORATORIES, LLC CHAIN OF CUSTODY RECORD

Ship to:
EMPIRICAL LABORATORIES, LLC
227 French Landing Drive
Suite 550
Nashville, TN 37228
Attn: Analytical Laboratory
(615) 345-1115 (phone)
(615) 846-5426 (fax)

Send Results to:

Name _____
Company _____
Address _____
City,State,Zip _____
Phone _____
Fax _____
E-mail _____

Send Invoice To:

Name _____
Company _____
Address _____
City,State,Zip _____
Phone _____
Purchase Order _____
E-mail _____

Details:

Page _____ of _____
Cooler No. _____ of _____
Date Shipped _____
Shipped By _____

Turnaround _____
(Std. Turn unless noted otherwise / There may be a surcharge for RUSH-contact lab)

Project No./Name

Samplers (Signature)*

Lab Use Only Lab #	Date Sampled	Time	Comp./ Grab	Sample Location/Description	Sample Matrix	Field pH/Temp	Field Cond.	ANALYSIS REQUIRED	No. of Bottles	*Lab Use Only* Containers/Pres.

Sample Kit Prep'd by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Relinquished by: (Signature)	Date/Time	Received By: (Signature)
Received for Laboratory by: (Signature)	Date/Time	*Temperature*

REMARKS
*Signature recuired to ensure validity

Lab Use Only

VOA Headspace	Y	N	NA
Field Filtered	Y	N	NA
Correct Containers	Y	N	NA
Discrepancies	Y	N	NA
Cust. Seals intact	Y	N	NA
Containers Intact	Y	N	NA

Airbill # _____

CAR # _____

Distribution: Original and yellow copies accompany sample shipment to laboratory; Pink retained by samplers

that the bill of lading records will be stapled to the chain-of-custody form by the person receiving the shipment.

Figure 4-2 illustrates the sample chain-of-custody form which is used for both sample kit and sample tracking.

During sample collection, the following procedures are observed:

- To assure the validity of the sample, on site sampling procedures are reviewed prior to arrival in the field and confirmed for accuracy.

- Sample handling is minimized in order to reduce the chance of error, confusion, and damage.

- Sample labels are marked in the field with water-proof ink to prevent misidentification due to label illegibility. The shipping container is either padlocked or provided with a tamper-proof custody seal.

- Samples and/or coolers can be provided with a tamperproof seal so that sample integrity can be documented upon receipt.

4.3 SHIPPING AND PACKAGING

Sample packaging for shipment is done such that under normal handling, there is no significant release of materials and the effectiveness of the packing is not reduced; and such that there is no cross-contamination of samples. Care is taken to maintain the integrity of the samples and satisfy the preservation requirements. These guidelines should be followed in order to achieve these objectives:

- Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape. Line the cooler with a large, heavy-duty plastic bag.

- Allow sufficient space (ullage) in all bottles (except VOCs) to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).

when they are received to ensure that they are adequately preserved. In some instances when nitric acid cannot be used as a preservative (US DOT regulations), the USEPA permits the preservation of metals samples with nitric acid immediately following receipt at the laboratory.

- That samples can be monitored to ensure that they are properly chilled. A temperature blank filled with tap water is placed in every cooler. The temperature of this bottle is checked upon receipt as a representation of the other containers in the cooler.

- That any problems associated with the shipment and log-in of the samples are minimized. This goal is achieved by: organizing sample containers by sample locations, providing pre-labeled containers with standard or custom labels, providing a copy of the sample kit work order, and providing special sampling instructions (e.g., for VOA sampling).

The sample kit technicians sign off on a chain-of-custody form certifying that they prepared the kit and that the containers are suitably clean. This chain-of-custody record is shipped with the containers to the site and tracks the containers from person to person and place to place. From this record, the movement in time and space of the trip blanks and reagent free water used for field/equipment blanks (which originate in the laboratory) can also be traced.

In some instances, it may be necessary to have sample containers shipped directly from the supply vendor to the sampling site.

4.2 FIELD COLLECTION AND SHIPMENT

When the sample kits are received in the field, the person receiving the kits signs and dates the chain-of-custody form to document receipt of the sample kits. When the sample kits are used for samples, the field sampler signs and dates the form again to complete the sample kit chain of custody and to begin the sample chain of custody. When transferred or shipped from the field, samples are accompanied by the chain-of-custody records. The records include the signatures of the relinquisher and the receiver, the date and time of the exchange, and any pertinent remarks. For the samples shipped to Empirical Laboratories, LLC the commercial shipper will appear in the chain-of-custody record only to the extent

FIGURE 4-1 (Continued)

LABORATORY SAMPLE TRACKING SYSTEM
INVOICING

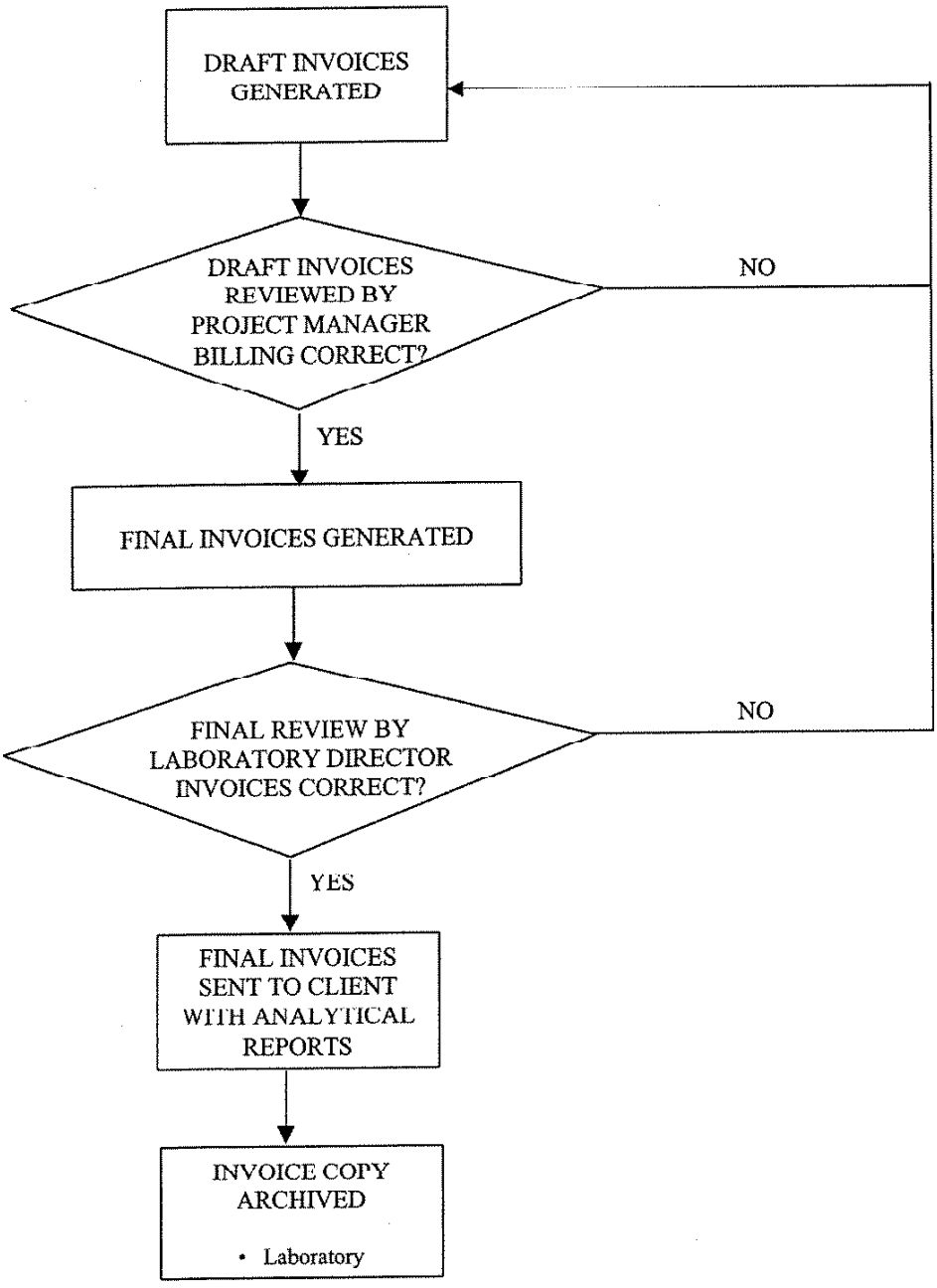


FIGURE 4-1 (Continued)

LABORATORY SAMPLE TRACKING SYSTEM
SAMPLE RECEIVING

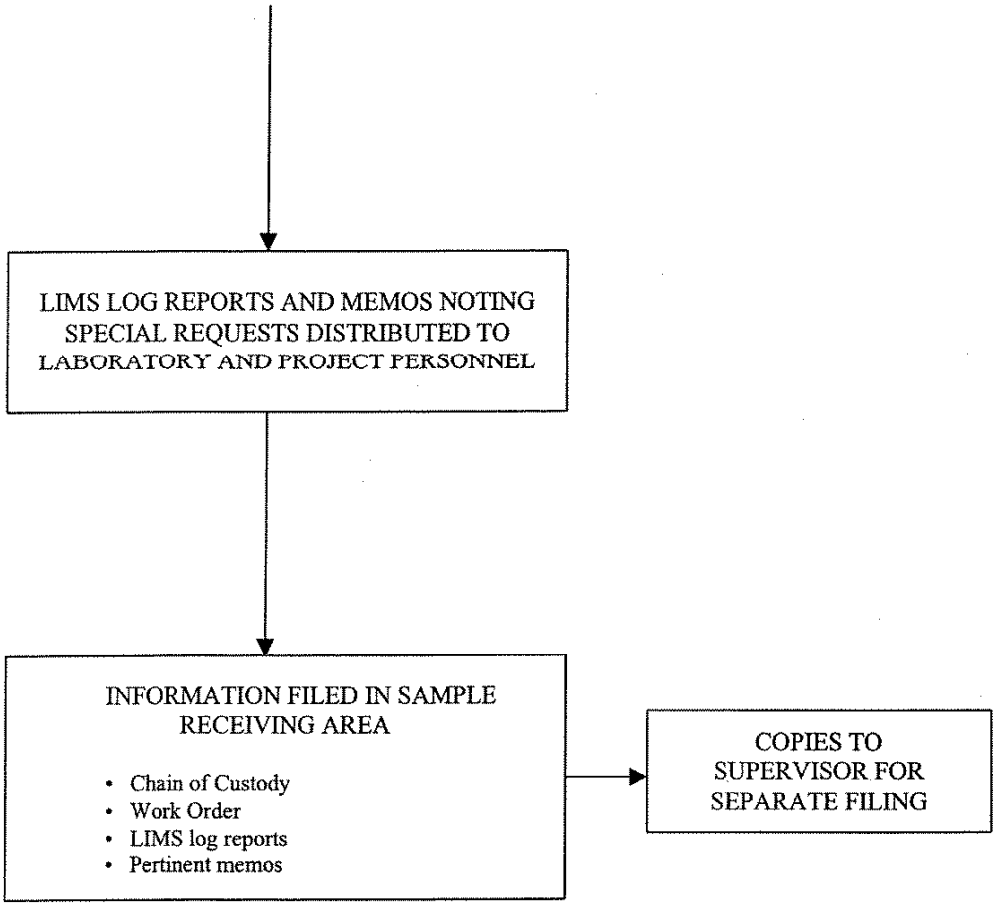
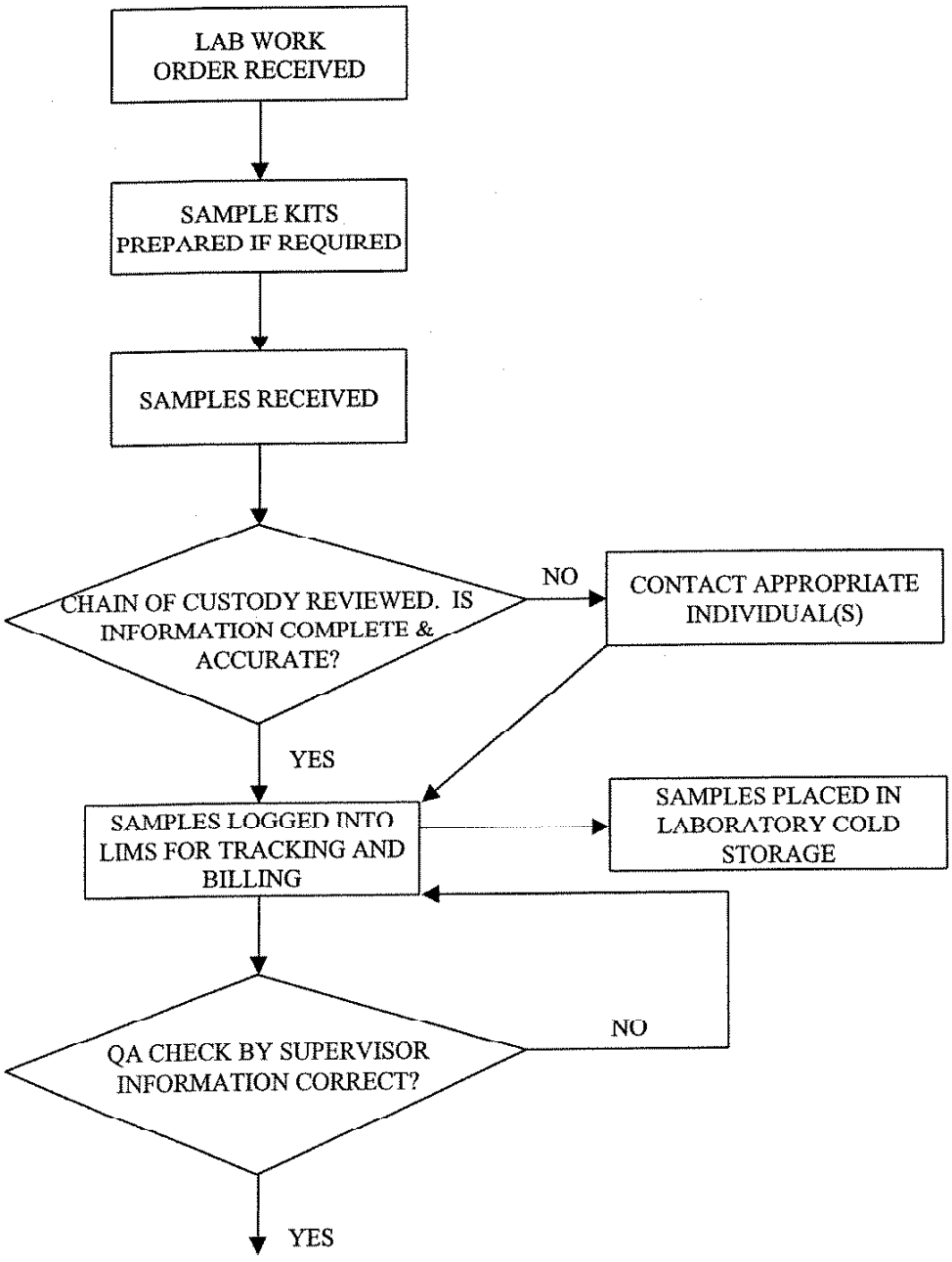


FIGURE 4-1

LABORATORY SAMPLE TRACKING SYSTEM
SAMPLE RECEIVING



4.0 SAMPLE CUSTODY, TRANSPORT, AND RECEIVING

To facilitate sample identification and analytical procedures required for each sample, proper chain-of-custody documentation will be prepared for each sample that is sent to the analytical laboratory. The operational details regarding sample tracking within the laboratory is presented in Figure 4-1.

4.1 SAMPLE KIT PREPARATION

The necessary sample information is organized by the Project Manager and passed on to the appropriate staff. The Project Manager prepares a sample kit work order which details the type and number of samples, type and number of required containers, type of preservation required, etc. Tables 3-1 and 3-2 list the required volumes, sample containers, preservations, and holding times for collection of groundwater and surface water, and soil and sediment samples.

All sample containers and chemical preservatives are stored in an area isolated from any areas where solvents are used or stored. Trip blanks for volatiles are also prepared away from these areas and as close to the time of shipment as possible in order to keep storage time to a minimum. If projects require containers that have been certified as contaminant-free, the certification papers are maintained on file.

The sample kits are prepared in such a manner to ensure the following:

- That samples are collected with adequate sample volume. The volume will be limited to the quantity needed for analysis but will include enough volume for retesting if necessary.

- That samples are collected in proper containers. Plastic containers and screw lids will be used whenever possible. If corks and stoppers are used, they will be taped to help assure that they remain in place during shipment. It is recommended as a precaution that all sample container lids be taped.

- That samples are properly preserved. For safety reasons and in order to minimize contamination, chemical preservations are, in general, added to the sample bottles prior to transporting to the field. The pH of these samples is then checked

TABLE 3-2 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
NON-AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b]	SW846 No.	Holding Time [c]	Detection Limit [d] (mg/kg)	Sample Volume Required [e]	Container Type	Preservation Technique [f]
ORGANICS (Continued)							
Volatiles	624 [h]	8260	14 days		2-2 oz. jars[j]	Glass, Teflon Lined Septum Cap No Headspace	Cool to 4° C
Low Level				1.0-200 µg/kg			
Medium Level				130-1300 µg/kg			
TPH-Diesel Range/EPH	NA	8015	14 days	4.0	100 grams	Glass,Teflon Lid[j]	Cool to 4° C
TPH-Gasoline Range/VPH	NA	8015	14 days	1.0	2-2oz. Jars[j]	Glass, Teflon Lid No headspace[j]	Cool to 4° C
FLPRO	NA	NA	14 days	1.0	2-2oz. Jars[j]	Glass, Teflon Lid No headspace[j]	Cool to 4° C

NA = Not Applicable

[a] If specific methods, detection limits, QC and/or reporting requirements, etc. are not specified, the analytical laboratory will utilize its best professional judgment in processing the samples.

[b] EPA Methods for Chemical Analysis of Water and Wastes

[c] The times listed are the maximum times that samples may be held before analysis.

[d] Detection limits listed are typical laboratory method detection limits. These are subject to change and may vary based on sample volume, matrix interferences, high concentration of analytes, etc. Units are mg/kg unless otherwise specified.

[e] These are typical volumes. In some cases may be able to perform analyses with less sample volume however detection limits are subject to increase. Laboratory will request extra volume (if available) in case of breakage, reanalysis, QC requirements etc. Certain analytes with the same collection requirements may be combined upon collection and analyzed from the same container.

[f] Sample preservation should be performed immediately upon sample collection.

[g] All results will be reported on a dry weight basis unless requested otherwiseStandard Methods 19th Edition

[h] 40 CFR 136 Methods

[i] Standard Methods 19th Edition

EnCore sampling technique may be required, check with regulatory agency.

TABLE 3-2 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
NON-AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b]	SW846 No.	Holding Time [c]	Detection Limit [d] (mg/kg)	Sample Volume Required [e]	Container Type	Preservation Technique [f]
ORGANICS							
Pesticides	608/608.2 [h]	8081	14 days/ 40 days			Glass, Teflon Lid	Cool to 4° C
Low Level				0.17-67 µg/kg	100 grams		
Medium Level				2.5-1000 µg/kg	10 grams		
PCB	608 [h]	8082	14 days/ 40 days			Glass, Teflon Lid	Cool to 4° C
Low Level (30 grams)				17 µg/kg	100 grams		
Medium Level (2 grams)				200 µg/kg	10 grams		
Soxhlet (10 grams)				2.5 µg			
Wipe							
Herbicides	615/SM18 6640B	8151	14 days/ 40 days	1-800 µg/kg	100 grams	Glass, Teflon Lid	Cool to 4° C
Semi-Volatiles (BNA)	625 h	8270	14 days/ 40 days			Glass, Teflon Lid	Cool to 4° C
Low Level				33-330 µg/kg	100 grams		
Medium Level				1-10	10 grams		
Explosives	NA	8330	14 days 40 days	50-140 µg/kg	100 grams	Glass, Teflon Lid	Cool to 4° C

TABLE 3-2 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
NON-AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b]	SW846 No.	Holding Time [c]	Detection Limit [d] (mg/kg)	Sample Volume Required [e]	Container Type	Preservation Technique [f]
METALS							
Total	200.7	6010	6 months	0.05-50	5 grams	High Density Polyethylene(CLP only) /Glass	Cool to ≤4° C
Chromium, Hexavalent	NA	3060/7196	Project Specific	1.0	10 grams	High Density Polyethylene(CLP only) /Glass	Cool to ≤4° C
Mercury	245.5	7471	28 days	0.033	5 grams	High Density Polyethylene(CLP only) /Glass	Cool to ≤4° C
TOC	NA	Modified 9060	28 days	800-900	5 grams	Glass	Cool to ≤4° C

TABLE 3-2
ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
NON-AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b]	SW846 No.	Holding Time [c]	Detection Limit [d] (mg/kg)	Sample Volume Required [e]	Container Type	Preservation Technique [f]
GENERAL CHEMISTRY							
% solids determination [g]	2540 [i]	NA	Not Specified	1.0 %	10 grams	Plastic/Glass	Cool 4°C
Cyanide						Plastic/Glass	Cool 4°C
Total	335.3	9012	14 days	0.25	10 grams		
Amenable	335.1	9012	14 days	0.25	10 grams		
Dissociable	335.3	9012	14 days		10 grams		
Reactivity	NA	Chapter 8	14 days	0.13	10 grams		
Nitrogen, Total Kjeldahl (TKN)	351.2	NA	28 days	20	10 grams	Plastic/Glass	Cool 4°C
Oil and Grease	1664	9071	28 days	5.0	20 grams	Plastic/Glass	Cool 4°C
Petroleum Hydrocarbons, Total (TPH)	1664	NA	28 days	100	20 grams	Plastic/Glass	Cool 4°C
Phenolics, Total	420.2	9066	28 days	0.5	10 grams	Plastic/Glass	Cool 4°C
Paint Filter	NA	9095	Not Specified	NA	500 grams	Plastic/Glass	None
TCLP	NA	1311	14 days	NA	500 grams	Plastic/Glass	Cool 4°C
SPLP	NA	1312	14 days	NA	500 grams	Plastic/Glass	Cool 4°C

For safety reasons and in order to minimize contamination, preservatives are, in general, added to the sample bottles prior to transporting to the field. The pH of these samples is then checked when the samples are received to ensure that they are adequately preserved.

3.2 SAMPLING PROCEDURES FOR SOILS AND SEDIMENTS

Soil and sediments are collected according to procedures in Test Methods for Evaluating Solid Waste USEPA-SW-846.

Metal sampling devices are used for collection of samples requiring organics analyses. Plastic sampling devices are used when metals are to be analyzed. Prior to use, corers and other sampling tools are washed with soapy water and rinsed with deionized water. Nanograde isopropanol or acetone may be used to remove organic contamination. For near surface samples (3 feet or less), disposable lengths of pipe can be used for taking cores.

Table 3-2 lists the containers for collection of soil and sediment samples and holding times. Containers for solid samples are purchased pre-cleaned when project requirements dictate.

Soil and sediment samples for volatile analysis should be quickly added to the sampling vials. Special precautions are taken to minimize head or void space.

Soil and sediment samples for organics and nutrients analyses are stored at 4°C prior to testing.

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. [g]	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
METALS							
Dissolved	200.7	6010	6 months	0.001 - 2.0	200 mL	High Density Polyethylene	Filtered on site HNO_3 to pH <2
Total	200.7	6010	6 months	0.001 - 2.0	200 mL	High Density Polyethylene	HNO_3 to pH <2
Chromium, Hexavalent	3500 CrD	7196	24 hours, 28 days	0.025	200 mL	High Density Polyethylene	Cool to 6° C, pH 9.3-9.7
Mercury	245.1	7470	28 days	0.0002	300 mL	High Density Polyethylene	HNO_3 to pH <2

NA = Not Applicable

[a] If specific methods, detection limits, QC and/or reporting requirements, etc. are not specified, the Empirical Laboratories, LLC will utilize its best professional judgment in processing the samples.

[b] EPA Methods for Chemical Analysis of Water and Wastes

[c] The times listed are the maximum times that samples may be held before analysis begins.

[d] Detection limits listed are typical laboratory method detection limits. These are subject to change and may vary based on sample volume, matrix interferences, high concentration of analytes, etc. Units are mg/L unless specified otherwise.

[e] These are typical volumes. In some cases may be able to perform analyses with less sample volume however detection limits are subject to increase. Laboratory will always request extra volume (if available) in case of breakage, reanalysis, dilutions, QC requirements etc. Certain analytes with the same collection requirements may be combined upon collection and analyzed from the same container.

[f] Sample preservation should be performed immediately upon sample collection.

[g] Standard Methods 20th Edition

[h] 40 CFR 136 Methods

i Analyzed immediately means that analysis must take place immediately at the point of collection or within 15 minutes of collection

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. [g]	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
ORGANICS (continued)							
Volatiles	624 [h]	8260	14 days	1.0-10 µg/L	3 40-oz. vials, No Headspace	Glass Vials, Teflon Lined Septum Cap	HCL to pH<2 Cool to ≤4° C Ascorbic Acid for chlorinated sample
FLPRO	NA	NA	7 days	0.1 mg/L	1000 mL	Glass Amber, Teflon Lid	H_2SO_4 to pH<2 Cool to ≤4° C
TPH-Gasoline/VPH	NA	8015	14 days	.020 mg/L	3-40 oz. vials, No Headspace	Glass Vials, Teflon Lined Septum Cap	HCL to PH<2 Cool to ≤4° C
TPH-Diesel/EPH	NA	8015	14 days	.10 mg/L	1000 mL	Glass Amber, Teflon Lid	HCL to PH<2 Cool to ≤4° C

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. g	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
ORGANICS							
Total Organic Carbon (TOC)	415.1,5310C	9060	28 days	1.0	100 mL	Plastic	H_2SO_4 to pH<2 Cool to ≤6° C
Total Organic Halogen (TOX)	NA	9020	28 days	5 µg/L	500 mL	Glass Amber, Teflon Lid	H_2SO_4 to pH<2 Cool to ≤4° C
Chlorinated Pesticides	608/608.2 [h]	8081	7 days/ 40 days	0.005-2.0 µg/L	1000 mL	Glass Amber, Teflon Lid	Cool to ≤4° C $Na_2S_2O_3$ for chlorinated sample
PCBs	608 [h]	8082	7 days/ 40 days	0.25 µg/L	1000 mL	Glass Amber, Teflon Lid	Cool to ≤4° C $Na_2S_2O_3$ for chlorinated sample
Chlorinated Herbicides	615 SM18 6640B	8151 modified	7 days/ 40 days	.025-25 µg/L	1000 mL	Glass Amber, Teflon Lid	Cool to ≤4° C $Na_2S_2O_3$ for chlorinated sample
Semi-Volatiles (BNA)	625 [h]	8270	7 days/ 40 days	1.0-10 µg/L	1000 mL	Glass Amber, Teflon Lid	Cool to ≤4° C $Na_2S_2O_3$ for chlorinated sample
Explosives	NA	8330	7 days/ 40 days	0.1 ug/L	1000 mL	Glass Amber, Teflon Lid	Cool to ≤4° C $Na_2S_2O_3$ for chlorinated sample

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. [g]	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
			3-4				
GENERAL CHEMISTRY (continued)							
Solids							
Dissolved	160.1,2540C	NA	7 days	20	200 mL	Plastic	Cool to ≤6° C
Suspended	160.2,2540D	NA	7 days	2.0	500 mL	Plastic	Cool to ≤6° C
Total	160.3,2540B	NA	7 days	50	200 mL	Plastic	Cool to ≤6° C
Volatile	160.2,2540D	NA	7 days	50	200 mL	Plastic	Cool to ≤6° C
Settleable	160.5,2540F	NA	48 hours	0.10 mL/L	1000 mL	Plastic	Cool to ≤6° C
Sulfate	375.4, 300.0	9038	28 days	1.0, 0.5	100 mL	Plastic	Cool to ≤6° C
Sulfide							
Total	376.1,4500SF	9030	7 days	1.0	500 mL	Glass, No	$Zn(Ac)_2$ +NaOH to pH>9
Reactivity	NA	Chapter 7	7 days	25	500 mL	Headspace	Cool to ≤6° C
Sulfite	377.1	NA	Immediate [i]	2.0	100 mL	Plastic	None
Surfactants, MBAS	425.1,5540C	NA	48 hours	0.05	200 mL	Plastic	Cool to ≤6° C
Turbidity	180.1	NA	48 hours	1.0 NTU	100 mL	Plastic	Cool to ≤6° C

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. g	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
			3-3				
GENERAL CHEMISTRY (continued)							
Odor	140.1	NA	24 hours	1.0 T.O.N	1000 mL	Glass , No Headspace	Cool to ≤4° C
Oil and Grease (Gravimetric)	1664	9070	28 days	2.0	1000 mL	Glass, Teflon Line Cap	H_2SO_4 to pH<2 Cool to ≤6° C
pH	4500-H B	9040	Immediate [h]	NA	50 mL	Plastic	None
Petroleum Hydrocarbons, Total (TPH)	1664	NA	28 days	2.0	1000 mL	Glass Amber	HCL to pH<2 Cool to ≤6° C
Phenolics, Total	420.2	9066	28 days	0.01	1000 mL	Glass	H_2SO_4 to pH<2 Cool to ≤6° C
Phosphorus							
Ortho	365.2,4500-P E	NA	48 hours	0.01	100 mL	Plastic	Cool to ≤6° C
Total	365.2,4500-P B5+E	NA	28 days	0.02	100 mL	Plastic	H_2SO_4 to pH<2 Cool to ≤6° C
Paint Filter	NA	9095	NA	NA	500 mL	Plastic/Glass	None
Perchlorate	314.0	9058	28 days	0.004	500 mL	Plastic/Glass	Cool to ≤4° C

TABLE 3-1 (Continued)

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. [g]	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
GENERAL CHEMISTRY (continued)							
Conductivity	120.1	9050	28 days	1.0 µmhos/cm	100 mL	Plastic	Cool to ≤6° C
Cyanide							NaOH to pH >12
Total	335.4	9012	14 days	0.005	500 mL	Plastic	Cool to ≤6° C
Amenable	4500-CN G	9012	14 days	0.005	500 mL	Plastic	For all CN tests
Dissociable	335.4	9012	14 days	0.005	500 mL	Plastic	
Reactivity	NA	Chapter 7	14 days	0.13	500 mL	Plastic	
Fluoride (Non-distilled)	300.0	NA	28 days	0.10(both)	100 mL	Plastic	None
Hardness (as $CaCO_3$)	200.7	6010	6 months	2.5	100 mL	Plastic	HNO_3 to pH<2 Cool to ≤6° C
Nitrate-Nitrite, as N	353.2	NA	28 days	0.05	100 mL	Plastic	H_2SO_4 to pH<2 Cool to ≤4° C
Nitrate, as N	353.2, 300.0	NA	48 hours	0.05(both)	100 mL	Plastic	Cool to ≤6° C
Nitrite, as N	354.1	NA	48 hours	0.01	100 mL	Plastic	Cool to ≤6° C
Nitrogen, Total Kjeldahl (TKN)	351.2	NA	28 days	1.0	100 mL	Plastic	H_2SO_4 to pH<2 Cool to ≤6° C

TABLE 3-1

ANALYTICAL METHODS AND COLLECTION REQUIREMENTS
AQUEOUS SAMPLES

PARAMETER	ANALYTICAL METHOD INFORMATION [a]				COLLECTION REQUIREMENTS		
	EPA No. [b] SM No. g	SW846 No.	Holding Time [c]	Detection Limit (mg/L) [d]	Sample Volume Required [e]	Container Type	Preservation Technique [f]
GENERAL CHEMISTRY							
Alkalinity	310.1, 2320B	NA	14 days	1.0	150 mL	Plastic	Cool to ≤6° C
Ammonia-Nitrogen	350.1, 4500-NH3 G	NA	28 days	1.0	100 mL (direct) 400 mL (distilled)	Plastic	H_2SO_4 to pH<2 Cool to ≤6° C
Bicarbonate/Carbonate	4500-CO2D g	NA	14 days	1.0	150 mL	Plastic	Cool to ≤4° C
BOD	405.1, 5210B	NA	48 hours	2.0	500 mL	Plastic	Cool to ≤6° C
Chloride	325.2, 300.0	9251	28 days	1.0, 0.5	200 mL	Plastic	None
Chlorine, Residual	330.4, 4500 Cl F	NA	Immediate [i]	0.10	200 mL	Plastic	None
COD	410.4	NA	28 days	20	50 mL	Plastic	H_2SO_4 to pH<2 Cool to ≤6° C
Coliform Total Fecal	 9222 g 9222 g	 9132 NA	 6 hours 6 hours	 1 colony/ per 100 mL	 200 mL 200 mL	 Plastic Plastic	Cool to ≤4° C $Na_2S_2O_3$
Color	2120B g	NA	48 hours	5 c. u.	1000 mL	Plastic	Cool to ≤6° C

3.0 SAMPLING PROCEDURES

When Empirical Laboratories, LLC is commissioned to conduct field sampling, a trained field sampling crew is sent to the site for sample collection and delivery of samples to the laboratory. Each crew is supervised by a qualified crew chief, trained in accordance with USEPA protocol for groundwater sampling and other types of environmental sampling.

3.1 SAMPLING PROCEDURES FOR GROUNDWATER AND SURFACE WATER

Samples from groundwater monitoring wells are collected with pre-cleaned teflon bailers except in cases where the client supplies a dedicated bailer. PVC bailers may be used in cases where only inorganic or metal analyses are required. Bailers are pre-cleaned by first rinsing with detergent then with tap water, followed by a final rinse with distilled water. Prior to sampling, the water level in the well is determined with an electronic water level meter or a fiberglass tape and recorded on the Custody Form. Date, time, location, client name and field notes are also recorded on the Custody Form. The volume of water in the casing is calculated and three to five times that volume is purged from the well. In some cases, the well is purged until the conductivity has stabilized. This is accomplished by checking the conductivity of every fifth bailer volume removed from the well. The conductivity is considered representative if two consecutive readings are constant.

For surface water sampling, the actual sample bottle can be used to collect a grab sample. Care is taken to avoid hand contact with the bottle lip. A clean dipper may be used to collect samples from shallow streams.

Table 3-1 lists the sample containers, preservatives, holding times and conditions for groundwater and surface water sampling. Only new pre-cleaned sample containers are used. Glass containers used for organic analyses are purchased pre-cleaned. These containers are cleaned in accordance with USEPA protocol. Plastic containers used for metals analyses are purchased pre-cleaned and cleaned in house by the following procedure:

All sample containers are stored in an area isolated from the solvent extraction laboratory. Trip blanks for volatiles are prepared and stored in the VOA lab. Storage time is kept to a minimum.

units. In addition, the use of USEPA methods provides data of known precision and accuracy.

2.2.2 Representativeness

Representativeness refers to how well measured results reflect the actual concentrations of chemical compounds in samples at the moment of sampling. Sample handling protocols (e.g., collection, preservation, transportation, and storage) have been developed to preserve the representativeness of the collected samples. Proper documentation establishes that protocols have been followed and that sample identification and integrity have been assured.

Data representativeness reflects the degree to which the data accurately and precisely represent a characteristic of a population or parameter variation at a sampling point, or an environmental condition. Data representativeness is a qualitative criteria that is associated with the proper design of the sampling and analysis program. Data that are highly representative of the geographical areas and matrices being sampled can be achieved by performing field sampling and measurements and laboratory analyses in a standardized manner strictly adhering to procedures specified in this manual and in the individual Quality Assurance Project Plans, and following, where applicable, USEPA guidance.

2.1.4 Completeness

Completeness is defined as the number of analyses considered to be valid compared to the number of analyses that were considered necessary for accomplishing the task. Typically, studies are designed with extra sampling so that the loss of a few samples (perhaps 10 percent) would still leave enough data to achieve the desired objectives. For the purpose of estimating completeness, the total number of analyses required for accomplishing the objectives requiring analytical laboratory data is 90 percent of the non-QC samples submitted for analysis. With a project designed to tolerate some loss of analytical data, one might expect completeness of 100 percent or greater.

A typical project quality assurance goal is that over 90 percent of the analyses should meet the QA objectives for precision and accuracy based upon the surrogate and spike results and should be within control with respect to all of the other quality control guidelines. Samples which demonstrate QC problems which can be shown to be due to the sample matrix are excluded in the QC goal calculations. Sample matrix QC problems are not under laboratory control. It is Empirical Laboratories, LLC's policy to "flag" all data on its submitted data reports which do not meet the method QA/QC guidelines .

2.1.5 Timeliness

The normal analytical turnaround time for the laboratory is completion of the final analytical report ten (10) to fifteen (15) business days from the time of sample receipt at the laboratory, and completion of data deliverables packages twenty five business days from sample receipt. Turnaround times are routinely adjusted to meet specific project requirements.

2.2 QUALITATIVE QA OBJECTIVES: COMPARABILITY AND REPRESENTATIVENESS

2.2.1 Comparability

Comparability of the analytical data can be achieved by the use of the same analytical procedures for the samples throughout the projects and through consistency of reporting

2.1.2 Accuracy

Accuracy is the nearness of a measurement or the mean ($\bar{x}$) of a set of measurements to the true value. Accuracy is assessed by means of reference samples and percent recoveries.

Accuracy for the various analytical processes is estimated using the recovery of the matrix spiking analytes from the MS/MSD samples mentioned above, other sample spikes as required by the methods, and/or by the analysis of Laboratory Control Samples (LCSs), standard reference materials of known composition. The methods for calculating accuracy based upon these data are presented in Section 10 of this manual. Tables 2-1, 2-2, and 2-3 show the accuracy limits to be achieved by the analytical laboratory data.

2.1.3 Method Detection Limit/Reporting Limit

The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. Generally, the reporting limit (RL) is established as the lowest standard used in the calibration curve. At a minimum, the RL should not be less than three times the MDL.

MDLs for the various analytical methods are estimated from the analysis of seven replicates of a spiked blank matrix (40 CFR 136, Appendix B). The replicate data used to estimate the MDLs (where appropriate) are calculated as described in Section 10 of this manual. The analytical tests performed within the laboratory and the associated MDLs are shown in Appendix A to this manual. RLs are adjusted based on sample matrix and any sample dilutions/concentrations necessary. In addition, compounds which are identified by recognizable patterns (example: PCBs, toxaphene, technical-chlordane), the RL is not only based upon the detection limit of individual components, but on the concentration of the mixture at which the pattern becomes recognizable. When defining appropriate requirements for the RL verses action levels, consideration must be given to use of the data, uncertainty of low-level data that are acceptable by the data user, and the sensitivity capability of the method and instrument. MDL check standards are also used to verify if calculated MDLs are achievable.

TABLE 2-3(Continued)

QUALITY ASSURANCE OBJECTIVES
ORGANIC ANALYTES

RECOMMENDED SURROGATE SPIKE RECOVERY LIMITS[a]

Fraction	Surrogate Compound	Low/Medium Water (% Rec.)	Low/Medium Soil/Sediment (% Rec.)
VOC	Toluene-d_8	88-110	84-138
VOC	4-Bromofluorobenzene	86-115	59 113
VOC	1,2-Dichloroethane-d_4	76-114	70-121
VOC	Dibromofluoromethane	86-118[b]	80-120[b]
SVOC	Nitrobenzene-d_5	35-114	23-120
SVOC	2-Fluorobiphenyl	43-116	30-115
SVOC	p-Terphenyl-d_{14}	33-141	18-137
SVOC	Phenol-d_6	10-110	24-113
SVOC	2-Fluorophenol	21-110	25-121
SVOC	2,4,6-Tribromophenol	10-123	19-122
Pesticide/PCB	Decachlorobiphenyl (DCB)	30-150	30-150
Pesticide	Tetrachloro-meta-xylene (TCMX)	30-150	30-150

[a]Limits from USEPA Contract Laboratory Program SOW OLM03.2/OLM04.2/OLM04.3
[b]Limits from USEPA SW-846, Third Edition, Final Update III Method 8260B

TABLE 2-3

QUALITY ASSURANCE OBJECTIVES
ORGANIC ANALYTES

RECOMMENDED MATRIX SPIKE RECOVERY LIMITS[a]

Fraction	Matrix Spike Compound	Water		Soil/Sediment	
		(% Rec.)	(RPD)	(% Rec.)	(RPD)
VOA	1,1-Dichloroethene	61-145	14	59-172	22
VOA	Trichlorethene	71-120	14	62-137	24
VOA	Chlorobenzene	75-130	13	60-133	21
VOA	Toluene	76-125	13	59-139	21
VOA	Benzene	76-127	11	66-142	21
BN	1,2,4-Trichlorobenzene	39-98	28	38-107	23
BN	Acenaphthene	46-118	31	31-137	19
BN	2,4-Dinitrotoluene	24-96	38	28-89	47
BN	Pyrene	26-127	31	35-142	36
BN	N-Nitroso-di-n-propylamine	41-116	38	41-126	38
BN	1,4-Dichlorobenzene	36-97	28	28-104	27
Acid	Pentachlorophenol	9-103	50	17-109	47
Acid	Phenol	12-110	42	26-90	35
Acid	2-Chlorophenol	27-123	40	25-102	50
Acid	4-Chloro-3-Methylphenol	23-97	42	26-103	33
Acid	4-Nitrophenol	10-80	50	11-114	50
Pesticide	Lindane	56-123	15	46-127	50
Pesticide	Heptachlor	40-131	20	35-130	31
Pesticide	Aldrin	40-120	22	34-132	43
Pesticide	Dieldrin	52-126	18	31-134	38
Pesticide	Endrin	56-121	21	42-139	45
Pesticide	4,4'-DDT	38-127	27	23-134	50

[a]Limits from USEPA Contract Laboratory Program SOW OLM03.2/OLM04.2/OLM04.3

TABLE 2-2

QUALITY ASSURANCE OBJECTIVES

(Metals, Cyanide, Phenolics)

Parameter	Accuracy[a] (% Recovery)		Precision[a] (RPD)	
	Water	Soil/Sediment	Water	Soil/Sediment
Cyanide	75-125	75-125	±20	±20
Phenolics	75-125	75-125	±20	±20
Aluminum	75-125	75-125	±20	±20
Antimony	75-125	75-125	±20	±20
Arsenic	75-125	75-125	±20	±20
Barium	75-125	75-125	±20	±20
Beryllium	75-125	75-125	±20	±20
Cadmium	75-125	75-125	±20	±20
Chromium	75-125	75-125	±20	±20
Cobalt	75-125	75-125	±20	±20
Copper	75-125	75-125	±20	±20
Lead	75-125	75-125	±20	±20
Mercury	75-125	75-125	±20	±20
Molybdenum	75-125	75-125	±20	±20
Potassium	75-125	75-125	±20	±20
Nickel	75-125	75-125	±20	±20
Selenium	75-125	75-125	±20	±20
Silver	75-125	75-125	±20	±20
Thallium	75-125	75-125	±20	±20
Tin	75-125	75-125	±20	±20
Vanadium	75-125	75-125	±20	±20
Zinc	75-125	75-125	±20	±20
	75-125	75-125		

[a]Sample concentrations must meet specific criteria for the data to be subjected to the specified control limits.

- For precision, sample concentrations must be at least 3 times the method detection limit.
- For accuracy the spike concentrations should be less than or equal to four times the sample concentration.

NA= Not Applicable

RPD= Relative Percent Difference

TABLE 2-1

QUALITY ASSURANCE OBJECTIVES
WATER QUALITY PARAMETERS

	Precision[a] (RPD)	Accuracy[a] (%Recovery)
FIELD PARAMETERS		
pH	±0.1[b]	±0.05[c]
Specific Conductance	±20	75-130
Dissolved Oxygen	±20	NA
Temperature	±10	NA
LABORATORY PARAMETERS		
pH	±0.1[b]	±0.05[c]
Calcium	±20	75-125
Magnesium	±20	75-125
Sodium	±20	75-125
Potassium	±20	75-125
Iron	±20	75-125
Sulfate	±20	75-125
Chloride	±20	75-125
HCO_3^-/CO_3^{-2}	±20	75-125
Total Suspended Solids	±20	75-125
Specific Conductance	±20	75-125

[a]Sample concentrations must meet specific criteria for the data to be subjected to the specified control limits.

- For precision, sample concentrations must be at least 5 times the method detection limit.
- For accuracy the spike concentrations should be less than or equal to four times the sample concentration.

[b]pH units

[c]Accuracy as absolute variation from true value of continuing calibration check standard.

NA= Not Applicable

RPD = Relative Percent Difference

2.0 QUALITY ASSURANCE OBJECTIVES

This section addresses the QA objectives for the analytical data which are generated to support various projects tasks or various specific customer needs. The overall analytical QA objective is to provide chemical data of known precision and accuracy obtained with standard methods acceptable to the appropriate regulatory agencies. To accomplish this objective, analytical work is performed using widely accepted analytical procedures, mostly those from the USEPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)", Third Edition, Final Update III (promulgated 6/13/97). The precision and accuracy of the analyses are maintained at the highest levels consistent with these methods using well defined QA programs described in this manual. As mentioned below, the precision and accuracy of the analytical processes are monitored using various data quality indicators.

2.1 QUANTITATIVE QA OBJECTIVES

2.1.1 Precision

Precision is the agreement between a set of replicate measurements without assumption or knowledge of the true value. Precision is assessed by means of duplicate/replicate sample analysis.

Precision for the various analytical laboratory processes is estimated using the relative percent difference in the recoveries between duplicate samples. Matrix spike (MS) and matrix spike duplicate (MSD) samples are analyzed where appropriate. In most cases, the samples used as MS/MSD samples and duplicates, are laboratory duplicates. Precision for some of the analytical methods may also be assessed from the percent recoveries of surrogate spike compounds.

The spiking procedures are performed as recommended by the appropriate USEPA methods. The equation for calculating Relative Percent Difference is given in Section 12 of this manual. The precision limits to be achieved are those shown in the Tables 2-1, 2-2, and 2-3. The frequency for analysis of spiked duplicate (or replicate) samples is approximately 1 replicate pair per 20 samples (excluding QC samples), spaced as evenly through the sequential analysis of samples as practical.

DEMONSTRATION OF CAPABILITY
CERTIFICATION STATEMENT

Date:

Laboratory Name: Empirical Laboratories, LLC

Laboratory Address: 227 French Landing Drive, Suite 550, Nashville, TN 37228

Analyst(s) Name(s):

Matrix/Methods: SOP#: REV#:

We, the undersigned, CERTIFY that:

1. The analysts identified above, with signature below, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program and other regulatory programs, have met the Demonstration of Capability.
2. The test method was performed by the analyst(s) identified on this certification.
3. A copy of the test method and the laboratory-specific SOPs are available for all personnel on-site.
4. The data associated with the demonstration capability are true, accurate, complete and self-explanatory (1).
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized assessors.

Technical Director's Name and Title	**Signature**	**Date**
Quality Assurance Officer's Name	**Signature**	**Date**

This certification form must be completed each time a demonstration of capability is completed.

(1) Definitions

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.

EMPIRICAL LABORATORIES, LLC

ETHICS AND DATA INTEGRITY

I. I, (print name)_____, state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at Empirical Laboratories, LLC.

II. I agree that in the performance of my duties at Empirical Laboratories, LLC:

a) I shall not intentionally report data values that are not the actual values obtained;
b) I shall not intentionally report the dates and times of data analyses that are not the actual dates and times of data analyses; and
c) I shall not intentionally represent another individual's work as my own.

III. I agree to inform Empirical Laboratories, LLC of any accidental reporting of non-authentic data by myself in a timely manner.

IV. I agree to inform Empirical Laboratories, LLC of any accidental or intentional reporting of non-authentic data by other employees.

V. I acknowledge that it is a crime to knowingly provide false, incomplete or misleading information. I understand that if I violate any of the obligations herein, I will be prosecuted to the fullest extent of the law and I will be subject to such penalties as may be prescribed by Federal, State or local laws.

_____

(Signature)

_____

(Date)

HR952e

demonstrate their capability in their area of the process. The procedure will follow NELAC guidance. See Laboratory SOP 413.

1.8 EDUCATION AND TRAINING IN ETHICAL AND LEGAL RESPONSIBILITIES

Laboratory management will require a formal statement that each employee has acknowledged and understood their personal ethical and legal responsibilities including the possible punishments and penalties for improper, unethical or illegal actions. **Further, this document will include an acknowledgement statement for protecting confidentiality and proprietary rights of client information generated within our laboratory. (See Empirical Laboratories, LLC ethics and data integrity form at the end of this section.) Laboratory management assures their employees that any information of illegal activties conveyed will be kept confidential.**

Education and training will be two-fold. First, during orientation, all new employees will be educated with regard to the above ramifications and how they will apply to the day to day operations within the laboratory. Secondly, all employees will meet annually to receive refresher training for a number of subjects, " legal and ethical" responsibilities will be a part of the annual refresher training agenda.

The Quality Assurance Officer shall conduct an annual internal laboratory audit. Checks for data integrity is included in this audit.

Laboratory management shall not put any pressure on personnel which might influence their technical judgment.

- The laboratory will maintain a training file which contains:

  - A statement from each employee that they have read, understood, and are using the latest version of the Laboratory Quality Manual and SOPs. The statement will be signed and dated.

  - A statement from each employee that they have read, acknowledged and understood their personal ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions. The statement will be signed and dated.

  - A Demonstration of Capability (DOC) for each employee or work group(work cell) for each accredited method.

  - Documentation of any training course, seminars, and/or workshops.

  - Documentation of each employee's continued proficiency to perform each test method by one of the following annually:

  - Acceptable performance of a blind sample (single blind to the analyst) for each accredited method;

    - At least four consecutive Laboratory Control Samples with acceptable levels of precision and accuracy.

    - If one of the above cannot be performed, analysis of authentic samples that have been analyzed by another trained analyst with statistically indistinguishable results.

      Demonstration of Capability (DOC) – A DOC must be performed prior to using any test method, and any time there is a change in instrument type, personnel, or method. Each analyst must have a DOC on file as well as analysts in a work group(work cell). A work cell is considered to be all those individuals who see a sample through the complete process such as sample prep, extraction and analysis. Each analyst must

1.5 EXCEPTIONALLY PERMITTED DEPARTURES FROM DOCUMENTED POLICIES AND PROCEDURES

The Lab Director has responsibility for ensuring the lab's policies and procedures are adhered to. Arrangements for known and controlled departures from documented policies and procedures are allowed. Planned departures do not require audits, however, the departure will be fully documented and include the reason for the departure, the affected SOP(s), the intended results of the departure and the actual results. If the data reported to the Authority is affected adversely, they will be notified in writing. The procedures used to document any specific departure will be the same as the corrective action procedure outlined in Section 11.

1.6 COMPLAINTS

All complaints about laboratory activities received from clients or other parties will be documented in a compliant file maintained in the laboratory. The file will contain the date and name of the person receiving the complaint, a description of the complaint, source of the complaint, the resolution, and any written material accompanying the complaint.

The QA Officer or designee investigates complaints and promptly audits all areas of activity and responsibility involved. The written results of the investigation including actions taken by the laboratory are reviewed by the Laboratory Director. The results of the investigation are signed and dated by the Laboratory Director and the QA Officer.

1.7 TRAINING AND REVIEW OF PERSONNEL QUALIFICATIONS

Laboratory management reviews an applicant's level of qualification, experience, and skills against the laboratory's job description requirements before assigning an employee to the laboratory. Each analyst has adequate experience and education to demonstrate specific knowledge of their function and a general knowledge of laboratory operations, test methods, QC procedures, and records management. Management will keep the following personnel records:

1.3 MANAGEMENT REVIEW OF PROJECTS/TESTING PROCEDURES

All new projects are initiated by the Laboratory Director or designee who delegates responsibilities for the new projects according to available resources. Staff meet prior to initiation of a new project in order to determine if appropriate facilities and resources are available. The plan for any new testing shall be reviewed and approved by the Laboratory Director or Laboratory Manager before commencing such work. After agreement is reached, facilities and resources are organized to efficiently perform the work. For any new testing requirements, the designated employee shall write a standard operating procedure and demonstrate capability to perform those tests prior to reporting results. The SOP(s) shall be under document control and a Demonstration of Capability Statement(s) must be on file.

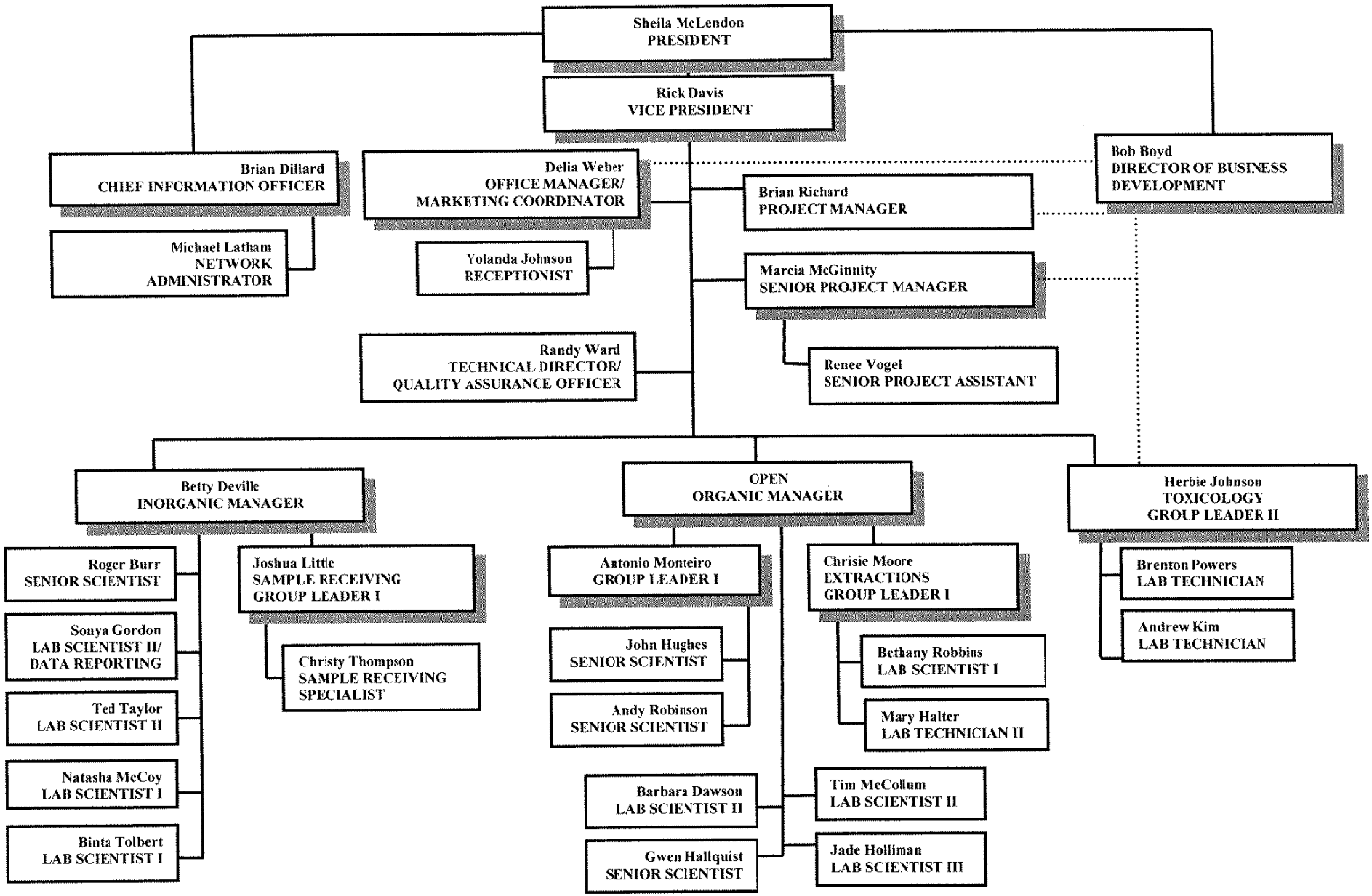
1.4 LABORATORY ENVIRONMENT

Calibration and testing occur only within the laboratory, designed, built and maintained as laboratory space. The laboratory space is maintained and monitored to the specifications required for laboratory space. In general the specifications for temperature is 70°F(+/- 3°F); and for voltage 120V (+/- 2%). Electronic balances are located away from drafts and doorways and mounted on marble slabs in areas where their use is not affected by vibrations. Neighboring test areas of incompatible activities are effectively separated. Specific work areas are defined and access is controlled. (Only authorized laboratory personnel and escorted signed-in visitors may enter the work area.) Good housekeeping measures are employed to avoid the possibility of contamination. (Smoking is prohibited.)

All equipment and reference materials required for the accredited tests are available in the laboratory. Records are maintained for all equipment, reference measurement materials, and services used by the laboratory.

Reference materials traceable to national standards of measurement or to national standard reference materials are stored away from heavy use areas or major equipment that may affect the proper operation of the materials. Certificates of Traceability are available for the reference thermometer and the Class S weights. The reference materials are used only for calibrations to maintain the validity of performance.

EMPIRICAL LABORATORIES, LLC
ORGANIZATIONAL CHART
(Revised 02/14/07)



- Coordinates all incoming work including price quotes, scheduling and oversight of sample kit and materials preparation.
- Tracks laboratory turnaround time to ensure timeliness on analytical deliverables.

The organizational structure of the Analytical Testing & Aquatic Toxicology Sections of Empirical Laboratories, LLC is presented in Figure 1-1.

1.2 RELATIONSHIP BETWEEN MANAGEMENT, TECHNICAL OPERATIONS, SUPPORT SERVICES, AND THE QUALITY SYSTEM

The Lab Director has overall responsibility for the technical operation of the lab. The lab director is also responsible for arranging and overseeing all support services including instrument service contracts, subcontracting sample analyses, and physical maintenance of the laboratory.

The Lab Director is responsible for providing supervision to all laboratory personnel to ensure adherence to lab documented procedures. When the director is not present in the lab, the lab manager who is familiar with the calibration and test procedures, the objective of the calibration or test and the assessment of results, will be appointed by the director to supervise.

The Lab Director shall certify that personnel with appropriate educational and/or technical background perform all tests for which the lab is accredited.

The Lab Director shall ensure that the lab's policies and objectives for quality of testing services are documented in the Quality Manual. The director shall assure that the Quality Manual is communicated to, understood, and implemented by all personnel concerned.

The Quality Assurance Officer has responsibility for the quality system and its implementation. The QA officer has direct access to the highest level of management at which decisions are taken on lab policy and /or resources, and to the lab director. When the QA officer is not present, an alternate shall be appointed.

- **Section Managers**

  - Provide technical and personnel management for the section (organic or inorganic).
  - Organize and schedule the analytical testing program with consideration for sample-holding times.
  - Review draft and final data reports.
  - Implement data verification procedures.
  - Assign analysts for data processing and validation activities.
  - Evaluate instrument performance and supervise instrument calibration and preventive maintenance programs.
  - Report out-of-control (beyond control limits) or nonconforming situations to Quality Assurance Manager.
  - Implement, supervise and monitor adherence to good documentation, record keeping and filing practices.

- **Analysts**

  - Perform analytical procedures and record all data in accordance with accepted methods.
  - Immediately report out-of-control situations, instrument malfunction, calibration failure, or other nonconformances to the appropriate Section Manager (including documentation with Corrective Action Report).
  - Perform data processing and validation with regard to QC limits.
  - Prepare draft data reports for review.
  - Perform and document all instrument calibration and preventive maintenance procedures, as appropriate.

- **Project Manager**

  - Oversees sample receiving, including the review of Laboratory Information Management System log reports for correctness, and follow-up communications with laboratory technical staff and clients.
  - Coordinates the billing and reporting of all samples and services.

- Maintain current distribution lists for specific attachments and project-specific manuals.
- Approve all reports.
- Serve as the "focal point" for the reporting and disposition of all nonconformances.
- Maintain current organization chart.

- **Laboratory Manager**

  - Supervision of group members, technical oversight and quality control.
  - Provides the lab supervisors with accurate and timely information on incoming projects.
  - Determines the priority of request for analyses to meet project requirements.
  - Coordinates the workload of each laboratory department.
  - Oversight for the laboratory quality control practices including coordinating the analyses of laboratory proficiency testing samples, reviewing laboratory QC data, approving daily laboratory results, and assists the QA officer in the various certification programs.

- **Quality Assurance Officer**

  - Supervise Quality Assurance Program.
  - Supervise the participation in inter-laboratory certification and proficiency testing programs.
  - Supervise performance of in-house Quality Assurance audits and Quality Control audits.
  - Prepare QC standards, insert QC samples into the sample inventory, and evaluate results.
  - Perform statistical evaluation of QC sample analytical results.
  - Report all nonconformance to the Director if the situation is not corrected.
  - Train analysts in QC procedures.

1.0 ORGANIZATION AND RESPONSIBILITY

This section presents specific laboratory personnel positions and the responsibilities which each provides in the implementation of the Quality Assurance Program and the execution of Quality Control activities. Quality Control begins at the lab bench with each analyst knowing the QC criteria for the analytical methods being performed and evaluating the analytical instrument calibrations and resulting data for compliance with these criteria. Each analyst has the responsibility and authority for halting an out-of-control analytical procedure, taking appropriate corrective action or seeking guidance from supervisory personnel. This process comprises the cornerstone of the Quality Assurance Program.

1.1 QUALITY-RELATED RESPONSIBILITIES

The Laboratory Director/Vice President of Operations, Quality Assurance Officer, Organic Laboratory Manager, Inorganic Laboratory Manager (listed on the cover page of this manual) and the Project managers listed below are the official signatories of our Laboratory. The staff positions outlined subsequently are fully implemented in the organization. The QA/QC responsibilities of each position are provided in the following.

D. Rick Davis	-	**Laboratory Director/Vice President of Operations**
Randy D. Ward	-	**Quality Assurance Officer**
Antonio D. Monteiro	-	**GC/MS Group Leader**
Betty L. DeVille	-	**Inorganic Laboratory Manager**
Marcia K. McGinnity	-	**Senior Project Manager**
Brian K. Richard	-	**Project Manager**

- **Laboratory Director/Vice President of Operations**

  - Implement the Quality Assurance Program.
  - Periodically determine effectiveness of the Quality Assurance Program.
  - Approve specific attachments to the Quality Manual and project-specific manuals and revisions.
  - Make recommendations to the appropriate laboratory section regarding necessary changes in the Quality Assurance Program.

AS A MATTER OF POLICY

Empirical Laboratories, LLC has established and will maintain a quality system consistent with elements contained in the *Quality Systems* chapter 5 of the *National Environmental Laboratory Accreditation Conference*, NELAC, 2003 Manual, and other State/Federal requlatory programs. All laboratory Standard Operating Procedures (SOP), Manuals, Documents and this Quality Assurance Plan are reviewed annually to insure that the most current information is available for laboratory use. Information is reviewed annually, updated if needed, and date stamped to indicate the time period that the document is in force.

It is the formal policy of Empirical Laboratories, LLC to maintain QA/QC procedures and practices which **meet or** exceed the overall goals and guidelines currently recommended by the **NELAC and other State/Federal regulatory programs**. State and Federal legislation has placed increased emphasis upon the accuracy of environmental analytical data. These programs require very stringent quality assurance and quality control procedures and documentation. Because of an increasing tendency to resolve discrepancies with litigation, most laboratories must be prepared to defend the accuracy of their reported data in court. This document outlines the elements of a good laboratory quality assurance program. More importantly, however, it emphasizes a systematic approach to both the acquisition and reporting of accurate data from all field and laboratory testing.

Empirical Laboratories, LLC intends to follow all of the procedures referenced within this manual and further, to be fully cognizant of **NELAC and other State/USEPA** guidelines for every project submitted. **Additionally, client specific Quality Assurance Project Plan ,QAPP, (when inplace) will be followed to meet all project requirements.** Any deviations from these established procedures will be submitted to the appropriate regulatory agency **and/or respective client** prior to project mobilization.

LIST OF FIGURES

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TABLE OF CONTENTS (Continued)

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ANALYTICAL QUALITY ASSURANCE MANUAL

Empirical Laboratories, LLC
227 French Landing Drive
Nashville, Tennessee 37228

Revision 16.0

April 24, 2007

Authorized for Release by:

D. Rick Davis, Vice President of Operations
(615) 345-1119 ex. 245

Randy D. Ward, Quality Assurance Officer
(615) 345-1119 ex. 253

Antonio D. Monteiro, GC/MS Group Leader
(615) 345-1119 ex. 236

Betty L. DeVille, Inorganic Laboratory Manager
(615) 345-1119 ex. 239

New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2007 until 06/30/2008

Laboratory Name: EMPIRICAL LABORATORIES, LLC Laboratory Number: TN473 Activity ID: NLC070001
227 FRENCH LANDING DR
NASHVILLE, TN 37228

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	NJ	SHW09.29000	SCM	Flow-Through Paint Filter, Observation	[SW-846 9095, Rev. 0, 9/86]	Free liquid

Joseph F. Aiello, Chief

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

Appendix B

Quality Assurance Manual
Air Toxics Laboratory

(Provided on CD)

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL
159 alpha-Chlorotoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
160 Indene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
161 1,2-Dichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
162 1,2-Dibromo-3-Chloropr	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
163 Aniline	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
164 Isooctyl Alcohol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
165 1,2,4-Trichlorobenzene	2.17	2.30	2.34	2.18	2.46	2.39	2.45	2.53	2.35	0.13	0.39
166 Hexachlorobutadiene	2.39	2.53	2.42	2.49	2.38	2.44	2.36	2.44	2.43	0.06	0.17
167 Naphthalene	2.06	2.11	2.21	2.02	2.18	2.29	2.29	2.21	2.17	0.10	0.30
168 Quinoline	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
169 1,3,5-Trichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
170 Isooctyl Acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
199 Vinyl Fluoride	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
200 2-Chloroethyl vinyl et	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
201 Pentachloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
202 1,2,3-Trichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
203 Hexachloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

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Air Toxics Ltd.
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Inst ID: msd7.i

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL
135 Cyclohexanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
136 Bromobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
$ 137 Bromofluorobenzene	25.38	25.33	24.90	24.78	24.37	24.53	24.50	24.86	24.83	0.37	1.11
138 1,2,3-Trichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
139 Decane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
140 1,1,2,2-Tetrachloroeth	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
141 2-Chlorotoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
142 Propylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
143 4-Chlorotoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
144 beta-Pinene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
145 4-Ethyltoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
146 Diisobutyl Ketone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
147 1,3,5-Trimethylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
148 tert-Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
149 sec-Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
150 1,2,4-Trimethylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
151 bis(2-chloroethyl)ethe	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
152 D-Limonene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
153 p-Cymene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
154 1,2,3-Trimethylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
155 1,3-Dichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
156 1,4-Dichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
157 Indan	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
158 Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

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RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL	
111 4-Methyl-2-pentanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
112 Octane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
$ 113 Toluene-d8	23.80	23.92	24.29	23.98	23.84	23.66	23.31	23.69	23.81	0.28	0.84	
114 Toluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
115 Undecane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
116 trans-1,3-Dichloroprop	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
117 1,1,2-Trichloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
118 1,3-Dichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
119 Butyl Acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
120 Tetrachloroethene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
121 2-Hexanone	2.15	2.11	2.14	2.15	2.12	2.21	2.12	2.19	2.15	0.04	0.11	2.0
122 Dibromochloromethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
123 1,2-Dibromoethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
124 Nonane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
125 1,1,1,2-Tetrachloroeth	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
* 126 Chlorobenzene-d5	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00	
127 Chlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
128 Ethyl Benzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
129 m,p-Xylene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
130 o-Xylene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
131 Styrene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
132 alpha-Pinene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
133 Bromoform	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
134 Cumene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	

Air Toxics Ltd.
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RL - (ppbv)

	Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL
87	Carbon Tetrachloride	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
88	1,1-Dichloropropene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
89	2,2,4-Trimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
$ 90	1,2-Dichloroethane-d4	29.83	30.11	29.33	29.12	29.58	29.02	29.50	29.31	29.48	0.36	1.09
91	Benzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
92	tert-amyl-Methyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
93	1,2-Dichloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
94	Heptane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
95	Thiophene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
96	2-Heptanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
* 97	1,4-Difluorobenzene	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00
98	1-Butanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
99	Isobutanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
100	trans-1,4-dichloro-2-b	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
101	Trichloroethene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
102	Methyl Cyclohexane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
103	Alphamethylstyrene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
104	1,2-Dichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
105	Dibromomethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
106	1,4-Dioxane	2.01	2.06	2.03	1.91	1.97	1.84	1.93	1.92	1.96	0.07	0.21
107	Bromodichloromethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
108	Epichlorohydrin	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
109	Dodecane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
110	cis-1,3-Dichloropropen	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

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RL (ppbv)

	Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL
64	Pentanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
65	Hexane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
66	1-Hexene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
67	2,4,4-Trimethyl-1-pent	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
68	Isopropyl ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
69	Vinyl Acetate	1.26	1.52	1.62	1.44	1.39	1.55	1.50	1.50	1.47	0.11	0.33
70	1,1-Dichloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
71	1-Propanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
72	2,4,4-Trimethyl-2-pent	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
73	t-Butylethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
74	Butanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
75	2-Butanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
76	cis-1,2-Dichloroethene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
77	Ethyl Acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
78	2,2-Dichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
79	Methyl Acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
80	Tetrahydrofuran	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
* 81	Bromochloromethane	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00
82	Chloroform	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
83	1,1,1-Trichloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
84	2,3-Dimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
85	Cyclohexane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
86	1-Bromo-2-Chloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

2.0

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL	
40 Freon123a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
41 Freon123	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
42 Freon 113	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
43 1,1-Dichloroethene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
44 Acrolein	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
45 Acetone	3.11	2.77	2.39	2.24	2.19	2.16	2.28	2.32	2.43	0.33	1.00	2.0
46 2-Propanol	1.62	1.61	1.52	1.49	1.56	1.55	1.56	1.51	1.55	0.05	0.14	2.0
47 Carbon Disulfide	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
48 Ethyl acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
49 Iodomethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
50 Methyl Methacrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
51 3-Chloropropene	1.25	1.52	1.41	1.44	1.56	1.52	1.46	1.32	1.43	0.11	0.32	2.0
52 Acetonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
53 2-Methylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
54 Methylene Chloride	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
55 Cyclopentene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
56 Cyclopentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
57 tert-Butyl-Alcohol	1.76	1.79	1.82	1.72	1.71	1.72	1.80	1.69	1.75	0.05	0.15	2.0
58 Freon143a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
59 2,3,4-Trimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
60 MTBE	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
61 trans-1,2-Dichloroethe	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
62 Acrylonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
63 2-Pentanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL	
18 Chloromethane	2.04	1.98	2.02	2.21	2.03	1.90	2.11	1.99	2.03	0.09	0.28	2.0
19 Butane	1.88	2.00	2.10	2.10	2.08	2.04	1.85	2.17	2.03	0.11	0.34	2.0
20 Vinyl Chloride	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
21 Isobutane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
22 1,3-Butadiene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
23 Methyl acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
24 Chloroprene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
25 Bromomethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
26 Methanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
27 Chloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
28 2,4-Dimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
29 Isopentane	1.84	1.85	1.77	1.74	1.73	1.74	1.72	1.77	1.77	0.05	0.15	2.0
30 2-Butanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
31 Trichlorofluoromethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
32 3-Methyl-1-Hexene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
33 Vinyl Bromide	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
34 Dichlorofluoromethane/	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
35 1-Pentene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
36 Methacrylonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
37 Pentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	
38 Ethanol	1.08	0.82	0.90	0.86	0.93	0.92	0.70	0.86	0.88	0.11	0.32	2.0
39 Ethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	

Quad T014/T015
MSD-7 7/26/08 - 7/27/08
Std ID #1576-302; 2.0ppbv; 200ml load
conc. on column 2.0ppbv

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

ID:	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08
FILENAME:	7022613	7022614	7022615	7022616	7022617	7022618	7022619	7022620
INJ.DATE:	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	27-FEB-2008	27-FEB-2008
INJ.TIME:	20:05	20:44	21:22	22:00	23:00	23:44	00:28	01:54

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	MDL08	AVG CONC	STD DEV	MDL
1 Dimethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
2 Isobutylene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
3 Acetaldehyde	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
4 2-Methyl-1-Butene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
5 Freon 143a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
6 Freon142b	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
7 Propanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
8 Freon 14	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
9 Freon 13	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
10 Bromoethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
11 Propylene	1.69	1.94	1.41	1.79	1.57	1.20	1.42	1.75	1.60	0.24	0.72
12 Dichlorodifluoromethan	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
13 Freon 134a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
14 2,3-Dimethylbutane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
15 Freon 152a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
16 Freon 114	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
17 Freon 22	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

2.5

Reviewer 1 _____ Date: 2/28/08
Reviewer 2 _____ Date: 2/28/08

MDL verification
7022707

Avg 20.3

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

EL (ppbv) 0-5

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
159 alpha-Chlorotoluene	0.45	0.45	0.45	0.47	0.44	0.46	0.47	0.45	0.01	0.04
160 Indene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
161 1,2-Dichlorobenzene	0.49	0.45	0.41	0.48	0.43	0.48	0.46	0.46	0.03	0.09
162 1,2-Dibromo-3-Chloropr	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
163 Aniline	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
164 Isooctyl Alcohol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
165 1,2,4-Trichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
166 Hexachlorobutadiene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
167 Naphthalene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
168 Quinoline	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
169 1,3,5-Trichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
170 Isooctyl Acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
199 Vinyl Fluoride	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
200 2-Chloroethyl vinyl et	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
201 Pentachloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
202 1,2,3-Trichlorobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
203 Hexachloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)
0.5

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
135 Cyclohexanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
136 Bromobenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
$ 137 Bromofluorobenzene	24.37	24.57	24.37	24.38	24.63	24.71	24.71	24.53	0.16	0.50
138 1,2,3-Trichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
139 Decane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
140 1,1,2,2-Tetrachloroeth	0.48	0.50	0.50	0.56	0.48	0.48	0.51	0.50	0.03	0.09
141 2-Chlorotoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
142 Propylbenzene	0.45	0.47	0.46	0.51	0.45	0.46	0.49	0.47	0.02	0.06
143 4-Chlorotoluene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
144 beta-Pinene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
145 4-Ethyltoluene	0.45	0.44	0.41	0.47	0.44	0.45	0.44	0.44	0.02	0.05
146 Diisobutyl Ketone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
147 1,3,5-Trimethylbenzene	0.53	0.52	0.49	0.56	0.52	0.54	0.52	0.53	0.02	0.06
148 tert-Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
149 sec-Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
150 1,2,4-Trimethylbenzene	0.43	0.41	0.41	0.42	0.42	0.39	0.43	0.41	0.02	0.05
151 bis(2-chloroethyl)ethe	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
152 D-Limonene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
153 p-Cymene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
154 1,2,3-Trimethylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
155 1,3-Dichlorobenzene	0.45	0.48	0.47	0.47	0.46	0.45	0.48	0.46	0.01	0.04
156 1,4-Dichlorobenzene	0.46	0.48	0.43	0.44	0.40	0.39	0.42	0.43	0.03	0.09
157 Indan	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
158 Butylbenzene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv) 0.5

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
111 4-Methyl-2-pentanone	0.38	0.36	0.34	0.37	0.36	0.34	0.33	0.36	0.02	0.05
112 Octane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
$ 113 Toluene-d8	23.71	23.90	23.67	23.72	23.34	23.63	23.62	23.65	0.17	0.53
114 Toluene	0.46	0.48	0.49	0.51	0.46	0.47	0.50	0.48	0.02	0.06
115 Undecane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
116 trans-1,3-Dichloroprop	0.44	0.45	0.45	0.50	0.48	0.46	0.47	0.46	0.02	0.07
117 1,1,2-Trichloroethane	0.50	0.52	0.48	0.57	0.54	0.52	0.51	0.52	0.03	0.10
118 1,3-Dichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
119 Butyl Acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
120 Tetrachloroethene	0.51	0.50	0.44	0.53	0.52	0.53	0.52	0.51	0.03	0.10
121 2-Hexanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
122 Dibromochloromethane	0.47	0.51	0.49	0.54	0.50	0.46	0.51	0.50	0.03	0.08
123 1,2-Dibromoethane	0.51	0.48	0.50	0.55	0.52	0.49	0.51	0.51	0.02	0.08
124 Nonane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
125 1,1,1,2-Tetrachloroeth	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
* 126 Chlorobenzene-d5	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00
127 Chlorobenzene	0.56	0.55	0.50	0.56	0.55	0.55	0.56	0.55	0.02	0.07
128 Ethyl Benzene	0.46	0.51	0.45	0.49	0.48	0.50	0.46	0.48	0.02	0.08
129 m,p-Xylene	0.46	0.39	0.41	0.47	0.41	0.47	0.42	0.43	0.03	0.10
130 o-Xylene	0.42	0.40	0.41	0.44	0.42	0.40	0.42	0.41	0.01	0.04
131 Styrene	0.39	0.39	0.35	0.40	0.36	0.35	0.37	0.37	0.02	0.06
132 alpha-Pinene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
133 Bromoform	0.41	0.43	0.46	0.45	0.45	0.44	0.46	0.45	0.02	0.06
134 Cumene	0.47	0.47	0.43	0.48	0.44	0.44	0.45	0.45	0.02	0.05

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv) 0.5

	Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
87	Carbon Tetrachloride	0.45	0.49	0.54	0.58	0.54	0.58	0.53	0.53	0.05	0.15
88	1,1-Dichloropropene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
89	2,2,4-Trimethylpentane	0.42	0.43	0.41	0.43	0.42	0.42	0.42	0.42	0.01	0.02
$ 90	1,2-Dichloroethane-d4	26.03	26.79	27.16	28.18	28.60	28.81	28.76	27.76	1.10	3.46
91	Benzene	0.52	0.56	0.52	0.56	0.49	0.50	0.51	0.52	0.03	0.09
92	tert-amyl-Methyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
93	1,2-Dichloroethane	0.54	0.54	0.59	0.56	0.58	0.57	0.61	0.57	0.02	0.07
94	Heptane	0.41	0.43	0.38	0.46	0.35	0.37	0.36	0.39	0.04	0.13
95	Thiophene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
96	2-Heptanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
* 97	1,4-Difluorobenzene	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00
98	1-Butanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
99	Isobutanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
100	trans-1,4-dichloro-2-b	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
101	Trichloroethene	0.48	0.49	0.54	0.54	0.51	0.52	0.50	0.51	0.02	0.07
102	Methyl Cyclohexane	0.40	0.39	0.39	0.42	0.41	0.39	0.38	0.40	0.01	0.04
103	Alphamethylstyrene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
104	1,2-Dichloropropane	0.47	0.47	0.47	0.48	0.47	0.48	0.47	0.47	0.01	0.02
105	Dibromomethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
106	1,4-Dioxane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
107	Bromodichloromethane	0.51	0.49	0.49	0.54	0.53	0.53	0.51	0.51	0.02	0.06
108	Epichlorohydrin	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
109	Dodecane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
110	cis-1,3-Dichloropropen	0.42	0.38	0.38	0.46	0.40	0.39	0.39	0.40	0.03	0.09

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)
0.5 ppbv

	Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
	64 Pentanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	65 Hexane	0.42	0.47	0.39	0.44	0.42	0.38	0.37	0.41	0.03	0.11
	66 1-Hexene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	67 2,4,4-Trimethyl-1-pent	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	68 Isopropyl ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	69 Vinyl Acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	70 1,1-Dichloroethane	0.49	0.47	0.47	0.54	0.51	0.48	0.48	0.49	0.02	0.07
	71 1-Propanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	72 2,4,4-Trimethyl-2-pent	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	73 t-Butylethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	74 Butanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	75 2-Butanone	0.42	0.45	0.42	0.44	0.38	0.41	0.44	0.42	0.02	0.07
	76 cis-1,2-Dichloroethene	0.49	0.45	0.45	0.50	0.48	0.43	0.47	0.47	0.02	0.08
	77 Ethyl Acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	78 2,2-Dichloropropane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	79 Methyl Acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	80 Tetrahydrofuran	0.52	0.49	0.50	0.55	0.46	0.46	0.51	0.50	0.03	0.10
*	81 Bromochloromethane	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	0.00	0.00
	82 Chloroform	0.55	0.59	0.58	0.64	0.61	0.63	0.63	0.60	0.03	0.10
	83 1,1,1-Trichloroethane	0.53	0.56	0.56	0.62	0.60	0.59	0.61	0.58	0.03	0.10
	84 2,3-Dimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
	85 Cyclohexane	0.42	0.45	0.44	0.45	0.46	0.39	0.44	0.44	0.02	0.07
	86 1-Bromo-2-Chloroethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv) = 0.5 ppbv

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
40 Freon123a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
41 Freon123	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
42 Freon 113	0.48	0.49	0.50	0.49	0.44	0.46	0.43	0.47	0.03	0.08
43 1,1-Dichloroethene	0.46	0.46	0.46	0.49	0.44	0.48	0.48	0.47	0.02	0.05
44 Acrolein	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
45 Acetone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
46 2-Propanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
47 Carbon Disulfide	0.27	0.30	0.31	0.31	0.31	0.29	0.30	0.30	0.01	0.04
48 Ethyl acrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
49 Iodomethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
50 Methyl Methacrylate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
51 3-Chloropropene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
52 Acetonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
53 2-Methylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
54 Methylene Chloride	0.53	0.54	0.55	0.61	0.51	0.58	0.56	0.56	0.03	0.10
55 Cyclopentene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
56 Cyclopentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
57 tert-Butyl-Alcohol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
58 Freon143a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
59 2,3,4-Trimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
60 MTBE	0.56	0.60	0.57	0.62	0.57	0.57	0.56	0.58	0.02	0.07
61 trans-1,2-Dichloroethe	0.49	0.49	0.42	0.45	0.47	0.45	0.46	0.46	0.02	0.07
62 Acrylonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
63 2-Pentanone	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
18 Chloromethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
19 Butane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
20 Vinyl Chloride	0.46	0.44	0.46	0.46	0.45	0.49	0.51	0.47	0.02	0.07
21 Isobutane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
22 1,3-Butadiene	0.39	0.41	0.43	0.48	0.45	0.47	0.50	0.45	0.04	0.12
23 Methyl acetate	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
24 Chloroprene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
25 Bromomethane	0.26	0.23	0.24	0.22	0.27	0.30	0.26	0.25	0.03	0.09
26 Methanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
27 Chloroethane	0.50	0.42	0.40	0.50	0.39	0.39	0.34	0.42	0.06	0.19
28 2,4-Dimethylpentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
29 Isopentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
30 2-Butanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
31 Trichlorofluoromethane	0.45	0.48	0.47	0.52	0.50	0.50	0.54	0.49	0.03	0.09
32 3-Methyl-1-Hexene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
33 Vinyl Bromide	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
34 Dichlorofluoromethane/	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
35 1-Pentene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
36 Methacrylonitrile	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
37 Pentane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
38 Ethanol	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
39 Ethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

0.5

Quad T014/T015
MSD-7 7/26/08 - 7/27/08
Std ID # 1576-302; 2.0 ppbv; 50mL load
Conc. on column 0.5 ppbv

Report Date : 26-Feb-2008 18:45

Air Toxics Ltd.
METHOD DETECTION LIMIT SUMMARY REPORT

Method File: /chem/msd7.i/7-26feb.b/t14q119b.m
Batch File: /chem/msd7.i/7-26feb.b
Inst ID: msd7.i

ID:	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07
FILENAME:	7022605	7022606	7022607	7022608	7022609	7022610	7022611
INJ.DATE:	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008	26-FEB-2008
INJ.TIME:	13:30	14:18	14:58	15:43	16:24	17:04	17:50

RL (ppbv)

Compound	MDL01	MDL02	MDL03	MDL04	MDL05	MDL06	MDL07	AVG CONC	STD DEV	MDL
1 Dimethyl Ether	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
2 Isobutylene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
3 Acetaldehyde	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
4 2-Methyl-1-Butene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
5 Freon 143a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
6 Freon142b	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
7 Propanal	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
8 Freon 14	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
9 Freon 13	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
10 Bromoethane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
11 Propylene	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
12 Dichlorodifluoromethan	0.50	0.52	0.49	0.50	0.53	0.58	0.52	0.52	0.03	0.09
13 Freon 134a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
14 2,3-Dimethylbutane	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
15 Freon 152a	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++
16 Freon 114	0.48	0.52	0.47	0.50	0.49	0.47	0.47	0.49	0.02	0.06
17 Freon 22	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++	+++++

0.25

Reviewer 1 _____ Date: 2/28/08
Reviewer 2 C Taylor Date: 2/28/08

MDL verification
7022706

Avg ≈ 0.98

TargetReview: eeyore: MDL 1: /chem/msd7.i/7-26feb.b/7022613.d

File Security Edit Display Process Spectra Help

Sample: MDL 1 Type: SAMPLE Inj.Date: 26-FEB-2008 20:05

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*+  81 Bromochloromethane
*+  97 1,4-Difluorobenzene
*+ 126 Chlorobenzene-d5
$+  90 1,2-Dichloroethane-d4
$+ 113 Toluene-d8
*+ 137 Bromofluorobenzene
 +  11 Propylene
 +  18 Chloromethane
+I  38 Ethanol
 +  45 Acetone
 +  46 2-Propanol
 +  51 3-Chloropropene
 +  69 Vinyl Acetate
 + 106 1,4-Dioxane
 + 121 2-Hexanone
 + 165 1,2,4-Trichlorobenzene
 + 166 Hexachlorobutadiene
 + 167 Naphthalene
 +  29 Isopentane
 +  19 Butane
    Unk: Ethane, 1,1,2-trichloro-1,2,2-trifluoro-
    Unk: Ethene, 1,2-dichloro-1,2-difluoro-
    Unk: Ethene, 1,2-dichloro-, (E)-
    Unk: Ethane, 1,1,2-trichloro-
    Unk: Methane, tribromo-
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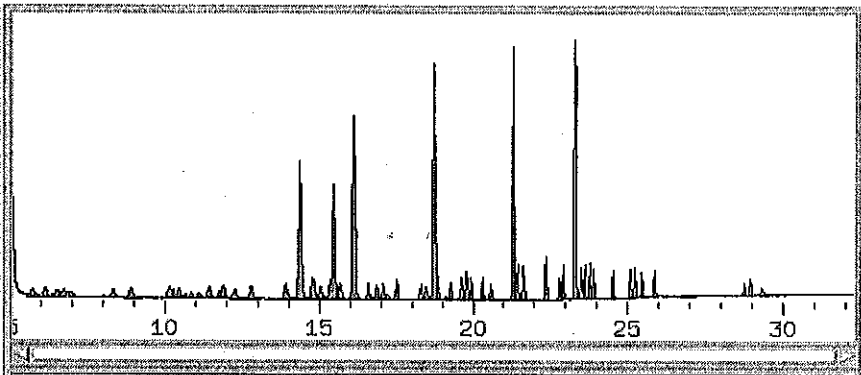

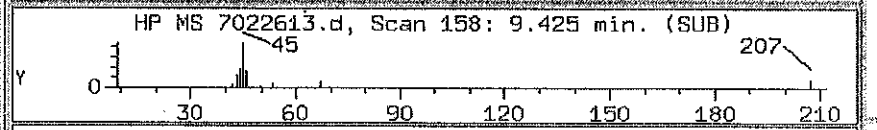

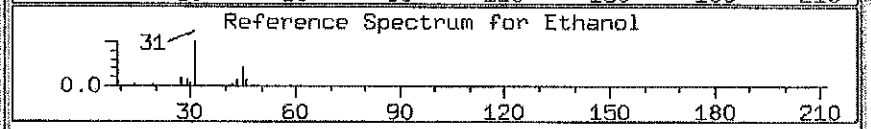

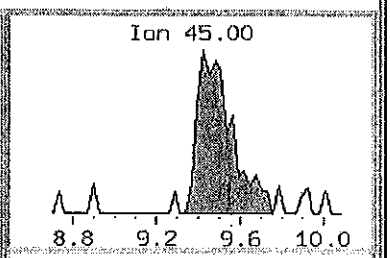

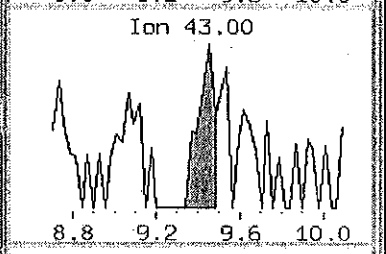

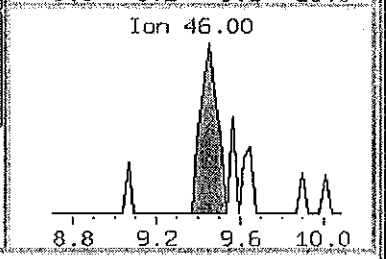


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1	9.425	9639	1.080	1.080	100	aM	
	9.453	1778			18		
	9.453	2347			24		

\- Mark Ethanol Undetected.

Date/Initial 2-27-08 CS

Poor Integration

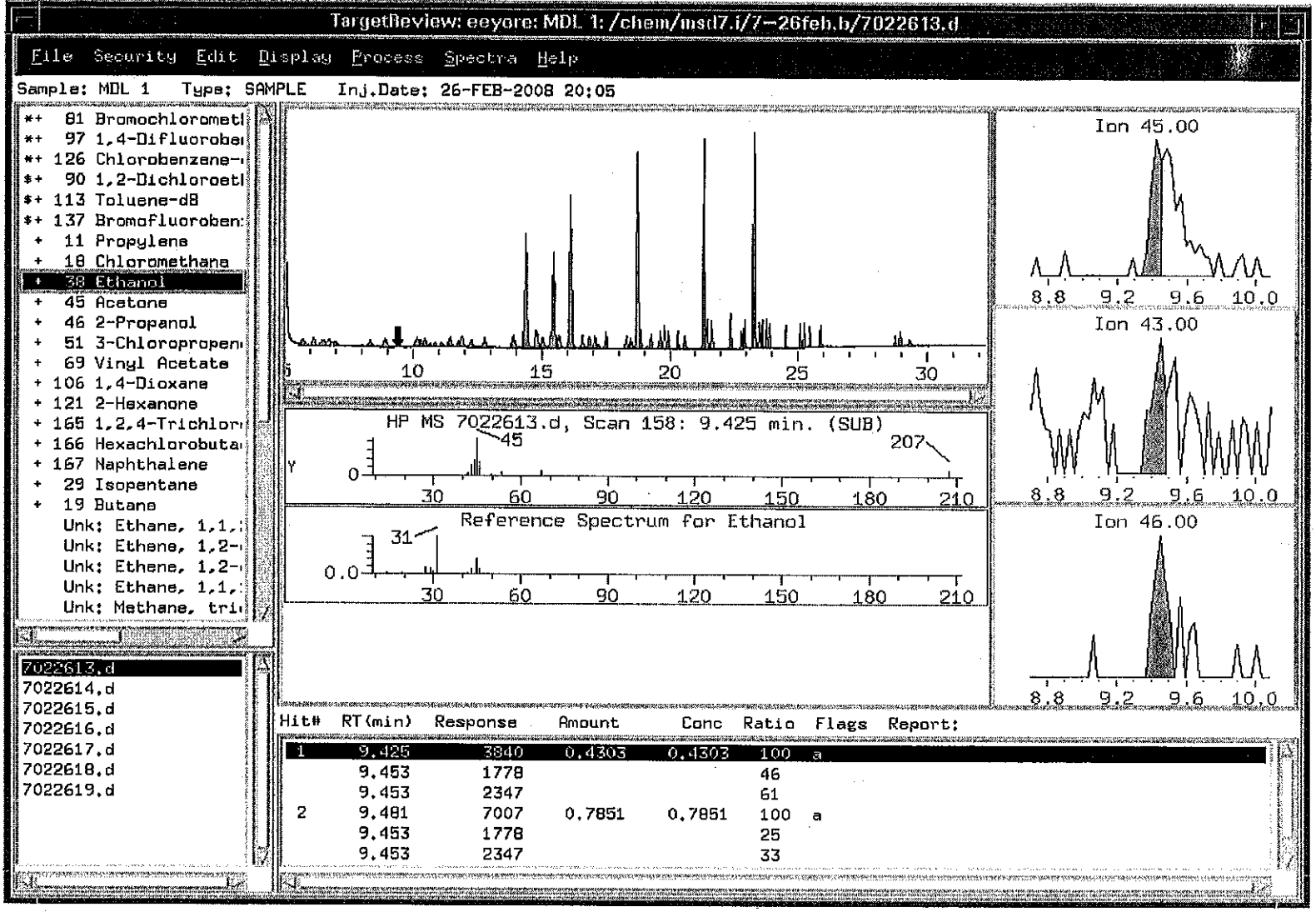
Split Peak

Peak Tailing

Background Subtraction

Zoom In X

Missed Peak



Before

Date/Initial	2-27-08
Poor Integration	
Split Peak	X
Peak Tailing	
Background Subtraction	
Zoom In	
Missed Peak	

File Name: O:\Variances\
Profile: N/A
Date: 03/27/08
Reviewer Initials: ML

Air Toxics Limited
Variance Requests

Client/Project Name: Arcadis – RFAAP

Item	Parameter	SOW	ATL SOP	Approval
1	Section 2. Project Schedule **Turnaround Time**	Hard copy deliverables.	Level 2 deliverable is provided electronically and Level 4 deliverable provided via wed portal.	
2	Section 3.2 **Analytical Methods**	EPA Method TO-15.	Modified EPA Method TO-15 (See Table 2 below).	
3	Section 3.2 **Analytical Methods**	Samples within an analytical batch are to be analyzed in the same analytical run sequence, by the same personnel, and using the same instrument.	Samples within an analytical batch may be analyzed out of sequence, by multiple analysts (i.e. due to shift change), and on multiple instruments.	
4	Section 3.3 Quality Control Requirements **Laboratory Corrective Action**	MS/MSD.	MS/MSDs are not applicable to air analyses.	
5	Section 4. **Holding Times**	Holding times recommended by EPA for TO-15 which is 14 days.	Holding time is 30 days per EPA Method TO-15 Section 2.3.	
6	Section 6. **Data Archive**	Data must be retained for a minimum of 6 years.	Data is retained for 5 years per NELAC requirements.	
7	Hardcopy Deliverable Content **Level 2 Data Packages**	RPD for LCS/LCSD.	The RPD report is provided in the Level 4 deliverable only.	

Table 2. Summary of Method Modifications

Requirement	TO-15	ATL Modifications
Daily CCV	70 - 130%	70 – 130% with two exceptions not to exceed 40 %D for standard compounds.
Method Detection Limit	Follow 40CFR Pt.136 App. B	The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases.
Sample collection media	Summa canister	ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request.

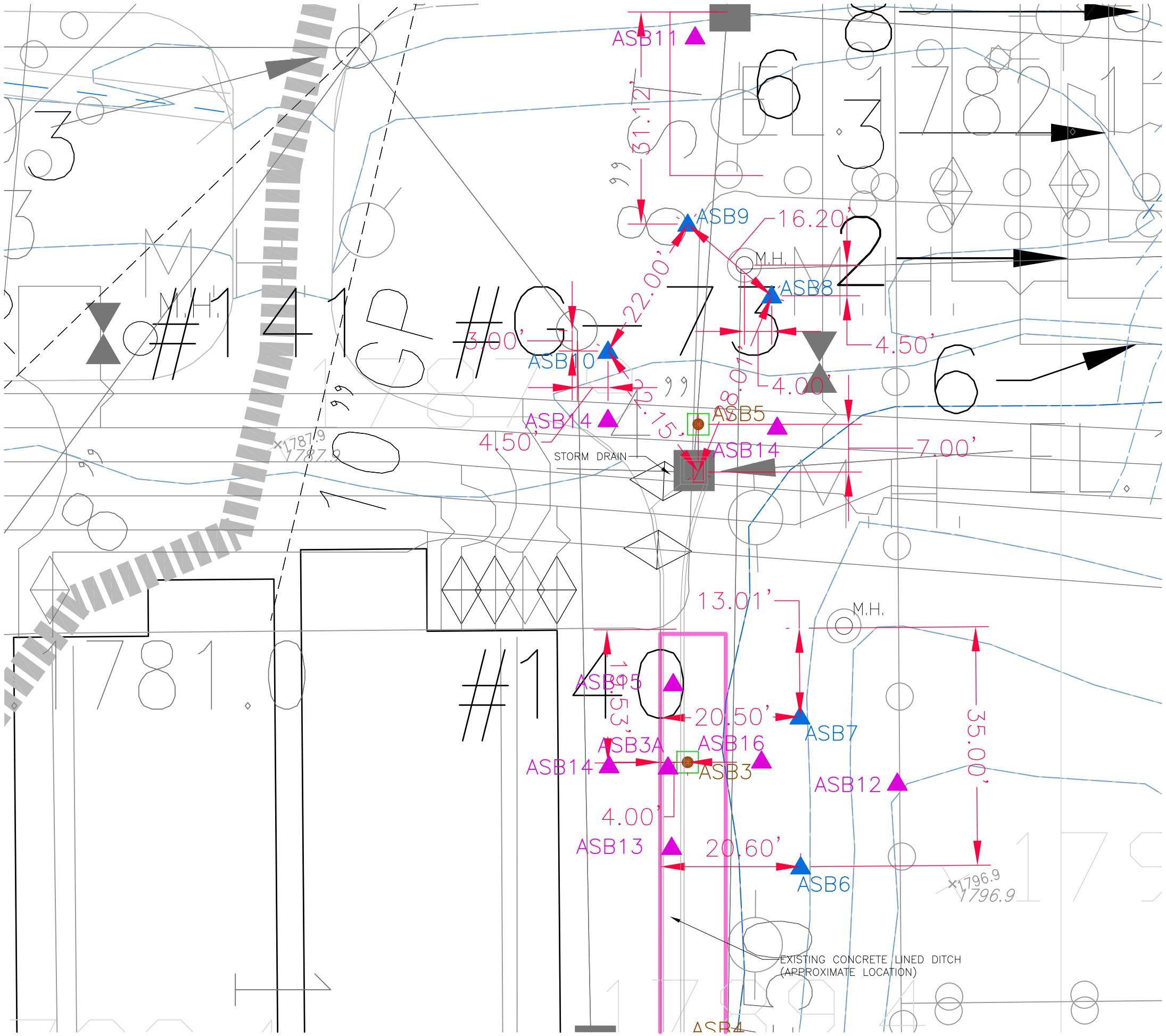
Attachment 2

1) Utility Map

2) Table A-1

3) Boring logs

Figure A-1 - Utility Map



LEGEND:

- AOC A APPROXIMATE BOUNDARY
- ABOVE–GROUND PIPING
- EXISTING CONCRETE LINED DITCH
- ASB1● SSP BORING LOCATION
- ASB6▲ DELINEATION SAMPLE LOCATION
- ASB3□ CONFIRMATION SAMPLE LOCATION
- ASB16▲ PROPOSED ADDITIONAL SAMPLE LOCATION

LOCATION ID	ANALYSIS	SAMPLE INTERVAL(S) FT
ASB3A	PCBS	(0–1)
ASB11	PCBS, DNT	(0–1, 5–6)
ASB12	PCBS, DNT	(0–1, 5–6)
ASB13	PCBS, DNT	(0–1, 5–6)
ASB14	PCBS, DNT	(0–1, 5–6)
ASB15*	PCBS, DNT	(0–1, 5–6)
ASB16	PCBS, DNT	(0–1, 5–6)
ASB17*	PCBS, DNT	(0–1, 5–6)
ASB18*	PCBS, DNT	(0–1, 5–6)

* PROBABLE ACCESS ISSUES

0 15
SCALE: 1"=15'

US ARMY
RADFORD ARMY AMMUNITION PLANT
SUPPLEMENTAL RFI WORK PLAN
RAAP-31 (AOC-A): NITROCELLULOSE RAINWATER DITCH

Utility Location Figure

ARCADIS

FIGURE
A-1

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
C:\Documents and Settings\csharpe\Desktop\Projects\AEC\Radford\Execution\RAAP-031\Supplemental Work Plan\Figures\APENDX-Utilities.dwg LAYOUT: 4 SAVED: 11/21/2008 10:15 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS(SIZE A+B).CTB PLOTTED: 11/21/2008
10:16 PM BY: SHARPE, CHRISTOPHER
XREFS: IMAGES:
BASEMAP-2006-ORDA.DWG ARCADIS Color Logo.JPG PROJECTNAME: ---
ARCADIS Color Logo.JPG

Table A-1

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB1	ASB1	ASB1	ASB2	ASB2	ASB2	ASB3	ASB3	ASB3	ASB3	ASB4	ASB4	ASB4	ASB5	ASB5	ASB5	ASB6
Sample Depth(Feet):	0 - 1	10 - 12	26 - 28	0 - 1	10 - 12	21 - 23	0 - 1	0 - 1	6 - 8	13 - 14.7	0 - 1	10 - 11	20	0 - 1	0 - 1	7	0 - 1
Date Collected:	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	06/30/08	10/11/03	10/11/03	04/20/06	04/20/06	04/20/06	04/20/06	06/30/08	04/20/06	06/30/08
Explosives (mg/kg)																	
2,4-Dinitrotoluene	<0.5	<0.5	<0.5	<0.5	<0.5 [<0.5]	0.2	20	NA	<0.5	<0.5	<0.5 [<0.5]	<0.5	<0.5	1.3	NA	<0.5	NA
2,6-Dinitrotoluene	<1	<1	<1	<1	<1 [<1]	<1	<1	NA	<1	<1	<1 [<1]	<1	<1	0.25 ,J	NA	<1	NA
Dinitrotoluene Mix	<1	<1	<1	<1	<1 [<1]	0.2	20	NA	<1	<1	<1 [<1]	<1	<1	1.55	NA	<1	NA
Organochlorine Pesticides (mg/kg)																	
Dieldrin	NA	NA	NA	<0.025	NA	NA	NA	NA	NA	NA	0.014 ,J [0.0032 ,J]	0.0046 ,J	<0.03	<0.51	NA	<0.027	NA
PAHs (mg/kg)																	
Benzo(a)anthracene	<0.026	<0.027	<0.027	0.0036	<0.028 [<0.029]	<0.065	<0.026	NA	<0.026 ,L	<0.025	NA	NA	NA	NA	NA	NA	NA
Chrysene	0.005	<0.027	<0.027	0.0037	<0.028 [<0.029]	<0.065	<0.026	NA	<0.026 ,L	0.0018	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	0.017 ,J	<0.027	<0.027	0.0077	<0.028 [<0.029]	<0.065	<0.026	NA	<0.026 ,L	0.0087	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	<0.026	<0.027	<0.027	0.0062	<0.028 [<0.029]	<0.065	<0.026	NA	<0.026 ,L	<0.025	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.0031	<0.027	<0.027	0.004	<0.028 [<0.029]	<0.065	0.0019	NA	<0.026 ,L	0.003	NA	NA	NA	NA	NA	NA	NA
Pyrene	0.011	<0.027	<0.027	0.021	<0.028 [<0.029]	<0.065	<0.026	NA	<0.026 ,L	0.0099	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)																	
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Aroclor-1254	NA	NA	NA	0.0099	NA	NA	NA	2.4	NA	NA	0.00014 [0.030]	0.041	<0.049	2.4	1.2 [0.34]	0.16	<0.020
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	<0.019	NA	NA	NA	NA	NA	NA	<0.022 [<0.022]	NA	<0.020
Volatile Organics (mg/kg)																	
Acetone	0.015 ,B	0.019 ,B	0.029 ,B	0.016 ,B	0.023 ,B [0.024 ,B]	0.023 ,B	0.012 ,B	NA	0.019 ,B	0.018 ,B	0.38 ,B [0.38 ,B]	0.39 ,B	0.46 ,B	0.42 ,B	NA	0.37 ,B	NA
Benzene	<0.0061	<0.0064	<0.0065	<0.0062	<0.0066 [<0.0069]	<0.0068	<0.0062	NA	<0.0062	<0.0060	0.013 [<0.065]	<0.064	<0.075	<0.063	NA	<0.068	NA
Ethylbenzene	<0.0061	<0.0064	<0.0065	<0.0062	<0.0066 [<0.0069]	<0.0068	<0.0062	NA	<0.0062	<0.0060	0.015 [<0.065]	<0.064	<0.075	<0.063	NA	<0.068	NA
Methyl acetate	<0.024	<0.026	<0.026 ,J	<0.025	<0.026 [<0.028]	<0.027	<0.025	NA	<0.025	<0.024	0.085 [0.089]	0.19	0.081	0.14	NA	0.076	NA
Methylene Chloride	0.0049	0.0059	0.0066 ,B	0.0045	0.0077 [0.0070]	0.011	0.0053	NA	0.0066	0.0037	0.094 ,B [0.097 ,B]	0.099 ,B	0.11 ,B	0.094 ,B	NA	0.10 ,B	NA
Toluene	<0.0061	<0.0064	<0.0065	<0.0062	<0.0066 [<0.0069]	<0.0068	<0.0062	NA	<0.0062	<0.0060	0.081 [<0.065]	<0.064	<0.075	<0.063	NA	<0.068	NA
Xylenes (total)	<0.0061	<0.0064	<0.0065	<0.0062	<0.0066 [<0.0069]	<0.0068	<0.0062	NA	<0.0062	<0.0060	0.10 [<0.19]	<0.19	<0.22	<0.19	NA	<0.21	NA
Semivolatile Organics (mg/kg)																	
1,1'-Biphenyl	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.0022	<0.44 [<0.45]	<0.023	<0.41
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
2,4-Dinitrotoluene	0.85	<0.22	<0.22	<1.0	<0.22 [<0.22]	<0.23	28	98	0.023	<0.20	<0.044 [<0.044]	<0.044	<0.051	11	2.8[7.3]	<0.047	<0.41
2,6-Dinitrotoluene	0.082	<0.22	<0.22	0.10	<0.22 [<0.22]	<0.23	3.3 ,J	4.6	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.49	0.17 [0.43]	<0.023	<0.41
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2-Methylnaphthalene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.0049	<0.44 [<0.45]	<0.023	<0.41
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41 Y
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	<1.5	NA	NA	NA	NA	NA	NA	<1.7 [<1.8]	NA	<1.6 Y
Acenaphthene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.0066	<0.44 [<0.45]	<0.023	<0.41
Acenaphthylene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.021	<0.44 [0.057]	<0.023	<0.41
Acetophenone	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Anthracene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.021	<0.44 [0.064]	<0.023	<0.41
Atrazine	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41 Y
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	R	NA	NA	NA	NA	NA	NA	R [R]	NA	R
Benzo(a)anthracene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.15	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.072	<0.17 [0.45]	<0.023	<0.16
Benzo(a)pyrene	0.0090	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	0.010 ,J	<0.15	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.022	<0.17 [0.38]	<0.023	<0.16
Benzo(b)fluoranthene	0.016 ,J	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21 ,J	<0.15	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.12	<0.17 [0.48]	<0.023	<0.16
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [0.28]	NA	<0.41

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB1	ASB1	ASB1	ASB2	ASB2	ASB2	ASB3	ASB3	ASB3	ASB3	ASB4	ASB4	ASB4	ASB5	ASB5	ASB5	ASB6
Sample Depth(Feet):	0 - 1	10 - 12	26 - 28	0 - 1	10 - 12	21 - 23	0 - 1	0 - 1	6 - 8	13 - 14.7	0 - 1	10 - 11	20	0 - 1	0 - 1	7	0 - 1
Date Collected:	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	06/30/08	10/11/03	10/11/03	04/20/06	04/20/06	04/20/06	04/20/06	06/30/08	04/20/06	06/30/08
Benzo(k)fluoranthene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21 ,J	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.036	<0.44 [0.38]	<0.023	<0.41
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
bis(2-Chloroisopropyl)ether	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
bis(2-Ethylhexyl)phthalate	1.4	0.022	0.017	0.11	0.022 [0.016]	0.034	1.2 ,J	3.4	0.020	0.022	0.16 ,J [0.31 ,J]	0.42	0.038	5.7	0.90 [2.5]	0.13	<0.41
Butylbenzylphthalate	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	0.0090	0.24	<0.38	<0.21	<0.20	<0.087 [<0.088]	<0.087	<0.10	0.16	<0.44 [<0.45]	<0.093	<0.41
Caprolactam	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Carbazole	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [0.077]	NA	<0.41
Chrysene	0.015	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	0.057	<0.21	0.20	<0.022 [<0.022]	<0.022	<0.025	0.087	0.042 [0.66]	<0.023	<0.41
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	<0.15	NA	NA	NA	NA	NA	NA	<0.17 [0.29]	NA	<0.16
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Diethylphthalate	0.014	0.0080	0.010	0.010	0.010 [<0.22]	0.0080	0.014	0.16	0.010	0.0080	0.026 [0.0068]	0.0084	0.0077	0.024	<0.44 [<0.45]	0.0039	<0.41
Dimethylphthalate	0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.21	<0.44 [<0.45]	<0.023	<0.41
Di-n-Butylphthalate	5.1	0.093	0.13	4.3	0.59 [0.64]	0.60	130	410	0.32	0.32	0.15 [0.10]	0.47	0.0098	62	15 [68]	0.089	0.060
Dinitrotoluene Mix	0.93	<0.22	<0.22	1.1	<0.22 [<0.22]	<0.23	31	100	0.023	<0.20	<0.022 [<0.022]	<0.022	<0.025	12	3.0 [7.7]	<0.023	<0.41
Di-n-Octylphthalate	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	0.038	<0.38	<0.21	<0.20	0.014 [0.012]	0.013	<0.025	0.055	<0.44 [<0.45]	<0.023	<0.41
Fluoranthene	0.030	<0.22	<0.22	0.0030	<0.22 [<0.22]	<0.23	0.0088	<0.38	<0.21	0.20	<0.022 [<0.022]	<0.022	<0.025	0.43	<0.44 [1.3]	<0.023	<0.41
Fluorene	<0.21	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21	<0.38	<0.21	<0.20	<0.022 [<0.022]	<0.022	<0.025	0.014	<0.44 [<0.45]	<0.023	<0.41
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Indeno(1,2,3-cd)pyrene	0.0060	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	<0.21 ,J	<0.15	<0.21	<0.20	<0.087 [<0.088]	<0.087	<0.10	<0.086	<0.17 [0.39]	<0.093	<0.16
Isophorone	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Naphthalene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
N-Nitrosodiphenylamine	1.0	<0.22	<0.22	0.12	<0.22 [<0.22]	<0.23	4.7	22	0.0080	<0.20	1.0 ,J [0.34 ,J]	0.15	<0.025	2.9	0.93 [1.4]	0.0052	<0.41
Pentachlorophenol	<0.40	<0.42	<0.43	<0.41	<0.43 [<0.43]	<0.45	<0.41	<1.5	<0.41	<0.39	<0.044 [<0.044]	<0.044	<0.051	0.10	<1.7 [<1.8]	<0.047	<1.6
Phenanthrene	0.011	<0.22	<0.22	<0.21	<0.22 [<0.22]	<0.23	0.0038	NA	<0.21	0.20	<0.022 [<0.022]	<0.022	<0.025	0.16	NA	<0.023	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	<0.38	NA	NA	NA	NA	NA	NA	<0.44 [<0.45]	NA	<0.41
Pyrene	0.026	<0.22	<0.22	0.0030	<0.22 [<0.22]	<0.23	0.0067	<0.38	<0.21	0.20	<0.022 [<0.022]	<0.022	<0.025	0.24	<0.44 [0.81]	<0.023	<0.41
SVOCs-TIC (mg/kg)																	
(Z)-9-Octadecenamide	NA	1.6 ,NJ	NA	0.19 ,NJ	0.23 ,NJ [0.094 ,NJ]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, butyl 2-et	NA	NA	NA	NA	NA	NA	0.56 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, butyl 2-me	0.06 ,NJ	NA	NA	NA	NA	NA	NA	NA	0.42 ,NJ	0.34 ,NJ	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylicacid, bis(2-methy	NA	0.11 ,B	0.2 ,NJ	0.49 ,NJ	0.51 ,NJ	0.5 ,NJ	0.17 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Dodecanol	NA	NA	NA	NA	NA	NA	NA	NA	0.047 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA
1-Heptadecanol	NA	NA	NA	NA	NA	0.26 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Pentadecanol	NA	NA	NA	NA	NA	NA	NA	NA	0.04 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA
2(5H)-Furanone, 5,5-dimethyl-	NA	NA	0.049 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Triallyloxy-1,3,5-triazine	NA	NA	NA	NA	0.087 ,B [0.069 ,B]	NA	NA	NA	0.094 ,B	0.065 ,B	NA	NA	NA	NA	NA	NA	NA
2-Ethyl-1-Hexanol	NA	0.033 ,NJ	NA	NA	NA	NA	NA	NA	NA	0.03 ,NJ	NA	NA	NA	NA	NA	NA	NA
Benzenamine, 4-nitro-N-phenyl-	NA	NA	NA	NA	NA	NA	0.31 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzeneamine, 2-nitro-N-phenyl-	0.14 ,NJ	NA	NA	NA	NA	NA	0.52 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)maleate	NA	NA	NA	NA	NA	0.076 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Erucylamide	1.5 ,B	NA	NA	1.1 ,B	NA	NA	NA	NA	NA	0.95 ,B	NA	NA	NA	NA	NA	NA	NA
Phosphonic acid, dioctadecyl ester	NA	0.024 ,NJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (mg/kg)																	
Aluminum	32,000	30,800	36,300	28,500	32,300 [34,800]	35,000	32,100	26,100	28,300	24,500	33,000 ,J [28,000 ,J]	26,000 ,J	27,000 ,J	21,000 ,J	32,300 [35,400]	36,000 ,J	37,000
Antimony	0.0860	<0.500	0.180	0.0710	<0.500 [0.0680]	<0.500	<0.500	<3.40	<0.500	<0.500	0.100 ,J [0.240 ,J]	<0.500 ,J	0.140 ,J	0.630 ,J	<3.60 [<3.80]	<0.500 ,J	<3.60
Arsenic	3.00	1.80	8.10	2.90	3.40 [4.70]	4.50	1.90	4.90	1.60	2.20	2.00 ,J [1.70 ,J]	1.60 ,J	4.20 ,J	20.0 ,J	10.4 [11.0]	1.80 ,J	3.60
Barium	86.0	99.0	115	61.0	77.0 [98.0]	88.0	114	203	63.0	50.0	67.0 ,J [57.0 ,J]	50.0 ,J	86.0 ,J	150 ,J	114 [90.9]	94.0 ,J	54.1
Beryllium	0.530	0.900	1.80	0.550	1.30 [0.860]	0.590	0.620	0.900	0.570	0.640	0.550 ,J [0.640 ,J]	0.590 ,J	1.10 ,J	0.590 ,J	0.790 [0.800]	0.840 ,J	0.760
Cadmium	0.940	<1.00	0.460	0.260	0.360 [<1.00]	<1.00	<1.00	0.470	0.750	<1.00	0.0760 ,J [0.170 ,J]	0.0360 ,J	0.150 ,J	1.30 ,J	0.850 [0.520]	0.0720 ,J	<1.20
Calcium	2,570	408	126	6,100	867 [380]	310	3,910	15,900	644	293	2,200 ,J [2,100 ,J]	710 ,J	320 ,J	18,000 ,J	6,700 [9,020]	220 ,J	1,120
Chromium	38.0 ,J	31.0 ,J	40.0 ,J	36.0 ,J	39.0 ,J [41.0 ,J]	52.0 ,J	33.0 ,J	44.7	30.0 ,J	41.0 ,J	29.0 ,J [43.0 ,J]	28.0 ,J	21.0 ,J	100 ,J	46.4 [59.7]	30.0 ,J	30.7
Cobalt	8.80 ,J	24.0 ,J	15.0 ,J	9.30 ,J	14.0 ,J [22.0 ,J]	20.0 ,J	24.0 ,J	9.90	12.0 ,J	11.0 ,J	6.20 ,J [6.20 ,J]	6.30 ,J	33.0 ,J	6.90 ,J	7.60 [6.30]	22.0 ,J	5.30
Copper	155	20.0	43.0	57.0	19.0 [23.0]	22.0	36.0	245	17.0	14.0	460 ,J [560 ,J]	15.0 ,J	30.0 ,J	150 ,J	113 [68.1]	21.0 ,J	21.1
Cyanide	0.0600	<0.500	0.470	0.230	0.180 [0.140]	<0.500	0.150	NA	<0.500	<0.500	<0.260 [<0.260]	<0.260	0.720	0.210	NA	0.600	NA
Iron	41,600	37,500	42,200	38,100	40,300 [38,000]	40,200	38,300	49,500	36,500	33,600	40,000 ,J [66,000 ,J]	33,000 ,J	55,000 ,J	33,000 ,J	44,400 [45,300]	47,000 ,J	46,900
Lead	76.0	26.0	19.0	25.0	8.80 ,J [13.0 ,J]	12.0	34.0	170	11.0	12.0	30.0 ,J [34.0 ,J]	13.0 ,J	25.0 ,J	330 ,J	78.4 [95.7]	24.0 ,J	18.0
Magnesium	2,450	2,050	5,870	3,180	5,220 ,J [2,800 ,J]	2,120	2,090	7,190	1,980	1,160	2,600 ,J [2,400 ,J]	1,300 ,J	3,900 ,J	10,000 ,J	4,480 [5,030]	2,700 ,J	1,560
Manganese	315	1,750	1,170	426	648 [859]	704	2,400	397	483	330	290 ,J [350 ,J]	260 ,J	1,700 ,J	310 ,J	329 [244]	950 ,J	226
Mercury	0.0670	0.0190	0.0750	0.0450	0.0140 [0.0220]	0.0200	0.0520	0.0970	0.0300	0.0250	0.0410 ,J [0.0350 ,J]	0.0330 ,J	0.0250 ,J	0.140 ,J	0.0880 [0.0810]	0.0620 ,J	0.0670

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB1	ASB1	ASB1	ASB2	ASB2	ASB2	ASB3	ASB3	ASB3	ASB3	ASB4	ASB4	ASB4	ASB5	ASB5	ASB5	ASB6
Sample Depth(Feet):	0 - 1	10 - 12	26 - 28	0 - 1	10 - 12	21 - 23	0 - 1	0 - 1	6 - 8	13 - 14.7	0 - 1	10 - 11	20	0 - 1	0 - 1	7	0 - 1
Date Collected:	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	10/11/03	06/30/08	10/11/03	10/11/03	04/20/06	04/20/06	04/20/06	04/20/06	06/30/08	04/20/06	06/30/08
Nickel	13.0	16.0	28.0	13.0	36.0 ,J [21.0 ,J]	20.0	12.0	20.1	13.0	14.0	16.0 ,J [13.0 ,J]	12.0 ,J	32.0 ,J	13.0 ,J	18.4 [13.3]	19.0 ,J	12.4
Potassium	1,540	1,840	3,780	1,220	2,750 ,J [1,560 ,J]	1,260	1,410	1,540	1,670	1,010	1,600 ,J [1,500 ,J]	1,200 ,J	2,600 ,J	1,100 ,J	1,510 [1,520]	2,600 ,J	1,250
Selenium	0.560	0.520	0.990	0.470	0.600 [0.500]	0.450	0.300	<1.80	0.400	0.400	<1.00 ,J [0.0700 ,J]	0.0700 ,J	0.100 ,J	0.320 ,J	<1.90 [<2.00]	0.160 ,J	<1.90
Silver	0.0700	0.0610	0.110	0.0720	0.0930 [0.0940]	0.0750	0.0540	<2.30	0.0480	0.0740	0.100 ,J [0.0650 ,J]	0.0450 ,J	0.190 ,J	0.180 ,J	<2.40 [<2.50]	0.0640 ,J	<2.40
Sodium	95.0	122	54.0	77.0	77.0 [50.0]	50.0	207	<1,150	237	131	120 ,J [49.0 ,J]	330 ,J	<100 ,J	41.0 ,J	<1,210 [<1,270]	<100 ,J	<1,190
Thallium	0.240 ,B	0.430	0.450	0.230 ,B	0.230 ,B [0.220 ,B]	0.210 ,B	0.480	<2.30	0.200 ,B	0.150 ,B	0.320 ,J [0.240 ,J]	0.190 ,J	0.370 ,J	0.210 ,J	<2.40 [<2.50]	0.390 ,J	<2.40
Vanadium	68.0 ,L	66.0 ,L	56.0 ,L	63.0 ,L	55.0 ,L [49.0 ,L]	54.0 ,L	68.0 ,L	66.5	66.0 ,L	42.0 ,L	91.0 ,J [75.0 ,J]	71.0 ,J	77.0 ,J	56.0 ,J	77.6 [83.5]	96.0 ,J	88.3
Zinc	78.0	56.0	109	58.0	45.0 [37.0]	40.0	56.0	313	46.0	44.0	76.0 ,J [140 ,J]	47.0 ,J	37.0 ,J	1,400 ,J	540 [375]	69.0 ,J	43.6
Miscellaneous (%)																	
Percent Solids	82	78	77	80	76 [72]	73	80	NA	80	84	78 [77]	78	67	79	NA	73	NA

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB6	ASB7	ASB7	ASB8	ASB8	ASB9	ASB9	ASB10	ASB10
Sample Depth(Feet):	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6
Date Collected:	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08
Explosives (mg/kg)									
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organochlorine Pesticides (mg/kg)									
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (mg/kg)									
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)									
Aroclor-1016	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	<0.022	<0.022
Aroclor-1221	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	<0.022	<0.022
Aroclor-1232	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	<0.022	<0.022
Aroclor-1242	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	0.015	<0.022
Aroclor-1248	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	<0.022	<0.022
Aroclor-1254	<0.020	0.096	<0.025	<0.023	<0.024	0.20	<0.022	0.011	0.016
Aroclor-1260	<0.020	<0.019	<0.025	<0.023	<0.024	<0.022	<0.022	<0.022	<0.022
Volatile Organics (mg/kg)									
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (mg/kg)									
1,1'-Biphenyl	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
1,2,4,5-Tetrachlorobenzene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2,4,5-Trichlorophenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2,4,6-Trichlorophenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2,4-Dichlorophenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2,4-Dimethylphenol	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
2,4-Dinitrophenol	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
2,4-Dinitrotoluene	<0.40	0.31	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2,6-Dinitrotoluene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2-Chloronaphthalene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2-Chlorophenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2-Methylnaphthalene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2-Methylphenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
2-Nitroaniline	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
2-Nitrophenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
3,3'-Dichlorobenzidine	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
3-Nitroaniline	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
4,6-Dinitro-2-methylphenol	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
4-Bromophenyl-phenylether	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
4-Chloro-3-Methylphenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
4-Chloroaniline	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
4-Chlorophenyl-phenylether	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
4-Methylphenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
4-Nitroaniline	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
4-Nitrophenol	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
Acenaphthene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Acenaphthylene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Acetophenone	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Anthracene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Atrazine	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Benzaldehyde	R	R	R	R	R	R	R	R	R
Benzo(a)anthracene	<0.16	<0.15	<0.20	<0.18	<0.19	<0.18	<0.17	<0.17	<0.18
Benzo(a)pyrene	<0.16	<0.15	<0.20	<0.18	<0.19	<0.18	<0.17	<0.17	<0.18
Benzo(b)fluoranthene	<0.16	<0.15	<0.20	<0.18	<0.19	<0.18	<0.17	<0.17	<0.18
Benzo(g,h,i)perylene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB6	ASB7	ASB7	ASB8	ASB8	ASB9	ASB9	ASB10	ASB10
Sample Depth(Feet):	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6
Date Collected:	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08
Benzo(k)fluoranthene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
bis(2-Chloroethoxy)methane	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
bis(2-Chloroethyl)ether	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
bis(2-Chloroisopropyl)ether	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
bis(2-Ethylhexyl)phthalate	<0.40	1.0	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Butylbenzylphthalate	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Caprolactam	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Carbazole	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Chrysene	<0.40	0.041	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Dibenzo(a,h)anthracene	<0.16	<0.15	<0.20	<0.18	<0.19	<0.18	<0.17	<0.17	<0.18
Dibenzofuran	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Diethylphthalate	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Dimethylphthalate	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Di-n-Butylphthalate	<0.40	2.7	<0.50	<0.45	<0.49	0.12	<0.43	<0.43	<0.44
Dinitrotoluene Mix	<0.40	0.31	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Di-n-Octylphthalate	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Fluoranthene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Fluorene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Hexachlorobenzene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Hexachlorobutadiene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Hexachlorocyclopentadiene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Hexachloroethane	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Indeno(1,2,3-cd)pyrene	<0.16	<0.15	<0.20	<0.18	<0.19	<0.18	<0.17	<0.17	<0.18
Isophorone	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Naphthalene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Nitrobenzene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
N-Nitroso-di-n-propylamine	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
N-Nitrosodiphenylamine	<0.40	0.20	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Pentachlorophenol	<1.6	<1.5	<2.0	<1.8	<1.9	<1.8	<1.7	<1.7	<1.8
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
Pyrene	<0.40	<0.38	<0.50	<0.45	<0.49	<0.45	<0.43	<0.43	<0.44
SVOCs-TIC (mg/kg)									
(Z)-9-Octadecenamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, butyl 2-et	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylic acid, butyl 2-me	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Benzenedicarboxylicacid, bis(2-methy	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Dodecanol	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Heptadecanol	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Pentadecanol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2(5H)-Furanone, 5,5-dimethyl-	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Triallyloxy-1,3,5-triazine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Ethyl-1-Hexanol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzenamine, 4-nitro-N-phenyl-	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzeneamine, 2-nitro-N-phenyl-	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)maleate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Erucylamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphonic acid, dioctadecyl ester	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (mg/kg)									
Aluminum	31,900	28,600	34,700	38,100	35,600	37,100	34,800	38,800	42,300
Antimony	<3.40	<3.30	<4.10	<4.00	<4.40	<4.00	<3.70	<3.90	<3.80
Arsenic	2.30	4.60	3.60	4.20	3.30	6.40	2.80	6.30	3.60
Barium	49.8	55.7	85.3	42.8	78.1	74.4	76.9	55.5	74.2
Beryllium	0.680	0.530	0.850	0.780	0.880	0.790	0.900	0.710	0.940
Cadmium	<1.10	0.230	<1.40	<1.30	<1.50	<1.30	<1.20	<1.30	<1.30
Calcium	<1,130	722	<1,370	1,620	420	1,890	<1,250	1,480	<1,250
Chromium	24.2	39.0	43.8	27.6	24.1	39.2	23.0	47.3	41.3
Cobalt	3.90	4.00	21.0	3.80	7.40	5.40	32.7	3.60	6.40
Copper	14.6	30.9	17.7	20.2	20.0	90.5	19.2	18.7	20.1
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	33,400	38,500	44,300	47,700	44,300	48,000	46,100	56,400	50,100
Lead	10.9	22.9	16.0	16.3	10.7	29.0	20.6	18.5	20.0
Magnesium	1,210	1,050	1,230	1,700	2,350	1,710	2,170	1,540	1,540
Manganese	135	168	772	152	232	272	836	117	364
Mercury	0.0290	0.0720	0.0860	0.0560	0.0280	0.0930	0.0700	0.180	0.0290

Appendix
Summary of Analytical Results for Soil (Soil to Groundwater)
RAAP-031 (AOC A): Nitrocellulose Rainwater Ditch
Radford Army Ammunition Plant

Location ID:	ASB6	ASB7	ASB7	ASB8	ASB8	ASB9	ASB9	ASB10	ASB10
Sample Depth(Feet):	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6	0 - 1	5 - 6
Date Collected:	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08	06/30/08
Nickel	11.2	8.50	12.9	12.6	15.2	12.7	14.2	10.6	14.7
Potassium	1,350	922	1,520	1,450	2,390	1,540	2,370	967	1,890
Selenium	<1.80	<1.80	<2.20	<2.10	<2.40	<2.10	<2.00	<2.10	<2.00
Silver	<2.30	<2.20	<2.70	<2.70	<2.90	<2.70	<2.50	<2.60	<2.50
Sodium	<1,130	<1,120	<1,370	<1,340	<1,470	546	<1,250	<1,290	<1,250
Thallium	<2.30	<2.20	<2.70	<2.70	<2.90	<2.70	<2.50	<2.60	<2.50
Vanadium	64.0	74.3	84.2	86.1	85.8	86.5	85.8	98.2	91.6
Zinc	35.8	48.9	53.9	43.8	53.4	123	51.7	52.7	58.4
Miscellaneous (%)									
Percent Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA

Results in brackets [##] represent duplicate sample concentrations.

Notes:
(a) USEPA (2008) Regional Soil Screening Levels (RSLs) for the soil to groundwater pathway.
Qualifier Definitions:
B - compound water detected in associated blank.
J - concentration is estimated
R - rejected
U - compound was analyzed for but not detected
E - concentration exceeds the upper calibration limit
L - concentration is biased low
K - concentration is biased high

Boring Logs

ARCADIS

Sample/Core Log

Boring/Well ASB010 Project/No GP08RAAP.0031.DF000 Page 1 of 1

Site Location Radford, VA Drilling Started 6/30/2008 Drilling Completed 6/30/2008

Total Depth Drilled 6 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macrocore w/ acetate liner

Length and Diameter of Coring Device 4-feet long by 2-inch diameter Sampling Interval (0'-1') 15:50 (5'-6') 15:55 feet

Land-Surface Elev. NA feet NA Surveyed NA Estimated Datum NA

Drilling Fluid Used NA Drilling Method Direct-push

Drilling Contractor Columbia Technologies Driller JK Helper NA

Prepared By SG, MC Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	3	3	0.0	NA	0'-1.5' Reddish-brown, Silt and Clay, trace fine sand and root hairs,
					very stiff, dry.
					1.5'-3' Reddish-brown mottled Clay and Silt, trace fine micaeous
					sand, very stiff, dry.
3	6	3	0.0	NA	3'-3.5' Reddish-brown mottled Clay and Silt, trace fine micaeous
					sand, very stiff, dry.
					3.5'-6' medium stiff, moist, silt, trace fine sand, orange brown
6					END BORING

ARCADIS

Sample/Core Log

Boring/Well: ASB009 | Project/No: GP08RAAP.0031.DF000 | Page: 1 of 1

Site Location: Radford, VA | Drilling Started: 6/30/2008 | Drilling Completed: 6/30/2008

Total Depth Drilled: 6 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macrocore w/ acetate liner

Length and Diameter of Coring Device: 4-feet long by 2-inch diameter | Sampling Interval: (0'-1') 16:05 MS/MSD; (5'-6') 16:10 feet

Land-Surface Elev.: NA feet | NA Surveyed | NA Estimated | Datum: NA

Drilling Fluid Used: NA | Drilling Method: Direct-push

Drilling Contractor: Columbia Technologies | Driller: JK | Helper: NA

Prepared By: SG, MC | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	3	2.8	0.0	NA	0'-1.8' Medium brown Silt and Clay; trace sand, gravel,
					and roadbed fill; very stiff.
					1.8'-3' Reddish-brown Silt, trace fine sand, moist.
3	6	3	0.0	NA	3'-6' Reddish-brown Silt, trace fine sand, moist. Trace black
					staining from 4' to 6'.
6					END BORING

ARCADIS

Sample/Core Log

Boring/Well ASB008 Project/No GP08RAAP.0031.DF000 Page 1 of 1

Site Location Radford, VA

Drilling Started 6/30/2008

Drilling Completed 6/30/2008

Total Depth Drilled 6 Feet

Hole Diameter 2 inches

Type of Sample/ Coring Device Macrocore w/ acetate liner

Length and Diameter of Coring Device 4-feet long by 2-inch diameter

Sampling Interval (0.5'-1.5') 16:25 (5'-6') 16:30 feet

Land-Surface Elev. NA feet NA Surveyed NA Estimated

Datum NA

Drilling Fluid Used NA

Drilling Method Direct-push

Drilling Contractor Columbia Technologies

Driller JK

Helper NA

Prepared By SG, MC

Hammer Weight NA

Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	3	3	0.0	NA	0'-0.5' Asphalt Roadbed and Topsoil.
			0.0		0.5'-3' Reddish-brown Silt and Clay, trace fine micaceous sand, stiff.
3	6	3	0.0	NA	3'-4' Reddish-brown Silt and Clay, trace fine micaceous sand, stiff.
					4'-6' Reddish-brown Silt, some fine micaceous sand, medium stiff,
					crumbles easily, moist.
6					END BORING

ARCADIS

Sample/Core Log

Boring/Well ASB007 Project/No GP08RAAP.0031.DF000 Page 1 of 1

Site Location Radford, VA

Drilling Started 6/30/2008 Drilling Completed 6/30/2008

Total Depth Drilled 6 Feet Hole Diameter 2 inches

Type of Sample/ Coring Device Macrocore w/ acetate liner

Length and Diameter of Coring Device 4-feet long by 2-inch diameter

Sampling Interval (0-1) 16:35 (5-6) 16:40 feet

Land-Surface Elev. NA feet NA Surveyed NA Estimated

Datum NA

Drilling Fluid Used NA

Drilling Method Direct-push

Drilling Contractor Columbia Technologies

Driller JK Helper NA

Prepared By SG, MC

Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	3	3	0.0	NA	0'-1' Silt and Clay, trace fine sand and root hairs, stiff, dry.
					1'-3' Reddish-brown Silt and Clay, trace fine sand and root hairs, very stiff,
					crumbles easily, dry. Trace black staining.
3	6	3	0.0	NA	3'-6' Yellow-brown mottled Silt, little clay, trace fine sand, stiff. Trace black
					speckles from 4' to 6'.
6					END BORING

ARCADIS

Sample/Core Log

Boring/Well ASB005 Project/No GP08RAAP.0031.DF000 Page 1 of 1

Site Location Radford, VA

Drilling Started 6/30/2008 Drilling Completed 6/30/2008

Total Depth Drilled 1 Feet Hole Diameter 3 inches Type of Sample/ Coring Device Hand Auger

Length and Diameter of Coring Device 6-inches long by 3-inch diameter

ASB DUP 001(0-1') 17:15
Sampling Interval (0-1') 17:15 feet

Land-Surface Elev. NA feet NA Surveyed NA Estimated Datum NA

Drilling Fluid Used NA Drilling Method Hand Auger

Drilling Contractor Columbia Technologies Driller JK Helper NA

Prepared By SG, MC Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	1	1	0.0	NA	0'-1' Reddish-brown Silt; trace fine sand, gravel, and root hairs; moist.
1					END OF BORING

ARCADIS

Sample/Core Log

Boring/Well ASB003 Project/No GP08RAAP.0031.DF000 Page 1 of 1

Site Location Radford, VA

Drilling Started 6/30/2008 Drilling Completed 6/30/2008

Total Depth Drilled 1 Feet Hole Diameter 3 inches Type of Sample/ Coring Device Hand Auger

Length and Diameter of Coring Device 6-inches long by 3-inch diameter Sampling Interval (0-1') 17:30 feet

Land-Surface Elev. NA feet NA Surveyed NA Estimated Datum NA

Drilling Fluid Used NA Drilling Method Hand Auger

Drilling Contractor Columbia Technologies Driller JK Helper NA

Prepared By SG, MC Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	PID Reading (ppm)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0	1	1	0.0	NA	0'-1' Brown Silty Fine Sand, little gravel, trace fill.
1					END OF BORING