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CORPORATE QUALITY ASSURANCE PLAN

Prepared by and for:
SAVANNAH LABORATORIES AND ENVIRONMENTAL SERVICES, INC.

Savannah Division
5102 LaRoche Avenue
Savannah, GA 31404
912-354-7858

Deerfield Beach Division
414 SW 12th Avenue
Deerfield Beach, FL 33442
954-421-7400

Tallahassee Division
2846 Industrial Plaza Drive
Tallahassee, FL 32317
850-878-3994

Tampa Bay Division
6712 Benjamin Road, Suite 100
Tampa, FL 33634
813-885-7427

Mobile Division
900 Lakeside Drive
Mobile, AL 36693
334-666-6633

James W. Andrews
President

1/21/98
Date

R. Wayne Robbins
Corporate QA Manager

1/21/98
Date

January, 1998
Revision: 0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2-Chlorophenol (MS)	8040/8041(3510/3520)	2	10-164	0-28	1.2	10	M
4-Chloro-3-methylphenol (MS)	8040/8041(3510/3520)	2	10-165	0-33	1.2	10	M
2,4-Dichlorophenol	8040/8041(3510/3520)	2	56-106	0-21	1.3	10	M
2,6-Dichlorophenol	8040/8041(3510/3520)	2	68-110	0-23	1.4	10	M
2,4-Dimethylphenol	8040/8041(3510/3520)	2	56-111	0-30	1.3	10	M
2,4-Dinitrophenol	8040/8041(3510/3520)	2	28-119	0-36	1.1	50	M
2-Methyl-4,6-dinitrophenol	8040/8041(3510/3520)	2	28-154	0-33	1.1	50	M
3- and 4-Methylphenol (m & p cresol)	8040(3520)/ 8041(3510/3520)	2	10-150	0-50	3.3	10	M
2-Methylphenol (o-cresol)	8040(3520)/ 8041(3510/3520)	2	10-150	0-50	1.8	10	M
Cresols (total)	8040/8041(3510/3520)	2	NA	NA	5.1	10	
2-Nitrophenol	8040/8041(3510/3520)	2	49-111	0-26	1.0	10	M
4-Nitrophenol (MS)	8040/8041(3510/3520)	2	10-171	0-33	1.2	50	M
Pentachlorophenol (MS)	8040/8041(3510/3520)	2	10-216	0-28	1.3	50	M
Phenol (MS)	8040/8041(3510/3520)	2	10-147	0-56	1.0	10	M
2,3,4,5-Tetrachlorophenol	8040(3520)/ 8041(3510/3520)	2	50-150	0-40	2.5	20	M
2,3,4,6-Tetrachlorophenol	8040(3520)/ 8041(3510/3520)	2	50-150	0-40	3.1	20	M
Tetrachlorophenols (2,3,4,5 & 2,3,4,6)	8040/8041(3510/3520)	2	50-150	0-40	5.6	20	M
2,4,5-Trichlorophenol	8040(3520)/ 8041(3510/3520)	2	53-119	0-40	4.4	10	M
2,4,6-Trichlorophenol	8040/8041(3510/3520)	2	56-114	0-30	1.9	10	M
Trichlorophenols (2,4,5 & 2,4,6)	8040/8041(3510/3520)	2	53-119	0-40	6.3	10	M
Surrogate - 2,4,6-Tribromophenol	8040/8041(3510/3520)	2	14-144	NA	NA	NA	M

2.0 TABLE OF CONTENTS

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9.0	Calibration Procedures and Frequency	20	0	1/98
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3.0 STATEMENT OF POLICY

Savannah Laboratories is committed to providing quality data and will endeavor to use good quality control and quality assurance practices for all field sampling and laboratory analytical procedures.

The objectives of the QA program are to:

(1) Properly collect, preserve, and store all samples;

(2) Maintain adequate custody records from sample collection through reporting and archiving of results;

(3) Provide adequate training to all analysts to ensure that approved procedures specified in this quality assurance plan and the standard operating procedures are followed without regard to scheduling or financial incentives. This training emphasizes that it is the responsibility of all analysts to follow approved SOPs and the QA Plan.

(4) Produce defensible data with associated documentation to show that each system was calibrated and operating within precision and accuracy control limits;

(5) Accurately calculate, check, and report all data using the Laboratory Information Management System; and

(6) Document all the above activities in order that all data can be internally evaluated and independently validated in a consistent manner to improve data quality and customer service.

Savannah Laboratories intends to follow EPA guidance for all methods referenced in this plan and to conform to EPA and state regulatory agency guidelines for each project reported. Any changes in EPA or state regulatory agency guidelines will be incorporated during periodic revisions of this plan and the appropriate standard operating procedures.

Adherence to the procedures of this plan is assured by the assignment of an experienced project manager to each project. The project manager coordinates and is responsible for all phases of Savannah Laboratories' involvement in the project, including pre-project planning, sample bottle preparation, field sampling, computer entry of work orders, approving analytical and quality control data, final review of report, and discussion of results with client. The project managers are assisted by full-time QA officers and QC staff at each laboratory. In the absence of a Project Manager, another knowledgeable Project Manager or the Lab Director will serve as backup.

The QA Plan is utilized by all five Savannah Laboratories facilities. Additionally, all labs operate under the same set of standard operating procedures (SOPs), and all data are incorporated into a single Laboratory Information Management System (LIMS) network which generates common QC limits, etc., and is accessible to all employees. Each project is directed by a single project manager who directs all employees involved on the project, and also reviews, approves, and signs all data reports.

The QA Plan is administered by the QA Officers in each Division. Each QA Officer is independent of production, and in their absence, the Laboratory Director will serve as the QA Officer's backup on quality issues.

Savannah Laboratories' quality assurance procedures are designed to ensure protection of client's confidentiality and proprietary rights. Data and associated client records are stored in secure locations and all Savannah Laboratories' employees sign an agreement to not divulge information to any third party without written authorization from the client.

The following sections detail the organizational structures and procedures through which all laboratory results are generated.

3.1 Sub-Contractor Policy

Generally, all analytical services required for a client's project can be provided by the primary SL division receiving the samples or by a laboratory in the SL network. Certain projects, however, may have requirements that necessitate the use of a sub-contractor. If required, analytical services are provided by approved sub-contractors with the full knowledge and consent of the client. Sample custody is maintained for all samples sent to sub-contractors and samples are shipped to the sub-contract lab with sufficient time to perform the preparation and/or analysis within the analytical holding time.

Sub-contractors are approved by SL Corporate Management after review of the sub-contractor's Quality Assurance Manual, appropriate SOPs, performance evaluation sample results, and other appropriate qualification information. When necessary, an on-site audit is performed. If the client specifies a sub-contractor that has not been approved by SL, it is the responsibility of the client to qualify the sub-contractor. An approved sub-contract agreement is maintained with all vendors supplying analytical services to SL and a list of approved sub-contractors is available to all labs in the SL network. The sub-contractor's analytical report is provided to the client or the data are transferred to the Savannah Laboratories' report. In the latter case, the sub-contracted items and sub-contracted laboratory are identified in the report footnotes.

4.0 ORGANIZATION AND RESPONSIBILITY

Savannah Laboratories and Environmental Services, Inc. has laboratory facilities in, and conducts field operations from, Savannah, Georgia; Tallahassee, Florida; Mobile, Alabama; Deerfield Beach, Florida; and Tampa, Florida. All five facilities are structured under a common administrative, data management, and quality assurance (QA) system as outlined in Figures 4.1, 4.2, 4.3, 4.4, 4.5, and 4.6.

4.1 PERSONNEL RESPONSIBILITIES

The five laboratories have a combined staff of over 400 professional and support personnel. Responsibilities of key personnel are as follows:

A) Company President

1) Establish corporate policy;

2) Plan and oversee laboratory infrastructure construction/ acquisition;

3) Negotiate contractual agreements; and

4) Other administrative and budgetary functions.

B) Company Vice President

1) Provide guidance to lab directors;

2) Establish and maintain company-client relationships; and

3) Assist president in establishing and carrying out corporate policy.

C) Secretary/Comptroller

1) Coordinate risk management and insurance program;

2) Prepare financial reports;

3) Coordinate Human Resources, Payroll and Accounts Receivable sections;

4) Keep corporate minutes and records; and

5) Review contracts and subcontracts.

D) Treasurer

1) Prepare financial reports and cost accounting reports;

2) Coordinate purchasing, accounts payable and accounting sections;

3) Assist corporate officers with budgetary problems;

4) Maintain equipment and facilities inventory; and

5) Coordinate maintenance program.

6) Ensure compliance and establish corporate policy for safety, waste disposal and shipping of hazardous materials.

E) Corporate Technical Staff

1) Provide technical support for all divisions;

2) Coordinate QA/QC and technical activities affecting all divisions;

3) Write SOPs and other technical documents;

4) Inform all divisions about method changes;

5) Evaluate new methodologies, instruments, and data processing hardware and software;

F) Corporate Quality Assurance Manager

1) Provide technical support for all divisions;

2) Coordinate QA/QC and technical activities affecting all divisions;

3) Write SOPs and other technical documents;

4) Inform all divisions about method changes;

5) Coordinate annual audits of divisions with President

6) Coordinate compilation and implementation of the Comprehensive QA Plan.

G) Marketing Director

1) Coordinate corporate marketing efforts with laboratory director, project directors, project managers, and marketing department;

2) Assist executive officers in defining corporate marketing policy;

3) Coordinate proposal process; and

4) Schedule trade shows, presentations, advertising and regional marketing efforts.

H) Corporate Administrative Staff

1) Manage Accounting, Human Resources, and other corporate departments;

2) Coordinate business managers;

3) Manage corporate-wide environmental and safety programs; and

4) Assist corporate officers on all administrative, safety and environmental issues.

I) Corporate Compliance Manager

1) Ensure that the Corporate Hazardous Waste Procedures and Waste Minimization

Policies are implemented at all SL Divisions:

2) Review monthly hazardous waste generation reports for each SL Division

3) Review each Division's hazardous waste manifests for accuracy and completeness;

4) Ensure that the Corporate Safety and Chemical Hygiene Plan is implemented at all SL Divisions;

5) Advise senior management of waste and safety issues that need corrective action and implement as defined.

J) Laboratory Director

1) Responsible for day-to-day operation of lab;

2) Provide project manager guidance;

3) Establish production priorities; and

4) Approve hiring decisions.

K) Project Manager

1) Initial contact with client on individual job tasks;

2) Prepare all work plans, schedules and manpower allocations;

3) Initiate all procurement for the projects;

4) Day-to-day direction of the project team;

5) Coordinate financial and contractual aspects of the projects;

6) Provide formatting and technical review of all reports;

7) Provide day-to-day communication with the client;

8) Exercise final review and approval on all reports and invoices for the project; and

9) Respond to post project inquiries.

L) QA Officer

1) Implement the provisions of the quality system as specified in the corporate quality assurance plan;

2) Coordinate with the project manager, and laboratory managers in order to ensure that project QA is maintained;

3) Be available to discuss QA activities and results with project managers;

4) Prepare QA reports to management;

5) Perform periodic system audits and coordinate all external QA audits;

6) Review not-in-compliance reports and approve corrective actions;

7) Coordinate the preparation and approval of all QA plans, method SOPs, QA audit responses, data packages; and

8) Coordinate training program.

M) Laboratory Manager

1) Coordinate all production activities;

2) Work with project managers to ensure project objectives are met;

3) Provide guidance to department managers; and

4) Interview and hire technical personnel.

N) Custody/Data Manager

1) Schedule bottle orders and supervise bottle prep staff;

2) Supervise custody staff;

3) Coordinate with project manager and field/sampling manager on scheduling field sampling efforts;

4) Identify and document custody discrepancies and communicate with the project manager and client on custody problems; and

5) Supervise data management staff including computer login, data entry, report preparation, and data archiving personnel.

O) Field/Sampling Manager

1) Coordinate and schedule sampling crews;

2) Prepare sampling reports; and

3) Ensure sampling protocols are followed.

P) Department Manager/Supervisor/Technical Manager

1) Organize work flow in department;

2) Assure adequate inventory of reagents and equipment;

3) Ensure effective maintenance and repair of instrumentation;

4) Investigate and evaluate new methodology and equipment; and

5) Ensure proper training is conducted.

6) Assure quality objectives are met for the department.

Q) Office Manager

1) Assist laboratory director with all administrative and financial activities;

2) Coordinate all procurement/receiving with corporate procurement department;

3) Coordinate posting of all invoices with corporate accounts receivable department;

4) Assist comptroller and laboratory directors with collection of receivables;

5) Maintain inventory of all facilities and equipment;

6) Coordinate all human resources and payroll activities; and

7) Maintain petty cash and coordinates laboratory expenditures with corporate accounting department.

R) Analyst

1) Perform preparation and/or analysis of samples using approved procedures;

2) Calculate, check, and report data in accordance with approved procedures and the Quality Assurance Plan;

3) Perform instrument maintenance and maintain instrument logs; and

4) Maintain proper documentation of all analytical steps.

S) Lab Technicians

1) Assist analysts in sample preparation and data collection;

2) Perform routine checks for data quality objectives-surrogate recoveries, LCS/MS recoveries, initial evaluation of dilutions, internal standards areas, and method blanks;

3) Assist analysts in maintaining traceability of standards and samples; and

4) Assist analysts in preparing samples, extracts, or digests for analysis; and

5) Check samples for proper preservation and maintain department sample receipt logs and chain-of-custody.

T) Custody Technician

1) Prepare and ship sample containers and/or receive samples from clients;

2) Check sample temperature and sample integrity upon receipt;

3) Maintain and sign appropriate chain-of-custody records;

4) Distribute samples to the appropriate lab department; and

5) Composite samples for testing prior to disposal.

U) Data Technician

1) Check data packages against data quality objectives;

2) Check final results against the LIMS report; and

3) Paginate and collate all items in data packages.

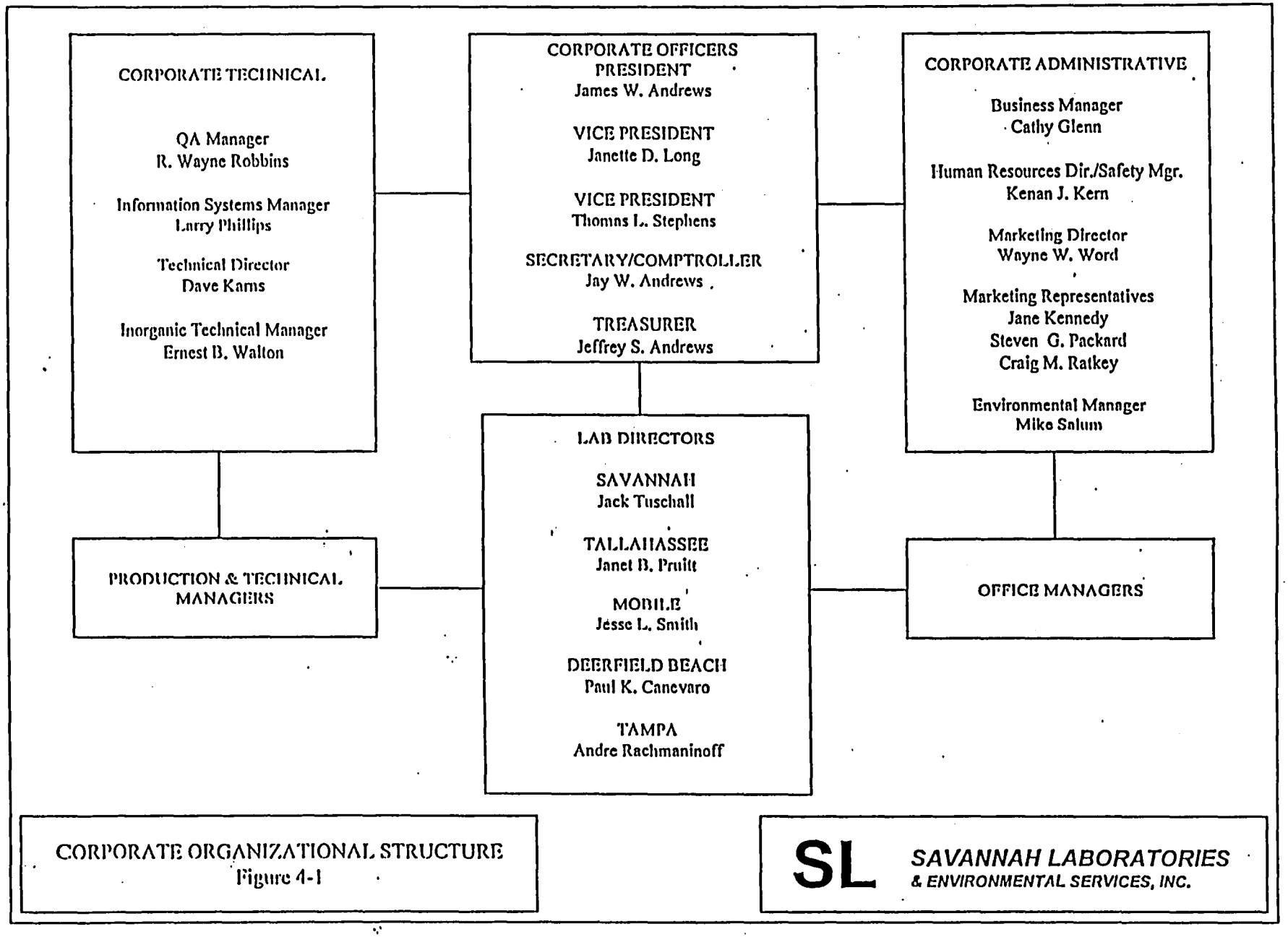
V) Compliance Officer

1) Provides technical assistance in complying with corporate policies concerning safety, waste, and shipping;

2) Assists project managers/lab director in developing appropriate safety precautions for new projects;

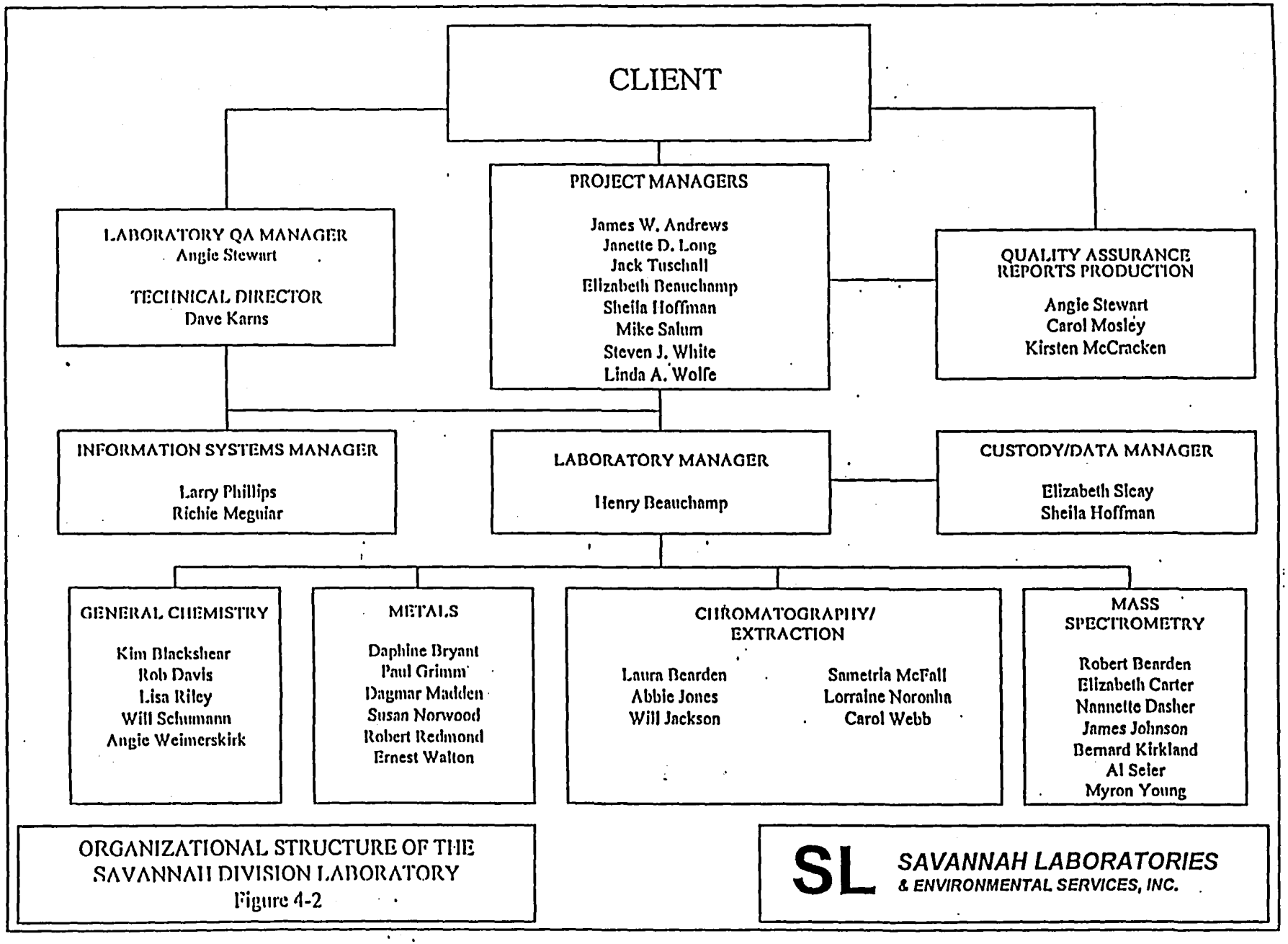
3) Monitors collection and disposal of chemical wastes;

4) Ensures employees comply with safety and waste disposal plans.



CORPORATE ORGANIZATIONAL STRUCTURE
Figure 4-1

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE SAVANNAH DIVISION LABORATORY
Figure 4-2

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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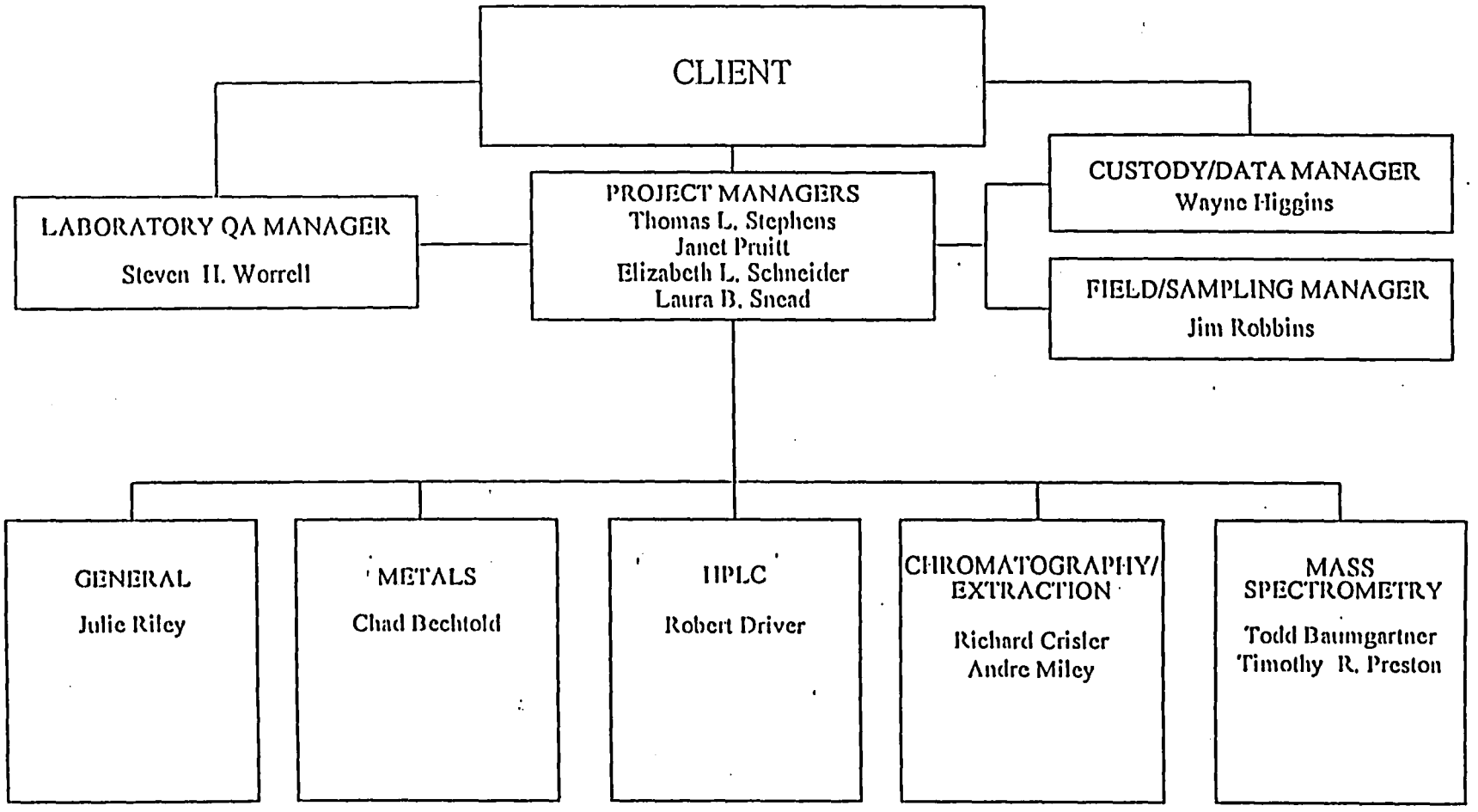
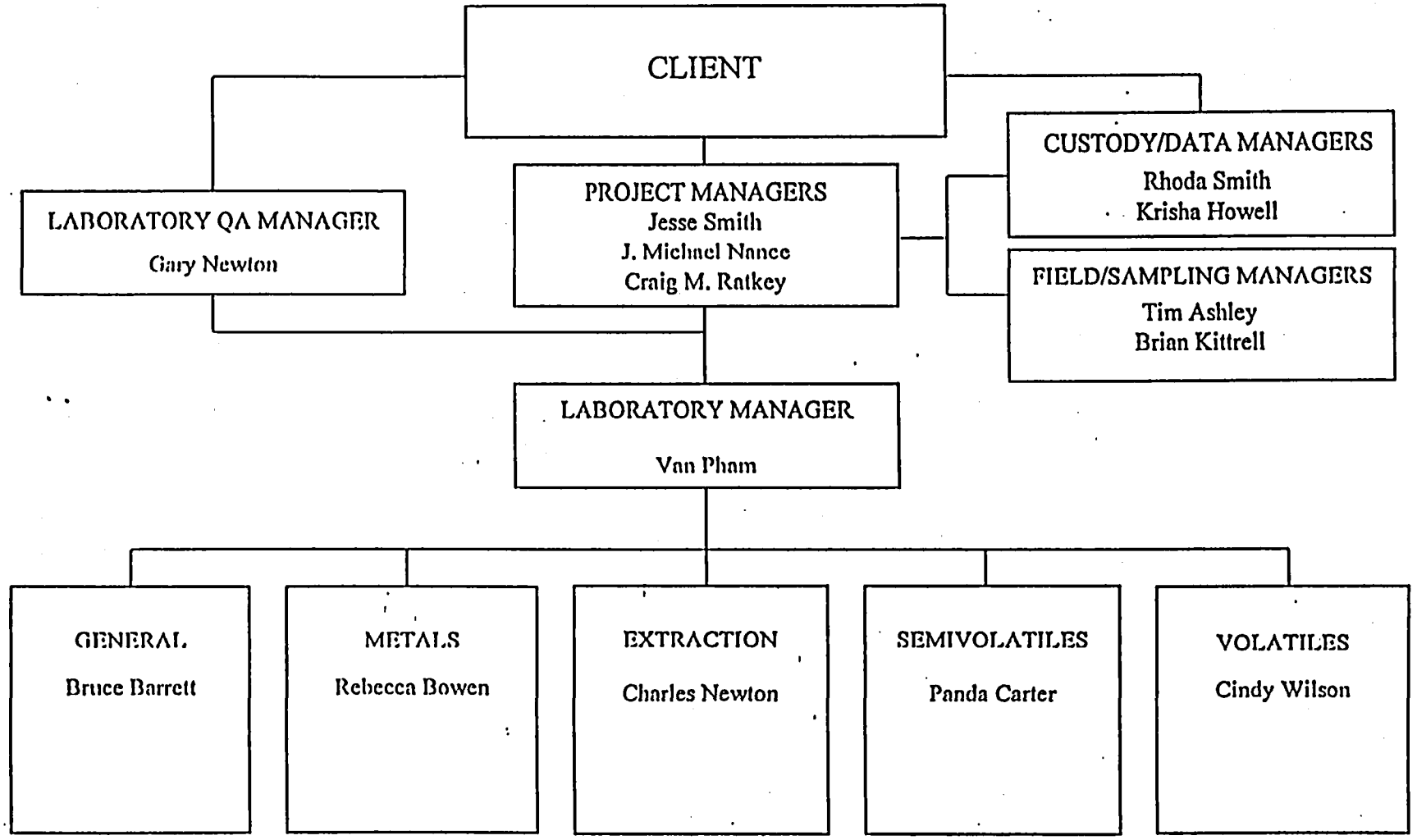


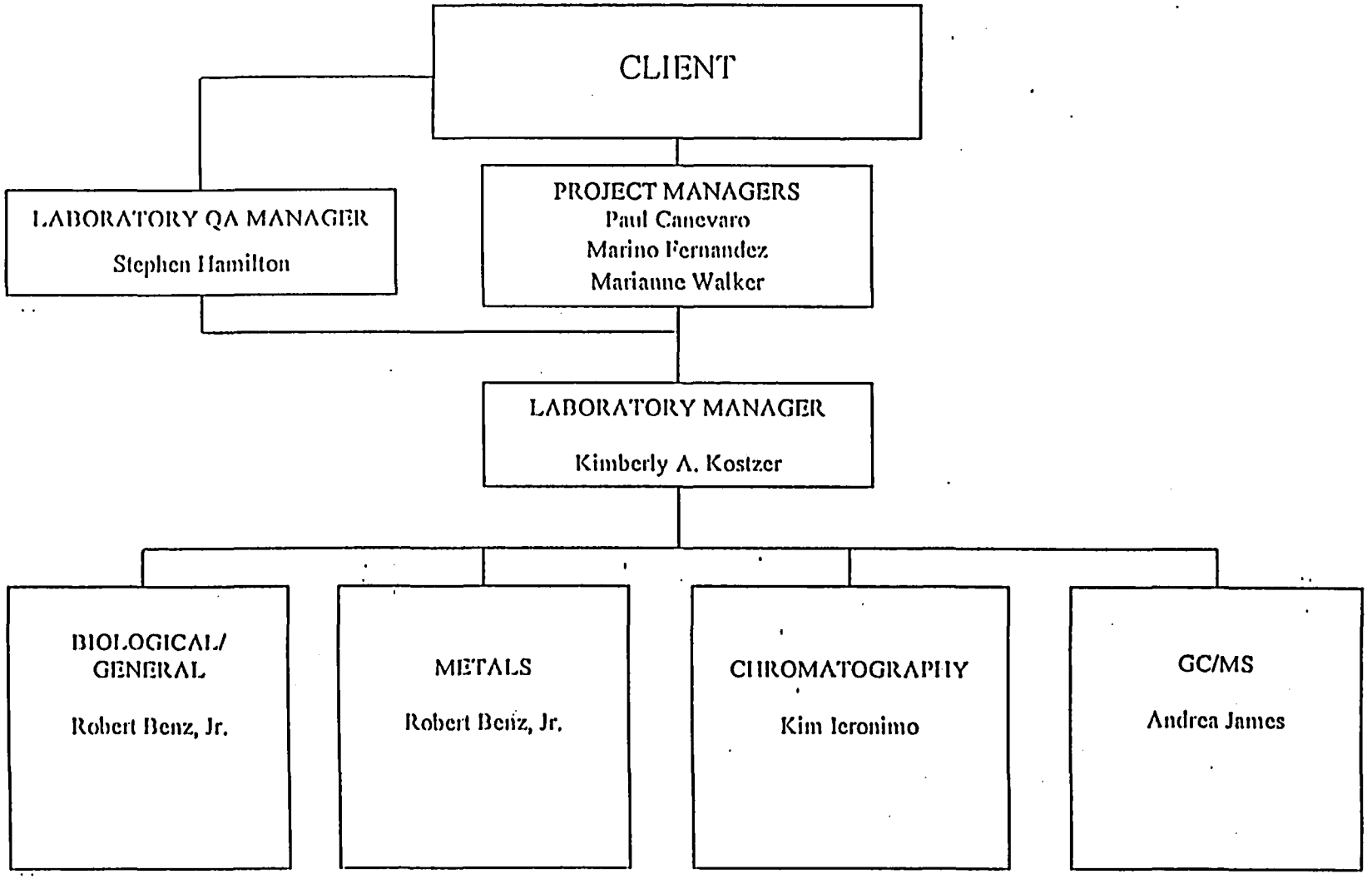
ORGANIZATIONAL STRUCTURE OF THE TALLAHASSEE DIVISION LABORATORY
Figure 4-3

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.



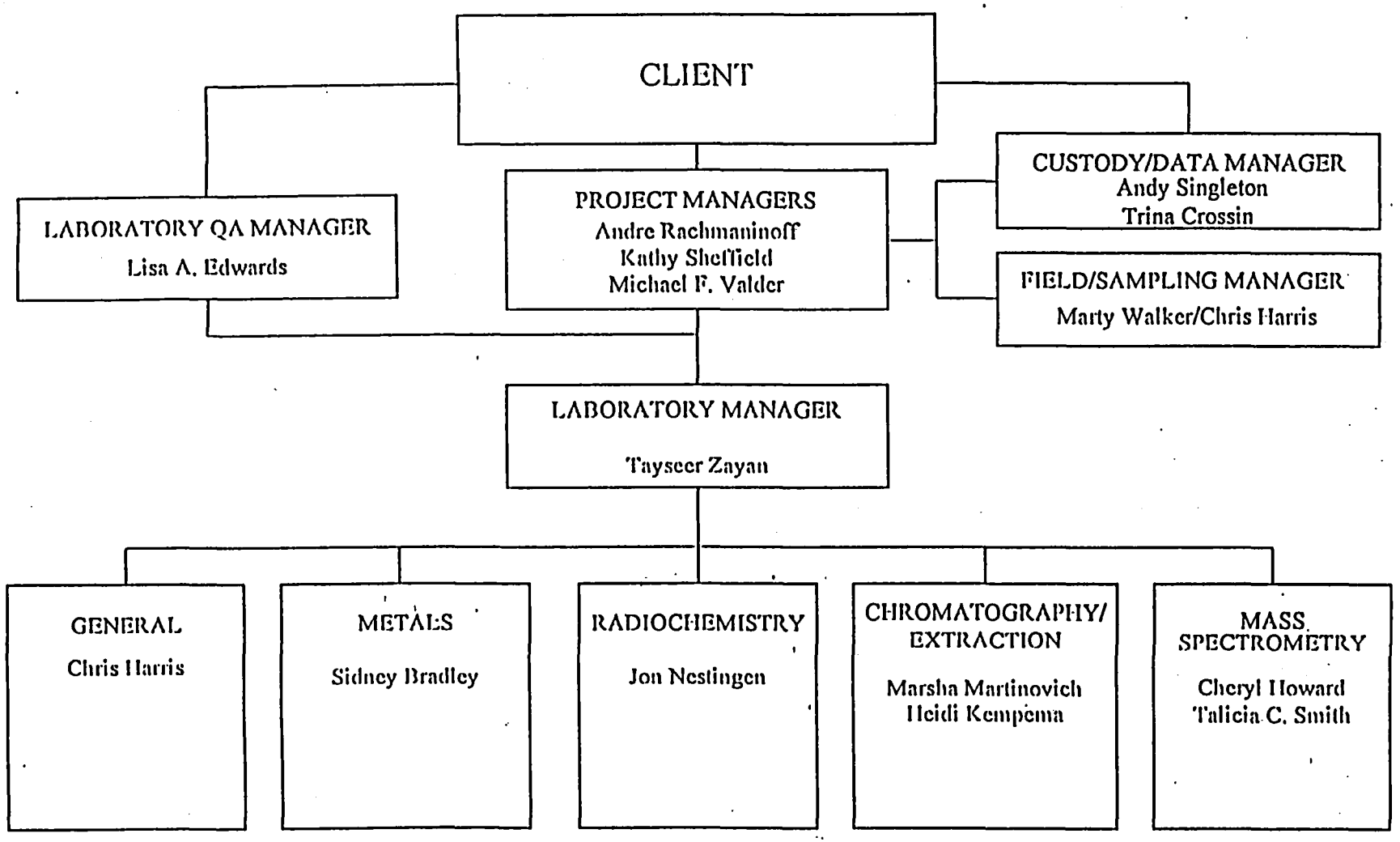
ORGANIZATIONAL STRUCTURE OF THE
MOBILE DIVISION LABORATORY
Figure 4-4

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE DEERFIELD BEACH DIVISION LABORATORY
Figure 4-5

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE TAMPA DIVISION LABORATORY
Figure 4-6

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

4.2 LABORATORY FACILITIES

Each of the five full-service laboratories are custom designed to accommodate modern instrumentation, permit highly efficient utilization of space, minimize employee exposure, and to reduce the potential of sample contamination. The volatile organics (VOC) analytical areas are completely isolated from the semivolatile extraction areas in order to prevent sample and blank contamination by methylene chloride, acetone, carbon disulfide and other solvent vapors. An isolated standards preparation room with a separate air conditioning/ heating system has been developed for dioxin and other hazardous substance testing.

4.3 RESOURCE COMMITMENT

State-of-the-art automation equipment is utilized, as appropriate per the methods, to operate each instrument at maximum efficiency. Instrumentation is summarized in Table 9.1. This table includes the instrument type, date, model, and date of purchase by Savannah Laboratories. Table 9.2 summarizes a cumulative total of instrumentation in all divisions.

4.4 COMPUTER SYSTEMS

SL's operations are highly computerized in order to efficiently collect and archive data and QA results. Over 100 individual computers are used in our data generation and archiving process. The primary LIMS software runs on an NCR M3455 which is centralized at the Savannah facility and communicates with each of the five laboratories via wide area network (WAN) dedicated telephone/data lines. The software utilized on the system is designed around a highly versatile UNIX/PICK relational data base. Each module of the system interacts with the other modules in order to eliminate the need for re-entry of information; thus, improving production and reducing entry errors. Section 7.0 provides a detailed discussion on the SL computer systems.

4.5 CONTINGENCY PLAN

In case of a disaster such as a hurricane, the laboratory network would be available to provide continuity for all projects to ensure meeting sample holding time or critical project schedule requirements. In general, each facility has at least one backup unit for each critical unit. In the event of instrument failure, portions of the sample load may be diverted to duplicate instrumentation within each facility, the analytical technique switched to an alternate approved technique (such as manual colorimetric determination as opposed to automated colorimetric determination), or samples shipped to another properly certified or approved Savannah Laboratories location (where identical QA procedures and instruments are utilized).

The LIMS is linked to a UPS system in order to respond to power outages, hurricanes, computer failure and other disasters. In addition to this provision, a back-up computer operates on a real-time basis at the Tallahassee, Florida facility. In case of emergency, this backup system can be immediately accessed by the laboratories and allows all laboratories to continue functioning until the primary system is back on line.

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5.0 QUALITY ASSURANCE OBJECTIVES (PRECISION, ACCURACY, AND DETECTION LIMITS)

Savannah Laboratories has a comprehensive quality assurance program which is based on the program outlined in EPA's *Requirements for Quality Assurance Project Plans for Environmental Data Operations* , EPA QA/R-5, Interim Final August 1994, in the *Handbook for Analytical Quality Control in Water and Wastewater Laboratories* (EPA, 1979), Chapter 1, Final Updates I, II, IIB, and III of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), and in the Association of Official Analytical Chemists' *Quality Assurance Principles for Analytical Laboratories*.

The key to Savannah Laboratories QA/QC program is strict adherence to the program during all phases of the project including: presampling discussions; sample collection, preservation, transportation and storage; sample login and tracking; laboratory analyses; and validation and reporting of results.

Project and QC data from all facilities are entered into a single Laboratory Information Management System (LIMS). The LIMS provides a computerized mechanism for storing field and login information, tracking sample holding times, scheduling and preparing laboratory work sheets, storing results and QC data, reviewing results and relating them to their corresponding QC data, and printing reports and invoices. The project manager, QA manager, and data management and reporting personnel have direct access via a CRT terminal to all project and QA data from all five facilities.

Tables 5.1 and 5.2 list the laboratory parameters determined by Savannah Laboratories, the methodology, the QA objectives for precision, accuracy and the normal method detection limits (MDLs) for relatively clean environmental samples. Table 5.3 gives the same information for TCLP samples. Tables 5.4 through 5.7 provide information for air, biological tissue, wipes and oily samples, and Table 5.8 provides information for field parameters.

PRECISION

Relative percent difference is used to express precision between two replicate values. In routine analyses, the values for most parameters are usually below quantitation limits; therefore, precision data are derived from duplicate or matrix spike duplicate results. Precision is used to evaluate matrix bias and is not used for method control, except where required in a specific quality assurance plan.

The relative percent difference (RPD) is calculated as:

$$\%RPD = \left| \frac{V1 - V2}{\left(\frac{V1 + V2}{2} \right)} \right| \otimes 100$$

V1, V2 = The two values (concentration for duplicates and percent recovery for spikes) obtained by analyzing the duplicate samples or matrix spike and matrix duplicate or lab control standard and lab control standard duplicate.

ACCURACY

Accuracy control limits are produced from environmental matrix spike data. Percent recovery (%R) is used to express accuracy. The percent recovery (%R) is calculated as below:

$$\%REC = \frac{SPV - SAV}{SA} \otimes 100$$

SPV = Value obtained by analyzing the sample with the spike added
SAV = The background value, value obtained by analyzing the unspiked sample
SA = Concentration of the spike added to the sample

COMPARABILITY

Savannah Laboratories strives for comparability of results through evaluation of data against established precision and accuracy limits. Strict adherence to QA/QC procedures promotes the comparability of one set of reference data to another or comparability of data among all facilities.

REPRESENTATIVENESS

The Savannah Laboratories objective for representativeness of field samples is to ensure that a set of data accurately depicts the chemical or biological characteristics of a sample source. Representativeness is enhanced by an attempt to mix samples prior to aliquot removal. Results are considered reliable and representative if the sample results distribution is within statistically defined bounds of the population mean and variance.

COMPLETENESS

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. Savannah Laboratories strives to maintain 90 percent completeness. However, since completeness goals for individual projects include factors which are outside the laboratory's control (e.g., samples broken or lost in shipment, samples received outside holding times, field sampling problems, data impacted by matrix interferences), project completeness goals may not always be achieved by the laboratory. The formula for calculation of completeness appears below.

$$\text{Percent completeness} = \frac{\text{number of valid results}}{\text{maximum number of expected resuts}} \otimes 100$$

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Aluminum (ICP)	200.7(Drinking Water)	86	70-130	0-20	11	200	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	34	200	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	69	200	M
	6010(3015)	2	75-125	0-20	17	200	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	200	200	M
Antimony (ICP)	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	31	50	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	3.8	20	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	31	50	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	4.0	20	M
	6010(3015)	2	75-125	0-20	17	50	M
	6010(3015)-T	2	75-125	0-20	4.0	20	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	60	60	M
Antimony (GFAA)	200.9	86	80-120	0-20	0.89	6.0	M
	204.2	3	80-120	0-20	2.1	10	M
	3113B(3030E)	4	80-120	0-20	2.1	6.0	M
	7041(3005)	2	80-120	0-20	1.2	10	M
	7041(3015)	2	80-120	0-20	1.2	10	M
Arsenic (ICP)	200.7 (Drinking Water)	86	70-130	0-30	11	100	M
	200.7 (Drinking Water)-T	86	70-130	0-30	0.99	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	26	100	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	2.4	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	26	100	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	3.4	10	M
	6010(3015)	2	75-125	0-20	20	100	M
	6010(3015)-T	2	75-125	0-20	4.0	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	10	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
Arsenic (GFAA)	200.9	86	80-120	0-20	1.4	4.0	M
	206.2	3	80-120	0-20	2.0	10	M
	3113B(3030E)	4	80-120	0-20	2.0	4.0	M
	3114B	4	80-120	0-20	0.40	2.0	M
	7060(3015)	2	80-120	0-20	3.0	10	M
	7060(3020)	2	80-120	0-20	1.5	10	M
	7062(3010)	2	80-120	0-20	0.40	2.0	M
Barium (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.5	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.17	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	2.2	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.41	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	2.2	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.41	10	M
	6010(3015)	2	75-125	0-20	3.9	10	M
	6010(3015)-T	2	75-125	0-20	0.73	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	200	200	M
Beryllium (ICP)	200.7(Drinking Water)	86	70-130	0-20	0.16	4.0	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.039	4.0	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	0.86	5.0	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.064	5.0	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	1.6	5.0	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.063	5.0	M
	6010(3015)	2	75-125	0-20	1.5	5.0	M
	6010(3015)-T	2	75-125	0-20	0.078	5.0	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5.0	5.0	M
Beryllium (GFAA)	210.2	3	80-120	0-20	1.3	5.0	M
	7091(3020)	2	80-120	0-20	1.2	5.0	M
Boron (ICP)	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	6.8	50	M
	6010(3010)/ 200.7(NPDES)	2/3	75-125	0-20	6.8	50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
Cadmium (ICP)	200.7(Drinking Water)	86	70-130	0-20	0.77	5.0	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.12	5.0	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	3.9	5.0	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.35	5.0	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.2	5.0	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.25	5.0	M
	6010(3015)	2	75-125	0-20	2.5	5.0	M
	6010(3015)-T	2	75-125	0-20	0.61	5.0	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5.0	5.0	M
Cadmium (GFAA)	200.9	86	80-120	0-20	0.25	1.0	M
	213.2	3	80-120	0-20	0.19	1.0	M
	3113B(3030E)	4	80-120	0-20	0.19	1.0	M
	7131(3015)	2	80-120	0-20	0.34	1.0	M
	7131(3020)	2	80-120	0-20	0.13	1.0	M
	Chelation/Extraction	5	60-140	0-40	0.0071	0.050	M
Calcium (ICP)	200.7(Drinking Water)	86	70-130	0-20	25	500	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	19	500	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	36	500	M
	6010(3015)	2	75-125	0-20	35	500	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5000	5000	M
Chromium (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.6	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.38	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	4.4	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.51	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	4.4	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	1.6	10	M
	6010(3015)	2	75-125	0-20	4.1	10	M
	6010(3015)-T	2	75-125	0-20	2.1	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	10	10	M
Chromium (GFAA)	200.9	86	80-120	0-20	2.5	10	M
	218.2	3	80-120	0-20	0.54	10	M
	3113B(3030E)	4	80-120	0-20	0.54	10	M
	7191(3015)	2	80-120	0-20	1.2	10	M
	7191(3020)	2	80-120	0-20	0.54	10	M
Chromium, hexavalent	200.7(218.4)	86/3	70-130	0-30	5.0	5.0	M
	7195	2	85-115	0-20	2.3	10	M
(colorimetric)	7196/3500-Cr-D	2/4	85-115	0-20	2.7	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Cobalt (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.6	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.32	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	3.4	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.66	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.4	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	1.1	10	M
	6010(3015)	2	75-125	0-20	2.9	10	M
	6010(3015)-T	2	75-125	0-20	1.8	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	50	50	M
Copper (ICP)	200.7(Drinking Water)	86	70-130	0-20	3.6	25	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.43	25	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	9.9	25	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	1.7	25	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	1.3	25	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	3.0	25	M
	6010(3015)	2	75-125	0-20	4.1	25	M
	6010(3015)-T	2	75-125	0-20	2.8	25	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	25	25	M
Copper (GFAA)	220.2	3	80-120	0-20	1.7	10	M
	7211(3015)	2	80-120	0-20	0.80	10	M
	7211(3020)	2	80-120	0-20	0.63	10	M
	Chelation/Extraction	5	60-140	0-20	0.22	1.0	M
Iron (ICP)	200.7(Drinking Water)	86	70-130	0-20	11	50	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	22	50	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	21	50	M
	6010(3015)	2	75-125	0-20	27	50	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	100	100	M
Iron(GFAA)	236.2	3	80-120	0-20	2.5	10	M
Iron (ferrous)	3500-Fe-D (colorimetric)	4	80-120	0-20	50	100	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
Lead (ICP)	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	20	50	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	1.2	5.0	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	20	50	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	1.3	5.0	M
	6010(3015)	2	75-125	0-20	14	50	M
	6010(3015)-T	2	75-125	0-20	1.3	5.0	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	3.0	3.0	M
Lead (GFAA)	200.9	86	80-120	0-20	0.54	2.0	M
	239.2	3	80-120	0-20	0.86	5.0	M
	3113B(3030E)	4	80-120	0-20	0.86	2.0	M
	7421(3015)	2	80-120	0-20	1.5	5.0	M
	7421(3020)	2	80-120	0-20	1.2	5.0	M
	Chelation/Extraction	5	60-140	0-40	0.50	0.50	M
Lithium (ICP)	6010(3005)/ 200.7(NPDES)	2	75-125	0-20	100	100	M
	6010(3010)/ 200.7(NPDES)	2/3	75-125	0-20	100	100	M
	6010(3015)	2	75-125	0-20	100	100	M
Lithium (GFAA)	3500-Li-B	4	80-120	0-20	1.9	10	M
Lithium (FLAA)	7430	2	80-120	0-20	42	100	M
Magnesium (ICP)	200.7(Drinking Water)	86	70-130	0-20	10	500	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	39	500	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	39	500	M
	6010(3015)	2	75-125	0-20	28	500	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5000	5000	M
Manganese (ICP)	200.7(Drinking Water)	86	70-130	0-20	0.90	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.092	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	1.3	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.30	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	1.3	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.51	10	M
	6010(3015)	2	75-125	0-20	1.2	10	M
	6010(3015)-T	2	75-125	0-20	0.65	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	15	15	M
Mercury (CVAA)	245.1	3	85-115	0-20	0.056	0.20	M
	7470	2	80-120	0-20	0.056	0.20	M
	3112B	4	80-120	0-20	0.056	0.20	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	0.20	0.20	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Molybdenum (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.5	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.25	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	2.7	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.41	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	2.7	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.94	10	M
	6010(3015)	2	75-125	0-20	2.3	10	M
	6010(3015)-T	2	75-125	0-20	1.7	10	M
Nickel (ICP)	200.7(Drinking Water)	86	70-130	0-20	6.8	40	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.88	40	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	12	40	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	1.9	40	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	12	40	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	1.9	40	M
	6010(3015)	2	75-125	0-20	8.1	40	M
	6010(3015)-T	2	75-125	0-20	2.6	40	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	40	40	M
Nickel (GFAA)	200.9	86	80-120	0-20	2.5	10	M
	249.2	3	80-120	0-20	2.5	10	M
	3113B(3030E)	4	80-120	0-20	2.5	10	M
	Chelation/Extraction	5	60-140	0-40	0.17	2.0	M
Phosphorus (ICP)	200.7(Drinking Water)	86	70-130	0-20	50	50	M
	6010(3010)	2	75-125	0-20	50	50	M
Potassium (ICP)	200.7(Drinking Water)	86	70-130	0-20	56	1000	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	110	1000	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	140	1000	M
	6010(3015)	2	75-125	0-20	48	1000	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5000	5000	M
Potassium (FLAA)	7610(3010)	2	80-120	0-20	100	100	M
	258.1	3	80-120	0-20	100	100	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Selenium (ICP)	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	52	500	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	1.5	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	51	500	M
	6010(3010)/200.7(NPDES)-T	2	75-125	0-20	2.2	10	M
	6010(3015)	2	75-125	0-20	60	500	M
	6010(3015)-T	2	75-125	0-20	2.2	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5.0	5.0	M
Selenium (GFAA)	200.9	86	80-120	0-20	1.1	10	M
	270.2	3	80-120	0-20	2.8	10	M
	3113B(3030E)	4	80-120	0-20	2.8	10	M
	3114B	4	80-120	0-20	1.2	2.0	M
	7740(3015)	2	80-120	0-20	3.6	10	M
	7740(3020)	2	80-120	0-20	2.7	10	M
	7742(3020)	2	80-120	0-20	1.2	2.0	M
Silica, dissolved (ICP)	200.7(Drinking Water)	86	70-130	0-20	130	500	M
	200.7(NPDES)	3	75-125	0-20	130	500	M
	6010(3010)	2	75-125	0-20	190	500	M
Silver (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.1	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.62	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	3.1	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	1.6	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.1	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	1.6	10	M
	6010(3015)	2	75-125	0-20	2.7	10	M
	6010(3015)-T	2	75-125	0-20	1.6	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	10	10	M
Silver (FLAA)	272.1	3	80-120	0-20	0.18	10	M
Silver(GFAA)	272.2	3	80-120	0-20	0.18	10	M
	7761(3020)	2	80-120	0-20	0.25	1.0	M
	7761(3015)	2	80-120	0-20	0.16	1.0	M
	Chelation/Extraction	5	60-140	0-40	0.017	0.050	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Sodium (ICP)	200.7(Drinking Water)	86	70-130	0-20	12	500	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	17	500	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	38	500	M
	6010(3015)	2	75-125	0-20	47	500	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	5000	5000	M
Sodium (FLAA)	273.1	3	75-125	0-20	500	500	M
Strontium (ICP)	200.7(Drinking Water)	86	70-130	0-20	1.1	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	4.4	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.1	10	M
	6010(3015)	2	75-125	0-20	4.4	10	M
Thallium (ICP)	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	120	500	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	3.9	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	86	500	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	4.6	10	M
	6010(3015)	2	75-125	0-20	82	500	M
	6010(3015)-T	2	75-125	0-20	5.4	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	10	10	M
Thallium (GFAA)	200.9	86	80-120	0-20	1.3	2.0	M
	279.2	3	80-120	0-20	1.4	10	M
	7841(3015)	2	80-120	0-20	1.7	10	M
	7841(3020)	2	80-120	0-20	1.1	10	M
Tin (ICP)	200.7(Drinking Water)	86	70-130	0-20	7.0	50	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.83	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	13	50	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	3.1	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	14	50	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	5.5	10	M
	6010(3015)	2	75-125	0-20	15	50	M
	6010(3015)-T	2	75-125	0-20	8.2	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Titanium (ICP)	200.7(Drinking Water)	86	70-130	0-20	2.2	10	M
	6010(3005)/ 200.7(NPDES)	2/3	75-125	0-20	2.2	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	2.2	10	M
	6010(3015)	2	75-125	0-20	2.2	10	M
Tributyl tin (GFAA)	Atomic absorption	40	60-140	0-40	0.0010	0.0010	M
Vanadium (ICP)	200.7(Drinking Water)	86	70-130	0-20	0.77	10	M
	200.7(Drinking Water)-T	86	70-130	0-20	0.55	10	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	2.7	10	M
	6010(3005)/200.7(NPDES)-T	2/3	75-125	0-20	0.64	10	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.0	10	M
	6010(3010)/200.7(NPDES)-T	2/3	75-125	0-20	0.64	10	M
	6010(3015)	2	75-125	0-20	2.4	10	M
	6010(3015)-T	2	75-125	0-20	1.5	10	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	50	50	M
Zinc (ICP)	200.7(Drinking Water)	86	70-130	0-20	2.6	20	M
	6010(3005)/200.7(NPDES)	2/3	75-125	0-20	3.1	20	M
	6010(3010)/200.7(NPDES)	2/3	75-125	0-20	3.4	20	M
	6010(3015)	2	75-125	0-20	9.5	20	M
	CLP ILMO 2.1/3.0/4.0	45	80-120	0-20	20	20	M
Zinc (GFAA)	3113B(3030F)	4	80-120	0-20	5.9	20	M

ICP = inductively coupled (argon) plasma atomic emission spectrophotometer
GFAA = graphite furnace atomic adsorption spectrophotometer
FLAA = flame atomic adsorption spectrophotometer
CVAA = cold vapor atomic adsorption spectrophotometer
-T = trace ICP

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Acetate	300.0	82	75-125	0-30	0.25	1.0	M
Acidity	305.1/2310-B	3/4	80-120	0-30	0.40	10	M
	305.2	3	80-120	0-30	0.40	10	M
Alkalinity, total, as $CaCO_3$	310.1/2320-B	3/4	80-120	0-30	0.40	1.0	M
Ammonia (as N)	350.1	82	85-115	0-30	0.017	0.030	M
	350.2	82	85-115	0-30	0.0099	0.030	M
	350.3	82	85-115	0-30	0.034	0.050	M
	4500NH3-F	4	80-120	0-30	0.034	0.050	M
	4500NH3-H	4	80-120	0-30	0.017	0.030	M
Ammonia, un-ionized	FL-DER	60	NA	NA	NA	Calculated based on sample pH and temperature	NA
Bicarbonate, as $CaCO_3$	4500-CO2-D	4	NA	NA	NA	1.0	M
BOD-5	405.1/5210-B	3/4	85-115	0-30	NA	2.0	M
BOD (Ultimate-UBOD)	5210-C	4	78-114	0-36	NA	2.0	M
Bromate	300.0	82	90-110	0-30	0.16	1.0	M
Bromide	300.0	82	90-110	0-30	0.055	1.0	M
	9056/4500-Br-C	2/4	80-120	0-30	0.055	1.0	M
	320.1	3	75-125	0-30	0.50	2.0	M
Carbon, total organic	415.1/9060/5310-B	3/2/4	80-120	0-25	0.25	1.0	M
	415.1/5310-C	4	80-120	0-25	0.27	1.0	M
Carbon dioxide	4500-CO2-C	4	80-120	0-30	0.40	10	M
	4500-CO2-D	4	NA	NA	NA	10	
Carbonate, as $CaCO_3$	4500-CO2-D	4	NA	NA	NA	1.0	
CBOD	5210-B	4	81-119	0-30	NA	2.0	M
Chloride	300.0	82	90-110	0-30	0.14	1.0	M
	9056/4500-Cl-F	2/4	80-120	0-30	0.14	1.0	M
	325.2	3/2	85-115	0-30	0.29	1.0	M
	9251	2	75-125	0-30	0.40	1.0	M
	325.3/9252A	3/2	75-125	0-30	0.40	1.0	M
	4500-Cl-C	4	75-125	0-30	0.40	1.0	M
	4500-Cl-D	4	80-120	0-30	0.40	1.0	M
	4500-Cl-E	4	85-115	0-30	0.29	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RL^ (mg/L)	TC∀
Chlorine, residual	330.2	3	NA	0-30	NA	1.0	M
	330.3	3	NA	0-30	NA	1.0	M
	330.4	3	NA	0-30	NA	1.0	M
	330.5	3	NA	0-30	NA	1.0	M
	4500-Cl2- G	4	NA	0-40	NA	0.05	M
	4500-Cl2- B	4	NA	0-30	NA	1.0	M
Chlorate	300.0	82	90-110	0-30	0.073	1.0	M
Chlorite	300.0	82	90-110	0-30	0.097	1.0	M
Chlorophyll	10200-H	4	NA	0-30	NA	0.00010	M
COD	410.1	3	60-140	0-30	8.7	20	M
	410.2	3	60-140	0-30	5.0	20	M
	410.4	82	90-110	0-30	13	20	M
	5220-C	4/71	80-120	0-25	8.7	20	M
	5220-D	4	60-140	0-30	13	20	M
Coliform, fecal, MPN	9221-E, C (non-potable)	4	NA	0-200	NA	2 MPN/100 mL	M
	9221-E, C (potable)	4	NA	0-200	NA	1.1 MPN/100 mL	M
Coliform, fecal, MF	9222-D	4	NA	0-200	NA	1 col/100 mL	M
Coliform, total, MPN	9131	2	NA	0-200	NA	2 MPN/100 mL	M
	9221-B, C (non-potable)	4	NA	0-200	NA	2 MPN/100 mL	M
	9221-B, C (potable)	4	NA	0-200	NA	1.1 MPN/100 mL	M
Coliform, total MF	9132	2	NA	0-200	NA	1 col/100 mL	M
	9222-B	4	NA	0-200	NA	1 col/100 mL	M
Coliform, total/e.coli (fecal), MMO MUG	9223/Colilert (potable)	4/81	NA	NA	NA	NA	M
Coliform, total, P-A	9221-D, B	4	NA	NA	NA	NA	M
Color	110.2/2120-B	3/4	NA	0-40	NA	5 PCU	M
	NCASI 253	90	75-125	0-40	NA	50 PCU	M
Corrosivity	2330-B	4	NA	NA	NA	NA	M
	1110 (NACE)	2	NA	NA	NA	NA	M
	9040/9041	2	63-158	0-40	NA	NA	M
Cyanate	4500-CN-L	4	NA	NA	NA	0.030	M
Cyanide, amenable to chlorination	9012	2	NA	NA	NA	0.010	M
	335.1/9010/9014/ 4500CN-G	2/3/4	NA	NA	NA	0.010	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Cyanide, reactive	7.3.3.2/9014	2	NA	0-50	NA	10 mg HCN/ Kg Waste	M
Cyanide, total	335.2/9010/9014 /4500CN-E	2/3/4	85-115	0-20	0.0034	0.010	M
	335.3/9012	3/2	85-115	0-20	0.0032	0.010	M
	335.4	82	90-110	0-20	0.0034	0.010	M
	CLP OLM02.1/3.0/4.0	45	85-115	0-20	0.010	0.010	M
Cyanide, weak and dissociable	4500-CN -I	4	85-115	0-30	0.0031	0.010	M
Fluoride	300.0	3	90-110	0-30	0.0068	0.10	M
	9056/4500-F-F	2/4	80-120	0-25	0.0068	0.10	M
	340.2/4500-F-C (undistilled)	3/4	85-115	0-30	0.023	0.20	M
Formate	300.0	3	90-110	0-30	0.062	1.0	M
Halogens, total organic (TOX)	450.1/9020B/5320-B	3/2	60-140	0-40	0.0066	0.010	M
Halogens, total absorbable (AOX)	1650	92	71-116	0-40	0.0070	0.020	M
Hardness, total (as $CaCO_3$)	2340-B (200.7/6010)	4	NA	NA	NA	3.3	M
	130.2/2340-C	3	75-125	0-30	0.40	10	M
Hydrogen ion (pH)	150.1/9040/4500-H-B	3/2	63-158	0-40	NA	NA	M
Iodide	300.0	3	90-110	0-30	NA	5.0	M
Nitrate (as N)	300.0	82	90-110	0-30	0.0060	0.10	M
	9056	2	80-120	0-30	0.0060	0.10	M
	352.1	3	80-120	0-30	0.025	0.10	M
	353.2 /4500-NO3-F	3/4	80-120	0-30	0.0040	0.050	M
	353.3 /4500-NO3-E	3/4	80-120	0-30	0.0050	0.050	M
Nitrate-Nitrite (as N)	353.2 /4500-NO3-F	3/4	80-120	0-30	0.0040	0.050	M
	353.3 /4500-NO3-E	3/4	80-120	0-30	0.0030	0.050	M
Nitrite(as N)	300.0	82	90-110	0-30	0.044	0.050	M
	9056	2	80-120	0-30	0.044	0.050	M
	353.2 /4500-NO3-F (w/o Cd reduction)	3/4	80-120	0-30	0.0013	0.050	M
	353.3 /4500-NO3-E (w/o Cd reduction)	3/4	80-120	0-30	0.013	0.050	M
	354.1	3	80-120	0-30	0.015	0.050	M
Nitrogen, total Kjeldahl (TKN)	351.2	82	75-125	0-40	0.068	0.20	M
Nitrogen, organic	EPA-CE: 3-205	46	NA	NA	NA	0.20	
	TKN -NH3 (as N)	82/3	NA	NA	NA	0.20	

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Nitrogen, total	TKN + NO_2/NO_3 as (N)	2/3	NA	NA	NA	0.25	
Odor	140.1/2150-B	3/4	NA	NA	NA	1 TON	
Oil & Grease	413.1 /5520-B	3/4	60-140	0-30	1.3	5.0	M
	413.2 /5520-C	3/4	60-140	0-30	0.31	1.0	M
	1664 (HEM)	84	79-114	0-18	0.91	5.0	M
Orthophosphate (as P)	300.0	82	90-110	0-30	0.071	1.0	M
	9056	2	80-120	0-30	0.071	1.0	M
	365.1	82	90-110	0-30	0.027	0.050	M
	365.2	3	90-110	0-30	0.023	0.050	M
	365.3	3	75-125	0-30	0.013	0.050	M
	4500-P-F	4	80-120	0-30	0.027	0.050	M
Oxalate	300.0	3	90-110	0-30	NA	1.0	M
Oxygen, dissolved	360.1 /4500-O-G	3/4	NA	0-30	NA	0.10	
	360.2 /4500-O-C	3/4	NA	0-30	NA	0.10	
Petroleum hydrocarbons	418.1	3/4	60-140	0-30	0.56	1.0	M
	5520-F	4	60-140	0-30	0.56	1.0	M
	1664 (SGT-HEM)	84	66-114	0-24	1.6	5.0	M
	FL-PRO	83	41-101	0-20	0.10	0.30	M
Phenolics, total recoverable	420.1/ 9065/5330-D,B	3/2/4	75-125	0-30	0.0060	0.050	M
	420.1/ 9065/5530-C,B (chloroform extraction)	3/2/4	75-125	0-30	0.0095	0.010	M
Phosphorus, organic (as P)	365.4	3	NA	NA	NA	0.10	
Phosphorus, total (as P)	365.1	82	60-140	0-40	0.0059	0.010	M
	365.2	3	60-140	0-40	0.0034	0.10	M
	365.3	3	60-140	0-40	0.025	0.050	M
	365.4 /4500-P-F	3/4	60-140	0-40	0.098	0.10	M
Plate count, heterotrophic	9215B	4	NA	NA	NA	1000 CFU/L	M
Redox potential	D1498-76/2580-B	38/4	NA	NA	NA	NA	M
Residue, dissolved	160.1/2540-C	3/4	80-120	0-25	NA	5.0	M
Residue, suspended	160.2 / 2540-D	3/4	80-120	0-25	NA	5.0	M
Residue, total	160.3 / 2540-B	3/4	80-120	0-25	NA	5.0	M
Residue, volatile	160.4/2540-E	3/4	NA	0-80	NA	5.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RL^ (mg/L)	TC^
Saturation Index (Langlier)	SM203	4	NA	NA	NA	NA	M
Salinity	2520-B	4	NA	NA	NA	2 parts per thousand	M
Settleable matter	160.5/2540-F	3/4	NA	NA	NA	0.20 mL	M
Silica, dissolved	370.1	3	75-125	0-30	2.5	10	M
Specific conductance	120.1/9050/2510-B	3/2/4	90-110	0-10	NA	1.0 µS/cm	M
Specific gravity	2710-F	3	NA	NA	NA	NA	M
Streptococcus, fecal, MPN	9230*B	4	NA	0-200	NA	2 MPN/100 mL	M
Streptococcus, fecal, MF	9230-C	4	NA	0-200	NA	1 col/100 mL	M
Sulfate	300.0	82	90-110	0-30	0.081	5.0	M
	9056/4500- SO4-B	2/4	80-120	0-30	0.081	5.0	
	375.3/4500-SO4-D	3/4	75-125	0-30	1.2	5.0	M
	375.4/9038/ 4500-SO4-E	3/2/4	75-125	0-30	1.4	5.0	M
Sulfide	376.1 /4500-S-E (undistilled)	3	75-125	0-30	0.40	1.0	M
	376.2 /4500-S-D (undistilled)	3	80-120	0-25	0.017	0.10	M
	9030/9034 (distilled)	2	50-150	0-50	0.36	1.0	M
Sulfide, reactive	7.3.4.2/9034	2	NA	NA	NA	50 mg H_2S/ Kg Waste	M
Sulfite	377.1/4500-SO2-B	3/4	70-130	0-30	2.0	5.0	M
Surfactants (MBAS)	425.1/5540-C	3/4	70-130	0-30	0.013	0.10	M
Surfactants (CTAS)	5540-D	4	70-130	0-30	0.25	1.0	M
Tannin and Lignin	5550-B	4	70-130	0-30	0.010	0.010	M
Temperature	170.1/2550-B	3/4	NA	NA	NA	NA	M
Thiocyanate	4500-CN-M	4	80-120	0-25	0.021	0.10	M
THM formation potential	5710-B	4	NA	NA	NA	0.010	M
Turbidity	180.1/2130-B	82/4	90-110	0-30	0.10 NTU	0.10 NTU	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (pCi/L)	TCV
Radionuclides, alpha	900.0/9310	54/2	64-145	0-31	NA	3.0	M
Radionuclides, beta	900.0/9310	54/2	67-140	0-28	NA	4.0	M
Radium, total (as Ra 226)	903.0/9315	54/2	48-145	0-49	NA	2.0	M
Radium 226	903.1	54	48-145	0-49	NA	0.60	M
Radium 228	Brooks	66	45-150	0-50	NA	1.0	M
	904.0/932.-0	54/2	27-149	0-86	NA	2.0	M
Tritium	906.0	54	41-133	0-20	NA	1000	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Benzene	502.2	51	80-120	0-22	0.27	0.50	M
Bromobenzene	502.2	51	80-120	0-40	0.20	0.50	M
Bromochloromethane	502.2	51	80-120	0-40	0.27	0.50	M
Bromodichloromethane	502.2	51	80-120	0-40	0.28	0.50	M
Bromoform	502.2	51	80-120	0-40	0.28	0.50	M
Bromomethane	502.2	51	60-140	0-40	0.57	1.0	M
n-Butylbenzene	502.2	51	60-140	0-40	0.057	0.50	M
sec-Butylbenzene	502.2	51	60-140	0-40	0.039	0.50	M
tert-Butylbenzene	502.2	51	60-140	0-40	0.045	0.50	M
Carbon tetrachloride	502.2	51	80-120	0-40	0.21	0.50	M
Chlorobenzene	502.2	51	80-120	0-29	0.10	0.50	M
Chloroethane	502.2	51	60-140	0-50	0.14	1.0	M
Chloroform	502.2	51	80-120	0-40	0.27	0.50	M
Chloromethane	502.2	51	60-140	0-40	0.35	1.0	M
2-Chlorotoluene	502.2	51	60-140	0-40	0.17	0.50	M
4-Chlorotoluene	502.2	51	60-140	0-40	0.21	0.50	M
Dibromochloromethane	502.2	51	80-120	0-40	0.22	0.50	M
1,2-Dibromo-3-chloropropane	502.2	51	80-120	0-40	0.25	5.0	M
1,2-Dibromoethane(EDB)	502.2	51	80-120	0-40	0.20	2.0	M
Dibromomethane	502.2	51	80-120	0-40	0.78	2.0	M
1,2-Dichlorobenzene	502.2	51	80-120	0-40	0.16	0.50	M
1,3-Dichlorobenzene	502.2	51	80-120	0-40	0.20	0.50	M
1,4-Dichlorobenzene	502.2	51	80-120	0-40	0.23	0.50	M
Dichlorodifluoromethane	502.2	51	60-140	0-50	0.62	1.0	M
1,1-Dichloroethane	502.2	51	80-120	0-40	0.25	0.50	M
1,2-Dichloroethane	502.2	51	80-120	0-40	0.20	0.50	M
1,1-Dichloroethene	502.2	51	80-120	0-29	0.23	0.50	M
cis-1,2-Dichloroethene	502.2	51	80-120	0-40	0.68	1.0	M
trans-1,2-Dichloroethene	502.2	51	80-120	0-40	0.29	0.50	M
1,2-Dichloropropane	502.2	51	80-120	0-40	0.18	0.50	M
1,3-Dichloropropane	502.2	51	80-120	0-40	0.22	0.50	M
2,2-Dichloropropane	502.2	51	80-120	0-40	0.10	0.50	M
1,1-Dichloropropene	502.2	51	80-120	0-40	0.081	0.50	M
cis-1,3-Dichloropropene	502.2	51	80-120	0-40	0.28	0.50	M
trans-1,3-Dichloropropene	502.2	51	80-120	0-40	0.20	0.50	M
Ethylbenzene	502.2	51	80-120	0-40	0.23	0.50	M
Hexachlorobutadiene	502.2	51	60-140	0-40	0.090	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Isopropylbenzene	502.2	51	60-140	0-40	0.060	0.50	M
4-Isopropyltoluene	502.2	51	60-140	0-40	0.052	0.50	M
Methylene chloride	502.2	51	80-120	0-40	1.0	1.0	M
Methyl t-butyl ether (MTBE)	502.2	51	80-120	0-40	1.9	2.0	M
Naphthalene	502.2	51	60-140	0-40	0.71	1.0	M
n-Propylbenzene	502.2	51	60-140	0-40	0.087	0.50	M
Styrene*2	502.2	51	80-120	0-40	0.057	0.50	M
1,1,1,2-Tetrachloroethane	502.2	51	80-120	0-40	0.46	0.50	M
1,1,2,2-Tetrachloroethane	502.2	51	80-120	0-40	0.18	1.0	M
Tetrachloroethene	502.2	51	80-120	0-40	0.14	0.50	M
Toluene	502.2	51	80-120	0-17	0.29	0.50	M
1,2,3-Trichlorobenzene	502.2	51	60-140	0-40	0.074	0.50	M
1,2,4-Trichlorobenzene	502.2	51	60-140	0-40	0.16	0.50	M
1,1,1-Trichloroethane	502.2	51	80-120	0-40	0.34	0.50	M
1,1,2-Trichloroethane	502.2	51	80-120	0-40	0.16	0.50	M
Trichloroethene	502.2	51	80-120	0-24	0.30	0.50	M
Trichlorofluoromethane	502.2	51	60-140	0-40	0.20	0.50	M
1,2,3-Trichloropropane	502.2	51	80-120	0-40	0.18	1.0	M
1,2,4-Trimethylbenzene	502.2	51	60-140	0-40	0.10	0.50	M
1,3,5-Trimethylbenzene	502.2	51	60-140	0-40	0.089	0.50	M
Vinyl chloride	502.2	51	60-140	0-40	0.31	1.0	M
o-Xylene*2	502.2	51	80-120	0-40	0.057	0.50	M
m-Xylene*1	502.2	51	80-120	0-40	0.13	0.50	M
p-Xylene*1	502.2	51	80-120	0-40	0.13	0.50	M
Surrogate - Fluorobenzene	502.2	51	50-136	NA	NA	NA	M
Surrogate* - 2-Bromo-1-chloropropane	502.2	51	70-130	NA	NA	NA	M
Surrogate* - 1-Bromo-3-chloropropane	502.2	51	50-136	NA	NA	NA	M

*# = Where the number is the same for any 2 compounds, these compounds cannot be routinely resolved chromatographically and are therefore reported as a combined result.
* = either of these 2 surrogates may be analyzed

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Chloropicrin	504	51	60-140	0-40	0.0025	0.010	M
1,1-Dichloropropane	504	51	60-140	0-40	0.50	2.0	M
1,3-Dichloropropene	504	51	60-140	0-40	0.25	1.0	M
Methyl isothiocyanate	504	51	60-140	0-40	5.0	20	M
Dibromochloropropane (DBCP)	504/504.1	91/78	60-140	0-40	0.0030	0.020	M
Ethylene dibromide (EDB)	504/504.1	91/78	60-140	0-40	0.0057	0.020	M
1,2,3-Trichloropropane	504.1	78	60-140	0-40	0.020	0.080	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep) ♦♦	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Alachlor	505	51	62-142	0-30	0.25	1.0	M
Aldrin	505	51	56-116	0-30	0.0025	0.010	M
Atrazine	505	51	36-134	0-40	0.25	1.0	M
gamma BHC (Lindane)	505	51	61-121	0-18	0.0058	0.010	M
alpha Chlordane	505	51	35-137	0-30	0.0033	0.010	M
gamma Chlordane	505	51	31-142	0-30	0.0039	0.010	M
technical Chlordane	505	51	68-142	0-40	0.025	0.10	M
Dieldrin	505	51	36-138	0-46	0.0060	0.020	M
Endrin	505	51	30-208	0-23	0.0073	0.020	M
Heptachlor	505	5	46-108	0-22	0.012	0.010	M
Heptachlor epoxide	505	51	53-147	0-30	0.0035	0.020	M
Hexachlorobenzene	505	51	64-145	0-40	0.012	0.050	M
Hexachlorocyclopentadiene	505	51	38-108	0-40	0.050	0.20	M
Methoxychlor	505	51	37-163	0-40	0.057	0.50	M
cis-Nonachlor	505	51	64-156	0-30	0.012	0.050	M
trans-Nonachlor	505	51	21-151	0-30	0.005	0.020	M
Simazine	505	51	69-129	0-40	0.25	1.0	M
Toxaphene	505	51	74-155	0-40	0.25	1.0	M
PCB 1016	505	51	7-127	0-40	0.12	0.50	M
PCB 1221	505	51	62-122	0-40	0.12	0.50	M
PCB 1232	505	51	56-116	0-40	0.12	0.50	M
PCB 1242	505	51	66-126	0-40	0.12	0.50	M
PCB 1248	505	51	54-114	0-40	0.12	0.50	M
PCB 1254	505	51	55-115	0-40	0.12	0.50	M
PCB 1260	505	51	58-118	0-40	0.12	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Alachlor	507	51	62-128	0-30	0.14	1.0	M
Ametryn	507	51	61-121	0-30	0.16	1.0	M
Atraton	507	51	58-124	0-30	1.2	5.0	M
Atrazine	507	51	62-122	0-30	0.13	1.0	M
Bromacil	507	51	61-121	0-30	0.50	2.0	M
Butachlor	507	51	66-126	0-30	0.35	1.0	M
Butylate	507	51	34-160	0-76	0.86	2.0	M
Carboxin	507	51	72-132	0-30	0.58	1.0	M
Chlorpropham	507	51	60-126	0-30	0.25	1.0	M
Cycloate	507	51	59-119	0-47	0.83	2.0	M
Diazinon	507	51	85-145	0-30	0.17	1.0	M
Dichlorvos	507	51	67-127	0-30	0.28	1.0	M
Diphenamid	507	51	63-123	0-30	0.96	2.0	M
Disulfoton	507	51	59-119	0-60	0.17	2.0	M
EPTC	507	51	55-115	0-55	0.68	2.0	M
Ethoprop	507	51	73-133	0-30	0.27	2.5	M
Fenamiphos	507	51	60-120	0-30	0.25	1.0	M
Fenarimol	507	51	69-129	0-30	1.0	1.0	M
Fluridone	507	51	57-117	0-30	1.2	5.0	M
Hexazinone	507	51	60-120	0-30	0.25	1.0	M
Merphos	507	51	66-126	0-30	0.22	2.5	M
Metalaxyl	507	51	40-160	0-30	0.56	1.0	M
Methyl paraoxon	507	51	68-128	0-30	0.62	1.0	M
Metolachlor	507	51	63-123	0-30	0.11	1.0	M
Metribuzin	507	51	71-131	0-30	0.11	1.0	M
Mevinphos	507	51	62-128	0-30	0.23	10	M
MGK 264	507	51	70-130	0-30	3.0	20	M
Molinate	507	51	44-152	0-74	0.84	2.0	M
Napropamide	507	51	71-131	0-30	0.81	1.0	M
Norflurazon	507	51	64-124	0-30	0.44	1.0	M
Pebulate	507	51	64-124	0-30	0.79	2.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Prometon	507	51	48-108	0-30	0.11	1.0	M
Prometryn	507	51	63-123	0-30	0.25	1.0	M
Pronamide	507	51	61-121	0-30	1.2	2.0	M
Propazine	507	51	62-122	0-30	0.25	1.0	M
Simazine	507	51	70-130	0-30	0.19	1.0	M
Simetryn	507	51	69-129	0-30	0.25	1.0	M
Stirophos	507	51	68-128	0-30	0.39	1.0	M
Tebuthiuron	507	51	54-114	0-30	1.8	5.0	M
Terbacil	507	51	67-127	0-30	1.2	10	M
Terbufos	507	51	67-127	0-30	0.16	1.0	M
Terbutryn	507	51	64-124	0-30	0.25	1.0	M
Triademefon	507	51	63-123	0-30	0.25	1.0	M
Vernolate	507	51	56-116	0-30	0.16	2.0	M
Surrogate - Triphenylphosphate	507	51	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Aldrin	508	51	56-116	0-30	0.0041	0.010	M
alpha BHC	508	51	62-122	0-30	0.0022	0.010	M
beta BHC	508	51	65-125	0-30	0.0053	0.020	M
delta BHC	508	51	68-136	0-30	0.0019	0.010	M
gamma BHC (Lindane)	508	51	59-119	0-18	0.0019	0.010	M
alpha Chlordane	508	51	63-135	0-30	0.0028	0.010	M
gamma Chlordane	508	51	63-135	0-30	0.0026	0.010	M
Chloroneb	508	51	62-132	0-30	0.012	0.50	M
Chlorobenzilate	508	51	78-138	0-30	0.0051	0.20	M
Chlorothalonil	508	51	61-121	0-30	0.0010	0.20	M
Dacthal (DCPA)	508	51	66-140	0-30	0.0010	0.20	M
4,4'-DDD	508	51	77-137	0-30	0.0060	0.020	M
4,4'-DDE	508	51	63-135	0-30	0.0069	0.020	M
4,4'-DDT	508	51	62-162	0-28	0.0074	0.050	M
Dieldrin	508	51	57-117	0-46	0.0023	0.020	M
Endosulfan I	508	51	57-117	0-30	0.0027	0.020	M
Endosulfan II	508	51	62-122	0-30	0.0037	0.050	M
Endosulfan sulfate	508	51	56-148	0-40	0.0053	0.10	M
Endrin	508	51	58-118	0-23	0.0085	0.020	M
Endrin aldehyde	508	51	58-118	0-30	0.0079	0.10	M
Etridiazole	508	51	73-133	0-30	0.0021	0.10	M
Heptachlor	508	5	63-133	0-22	0.0025	0.010	M
Heptachlor epoxide	508	51	57-117	0-30	0.0085	0.020	M
Hexachlorobenzene	508	51	34-164	0-40	0.0107	0.050	M
Methoxychlor	508	51	64-146	0-40	0.032	0.50	M
cis-Permethrin	508	51	61-121	0-30	0.0061	1.0	M
trans-Permethrin	508	51	81-141	0-30	0.0038	1.0	M
Propachlor	508	51	73-133	0-30	0.15	1.0	M
Toxaphene	508	51	60-150	0-40	0.55	1.0	M
Trifluralin	508	51	73-133	0-30	0.0018	0.050	M
PCB 1016	508	51	60-150	0-40	0.15	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
PCB 1221	508	51	60-150	0-40	0.27	0.50	M
PCB 1232	508	51	60-150	0-40	0.21	0.50	M
PCB 1242	508	51	60-150	0-40	0.25	0.50	M
PCB 1248	508	51	60-150	0-40	0.18	0.50	M
PCB 1254	508	51	60-150	0-40	0.11	0.50	M
PCB 1260	508	51	60-150	0-40	0.12	0.50	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	508	51	70-130	NA	NA	NA	M
Surrogate - 4,4-Dichlorobiphenyl	508	51	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acifluorfen	515.1	51	74-168	0-40	0.023	1.0	M
Bentazon	515.1	51	70-170	0-40	0.081	1.0	M
Chloramben	515.1	51	68-154	0-40	0.047	1.0	M
2,4-D	515.1	51	49-214	0-60	0.21	0.50	M
Dalapon	515.1	51	48-126	0-50	1.5	10	M
2,4-DB	515.1	51	48-126	0-40	0.34	0.50	M
Dicamba	515.1	51	38-232	0-40	0.090	0.50	M
3,5-Dichlorobenzoic acid	515.1	51	53-151	0-40	0.027	1.0	M
Dichlorprop	515.1	51	46-168	0-40	0.070	0.50	M
Dinoseb	515.1	51	DL-85	0-40	0.170	0.50	M
5-Hydroxydicamba	515.1	51	54-153	0-40	0.25	1.0	M
4-Nitrophenol	515.1	51	60-202	0-40	0.066	1.0	M
Pentachlorophenol	515.1	51	37-224	0-40	0.013	1.0	M
Picloram	515.1	51	45-138	0-40	0.223	0.50	M
2,4,5-T	515.1	51	68-166	0-62	0.027	0.50	M
2,4,5-TP (Silvex)	515.1	51	42-226	0-81	0.071	0.50	M
Surrogate - 2,4-Dichlorophenylacetic Acid (DCAA)	515.1	51	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acifluorfen	515.2	51	60-140	0-40	0.25	1.0	M
Bentazon	515.2	51	60-140	0-40	0.25	1.0	M
2,4-D	515.2	51	60-140	0-60	0.12	0.50	M
2,4-DB	515.2	51	60-140	0-40	0.12	0.50	M
Dacthal	515.2	51	60-140	0-40	0.12	0.50	M
Dicamba	515.2	51	60-140	0-40	0.12	0.50	M
3,5-Dichlorobenzoic acid	515.2	51	60-140	0-40	0.25	1.0	M
Dichlorprop	515.2	51	60-140	0-40	0.12	0.50	M
Dinoseb	515.2	51	60-140	0-40	0.12	0.50	M
5-Hydroxydicamba	515.2	51	60-140	0-40	0.25	1.0	M
Pentachlorophenol	515.2	51	60-140	0-40	0.25	1.0	M
Picloram	515.2	51	60-140	0-40	0.12	0.50	M
2,4,5-T	515.2	51	60-140	0-62	0.12	0.50	M
2,4,5-TP (Silvex)	515.2	51	60-140	0-81	0.12	0.50	M
Surrogate - 2,4-Dichlorophenylacetic Acid (DCAA)	515.2	51	60-140	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benzene	524.2	51	70-130	0-40	0.036	0.50	M
Bromobenzene	524.2	51	70-130	0-40	0.097	1.0	M
Bromochloromethane	524.2	51	70-130	0-40	0.12	1.0	M
Bromodichloromethane	524.2	51	70-130	0-40	0.080	1.0	M
Bromoform	524.2	51	70-130	0-40	0.14	1.0	M
Bromomethane	524.2	51	70-130	0-40	0.29	2.0	M
n-Butylbenzene	524.2	51	70-130	0-40	0.088	1.0	M
sec-Butylbenzene	524.2	51	70-130	0-40	0.11	1.0	M
tert-Butylbenzene	524.2	51	70-130	0-40	0.11	1.0	M
Carbon tetrachloride	524.2	51	70-130	0-40	0.078	0.50	M
Chlorobenzene	524.2	51	70-130	0-40	0.072	0.50	M
Chloroethane	524.2	51	70-130	0-40	0.16	2.0	M
Chloroform	524.2	51	70-130	0-40	0.11	1.0	M
Chloromethane	524.2	51	70-130	0-40	0.23	2.0	M
2-Chlorotoluene	524.2	51	70-130	0-40	0.26	1.0	M
4-Chlorotoluene	524.2	51	70-130	0-40	0.26	1.0	M
Dibromochloromethane	524.2	51	70-130	0-40	0.081	1.0	M
1,2-Dibromo-3-chloropropane	524.2	51	70-130	0-40	0.35	2.0	M
1,2-Dibromoethane	524.2	51	70-130	0-40	0.10	1.0	M
Dibromomethane	524.2	51	70-130	0-40	0.23	1.0	M
1,2-Dichlorobenzene	524.2	51	70-130	0-40	0.11	0.50	M
1,3-Dichlorobenzene	524.2	51	70-130	0-40	0.086	1.0	M
1,4-Dichlorobenzene	524.2	51	70-130	0-40	0.11	0.50	M
Dichlorodifluoromethane	524.2	51	70-130	0-40	0.15	1.0	M
1,1-Dichloroethane	524.2	51	70-130	0-40	0.11	1.0	M
1,2-Dichloroethane	524.2	51	70-130	0-40	0.10	0.50	M
1,1-Dichloroethene	524.2	51	70-130	0-40	0.091	0.50	M
cis-1,2-Dichloroethene	524.2	51	70-130	0-40	0.093	0.50	M
trans-1,2-Dichloroethene	524.2	51	70-130	0-40	0.060	0.50	M
1,2-Dichloropropane	524.2	51	70-130	0-40	0.25	0.50	M
1,3-Dichloropropane	524.2	51	70-130	0-40	0.45	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
2,2-Dichloropropane	524.2	51	70-130	0-40	0.11	1.0	M
1,1-Dichloropropene	524.2	51	70-130	0-40	0.12	1.0	M
cis-1,3-Dichloropropene	524.2	51	70-130	0-40	0.084	1.0	M
trans-1,3-Dichloropropene	524.2	51	70-130	0-40	0.084	1.0	M
Ethylbenzene	524.2	51	70-130	0-40	0.13	0.50	M
Hexachlorobutadiene	524.2	51	70-130	0-40	0.21	1.0	M
Isopropylbenzene	524.2	51	70-130	0-40	0.093	1.0	M
4-Isopropyltoluene	524.2	51	70-130	0-40	0.13	1.0	M
Methylene chloride	524.2	51	70-130	0-40	0.33	0.50	M
Methyl t-butyl ether (MTBE)	524.2	51	70-130	0-40	0.55	2.0	M
Naphthalene	524.2	51	70-130	0-40	0.26	1.0	M
n-Propylbenzene	524.2	51	70-130	0-40	0.098	1.0	M
Styrene	524.2	51	70-130	0-40	0.088	0.50	M
1,1,1,2-Tetrachloroethane	524.2	51	70-130	0-40	0.086	1.0	M
1,1,2,2-Tetrachloroethane	524.2	51	70-130	0-40	0.11	1.0	M
Tetrachloroethene	524.2	51	70-130	0-40	0.094	0.50	M
Toluene	524.2	51	70-130	0-40	0.074	0.50	M
1,2,3-Trichlorobenzene	524.2	51	70-130	0-40	0.15	1.0	M
1,2,4-Trichlorobenzene	524.2	51	70-130	0-40	0.21	0.50	M
1,1,1-Trichloroethane	524.2	51	70-130	0-40	0.079	0.50	M
1,1,2-Trichloroethane	524.2	51	70-130	0-40	0.16	0.50	M
Trichloroethene	524.2	51	70-130	0-40	0.12	0.50	M
Trichlorofluoromethane	524.2	51	70-130	0-40	0.10	1.0	M
1,2,3-Trichloropropane	524.2	51	70-130	0-40	0.19	1.0	M
1,2,4-Trimethylbenzene	524.2	51	70-130	0-40	0.18	1.0	M
1,3,5-Trimethylbenzene	524.2	51	70-130	0-40	0.12	1.0	M
Vinyl chloride	524.2	51	70-130	0-40	0.18	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
o-Xylene	524.2	51	70-130	0-40	0.083	0.50	M
m-Xylene and p-Xylene	524.2	51	70-130	0-40	0.16	0.50	M
Surrogate - p-Bromofluorobenzene	524.2	51	70-130	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	524.2	51	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acenaphthylene	525.2	51	70-130	0-50	0.080	0.50	M
Alachlor	525.2	51	70-130	0-50	0.10	1.0	M
Aldrin	525.2	51	35-130	0-50	0.04	1.0	M
Anthracene	525.2	51	70-130	0-50	0.060	0.50	M
Atrazine	525.2	51	70-130	0-50	0.060	2.0	M
Benz(a)anthracene	525.2	51	70-130	0-50	0.15	0.50	M
Benzo(b)fluoranthene	525.2	51	35-130	0-50	0.15	0.50	M
Benzo(k)fluoranthene	525.2	51	35-130	0-50	0.17	0.50	M
Benzo(a)pyrene	525.2	51	35-130	0-50	0.13	0.20	M
Benzo(g,h,i)perylene	525.2	51	35-130	0-50	0.11	0.50	M
Butyl benzyl phthalate	525.2	51	70-130	0-50	0.12	1.0	M
alpha Chlordane	525.2	51	35-130	0-50	0.19	1.0	M
gamma Chlordane	525.2	51	35-130	0-50	0.19	1.0	M
Chrysene	525.2	51	70-130	0-50	0.090	0.50	M
Dibenz(a,h)anthracene	525.2	51	35-130	0-50	0.15	0.50	M
Di-n-butyl phthalate	525.2	51	70-130	0-50	0.080	10	M
Diethylphthalate	525.2	51	70-130	0-50	0.060	2.0	M
bis(2-ethylhexyl)adipate	525.2	51	35-130	0-50	0.36	1.0	M
bis(2-ethylhexyl)phthalate	525.2	51	35-130	0-50	0.38	2.0	M
Dimethylphthalate	525.2	51	70-130	0-50	0.33	1.0	M
Endrin	525.2	51	35-130	0-50	0.20	5.0	M
Fluorene	525.2	51	70-130	0-50	0.060	0.50	M
Heptachlor	525.2	51	35-130	0-50	0.050	1.0	M
Heptachlor epoxide	525.2	51	35-130	0-50	0.023	1.0	M
Hexachlorobenzene	525.2	51	35-130	0-50	0.090	0.50	M
Hexachlorocyclopentadiene	525.2	51	35-130	0-50	0.14	0.50	M
Indeno(1,2,3-cd)pyrene	525.2	51	35-130	0-50	0.21	0.50	M
Lindane	525.2	51	35-130	0-50	0.25	1.0	M
Methoxychlor	525.2	51	35-130	0-50	0.56	1.0	M
trans-Nonachlor	525.2	51	35-130	0-50	0.26	1.0	M
Pentachlorophenol	525.2	51	35-130	0-50	0.15	3.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Phenanthrene	525.2	51	70-130	0-50	0.050	0.50	M
Pyrene	525.2	51	70-130	0-50	0.020	0.50	M
Simazine	525.2	51	70-130	0-50	0.020	2.0	M
Toxaphene	525.2	51	35-130	0-50	12	50	M
2-Chlorobiphenyl	525.2	51	35-130	0-50	0.15	5.0	M
2,3-Dichlorobiphenyl	525.2	51	35-130	0-50	0.20	5.0	M
2,4,5-Trichlorobiphenly	525.2	51	35-130	0-50	0.030	5.0	M
2,2',4,4'-Tetrachlorobiphenyl	525.2	51	35-130	0-50	0.070	5.0	M
2,2',3',4,6-Pentachlorobiphenyl	525.2	51	35-130	0-50	0.030	5.0	M
2,2',4,4',5,6'-Hexachlorobiphenyl	525.2	51	35-130	0-50	0.21	5.0	M
2,2',3,3',4,4',6-Heptachlorobiphenyl	525.2	51	35-130	0-50	0.27	5.0	M
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	525.2	51	35-130	0-50	0.040	5.0	M
Surrogate - Perylene-d12	525.2	51	35-130	NA	NA	NA	M
Surrogate - Pyrene-d10	525.2	51	70-130	NA	NA	NA	M
Surrogate - 1,3-dimethyl-2-nitrobenzene	525.2	51	70-130	NA	NA	NA	M
Surrogate - Triphenylphosphate	525.2	51	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Aldicarb (MS)	531.1	33/51	75-138	0-20	0.15	0.50	M
Aldicarb sulfone	531.1	33/51	69-127	0-20	0.13	0.50	M
Aldicarb sulfoxide	531.1	33/51	74-136	0-40	0.13	0.50	M
Carbaryl	531.1	33/51	66-122	0-30	0.11	1.0	M
Carbofuran (MS)	531.1	33/51	71-133	0-20	0.18	1.0	M
3-Hydroxycarbofuran	531.1	33/51	69-127	0-20	0.17	1.0	M
Methiocarb	531.1	51	72-133	0-40	0.35	5.0	M
Methomyl	531.1	33/51	69-127	0-20	0.14	1.0	M
Oxamyl (MS)	531.1	33/51	68-126	0-30	0.14	1.0	M
Propoxur (Baygon)	531.1	33/51	76-136	0-40	0.36	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Glyphosate	547	51	53-125	0-50	29	50	M
Endothall	548.1	51	15-122	0-50	3.7	25	M
Diquat	549.1	51/56	16-120	0-50	0.42	1.0	M
Paraquat	549.1	51/56	27-127	0-50	0.17	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Bromochloroacetonitrile	551.1	89	80-120	0-20	0.092	1.0	M
Chloral hydrate	551.1	89	80-120	0.-20	0.16	1.0	M
Chloropicrin	551.1	89	80-120	0.-20	0.13	1.0	M
Dibromoacetonitrile	551.1	89	80-120	0.-20	0.12	1.0	M
1,1-Dichloro-2-propanone	551.1	89	80-120	0.-20	0.14	1.0	M
Dichloroacetonitrile	551.1	89	80-120	0.-20	0.15	1.0	M
Trichloroacetonitrile	551.1	89	80-120	0.-20	0.17	1.0	M
1,1,1-Trichloro-2-propanone	551.1	89	80-120	0.-20	0.10	1.0	M
Surrogate-Decafluorobiphenyl	551.1	89	80-120	NA	NA	NA	

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Bromochloroacetic acid	552.2	89	70-130	0-30	0.15	1.0	M
Dibromoacetic acid	552.2	89	70-130	0-30	0.14	1.0	M
Dichloroacetic acid	552.2	89	70-130	0-30	0.30	1.0	M
Monobromoacetic acid	552.2	89	70-130	0-30	0.085	1.0	M
Monochloroacetic acid	552.2	89	70-130	0-30	0.28	1.0	M
Trichloroacetic acid	552.2	89	70-130	0-30	0.25	1.0	M
Surrogate-2,3-Dibromopropionic acid	552.2	89	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Bromodichloromethane	601	1	42-172	0.54	0.28	1.0	M
Bromoform	601	1	13-159	0-40	0.28	5.0	M
Bromomethane	601	1	D-144	0-78	0.57	1.0	M
Carbon tetrachloride	601	1	43-143	0-50	0.21	1.0	M
Chlorobenzene	601	1	38-150	0-25	0.10	1.0	M
Chloroethane	601	1	46-137	0-52	0.14	1.0	M
2-Chloroethylvinyl ether	601	1	14-186	0-50	0.56	10	M
Chloroform	601	1	49-133	0-36	0.27	1.0	M
Chloromethane	601	1	D-193	0-57	0.35	1.0	M
Dibromochloromethane	601	1	24-191	0-56	0.22	1.0	M
1,2-Dichlorobenzene	601	1	D-208	0-39	0.16	1.0	M
1,3-Dichlorobenzene	601	1	7-187	0-28	0.20	1.0	M
1,4-Dichlorobenzene	601	1	42-143	0-42	0.23	1.0	M
Dichlorodifluoromethane	601	1	50-130	0-50	0.62	1.0	M
1,1-Dichloroethane	601	1	47-132	0-25	0.25	1.0	M
1,2-Dichloroethane	601	1	51-147	0-58	0.20	1.0	M
1,1-Dichloroethene	601	1	28-167	0-35	0.23	1.0	M
cis-1,2-Dichloroethene(1)	601	1	38-155	0-39	0.68	1.0	M
trans-1,2-Dichloroethene	601	1	38-155	0-43	0.29	1.0	M
Dichloromethane (Methylene chloride)	601	1	25-162	0-40	1.0	5.0	M
1,2-Dichloropropane	601	1	44-156	0-45	0.18	1.0	M
cis-1,3-Dichloropropylene	601	1	22-178	0-45	0.28	1.0	M
trans-1,3-Dichloropropylene	601	1	22-178	0-55	0.20	1.0	M
1,1,2,2-Tetrachloroethane	601	1	8-184	0-48	0.18	1.0	M
Tetrachloroethylene	601	1	26-162	0-57	0.14	1.0	M
1,1,1-Trichloroethane	601	1	41-138	0-47	0.34	1.0	M
1,1,2-Trichloroethane	601	1	39-136	0-53	0.16	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Trichloroethene	601	1	35-146	0-48	0.30	1.0	M
Trichlorofluoromethane	601	1	21-156	0-37	0.20	1.0	M
Vinyl chloride	601	1	28-163	0-61	0.31	1.0	M
Surrogate - Bromochloromethane	601	1	30-171	NA	NA	NA	M

(1) Compound determined using capillary column.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benzene	602	1	39-150	0-31	0.27	1.0	M
Chlorobenzene	602	1	55-135	0-25	0.21	1.0	M
1,2-Dichlorobenzene	602	1	37-154	0-25	0.61	1.0	M
1,3-Dichlorobenzene	602	1	50-141	0-25	0.70	1.0	M
1,4-Dichlorobenzene	602	1	42-143	0-25	0.51	1.0	M
Ethylbenzene	602	1	32-160	0-25	0.23	1.0	M
Methyl Tert-Butyl Ether (MTBE)	602	1/87	50-150	0-30	1.9	10	M
Toluene	602	1	46-148	0-25	0.29	1.0	M
Xylenes, m- and p-	602	1/87	50-150	0-30	0.64	1.0	M
Xylenes, o-	602	1/87	50-150	0-30	0.24	1.0	M
Xylenes, total	602	1/87	50-150	0-30	0.88	2.0	M
rogate - a,a,a-Trifluorotoluene	602	1	41-150	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (%RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acrolein	603	1	88-118	0-30	12	20	M
Acrylonitrile	603	1	71-135	0-30	4.4	20	M
Surrogate - a,a,a-Trifluorotoluene	603	1	41-150	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2-Chlorophenol	604	1	38-126	0-28	1.2	10	M
4-Chloro-3-methylphenol	604	1	49-122	0-33	1.2	10	M
2,4-Dichlorophenol	604	1	44-119	0-21	1.3	10	M
2,4-Dimethylphenol	604	1	24-118	0-30	1.3	10	M
2,4-Dinitrophenol	604	1	12-145	0-36	1.1	50	M
2-Methyl-4,6-dinitrophenol	604	1	30-136	0-33	1.1	50	M
2-Nitrophenol	604	1	43-117	0-26	1.0	10	M
4-Nitrophenol	604	1	13-110	0-33	1.2	50	M
Pentachlorophenol	604	1	36-134	0-28	1.3	50	M
Phenol	604	1	23-108	0-56	1.0	10	M
2,4,6-Trichlorophenol	604	1	53-119	0-30	1.9	10	M
Surrogate - 2,4,6-Tribromophenol	604	1	14-144	NA	NA	NA	M
Dichlorophen	604.1	18	22-125	0-30	0.32	2.0	M
Hexachlorophene	604.1	18	32-149	0-30	0.34	2.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
Bis(2-ethylhexyl) phthalate	606	1	D-158	0-82	1.2	10	M
Butyl benzyl phthalate	606	1	30-136	0-73	1.3	10	M
Diethyl phthalate	606	1	D-149	0-47	1.8	10	M
Dimethyl phthalate	606	1	D-156	0-63	1.8	10	M
Di-n-butyl phthalate	606	1	23-136	0-46	1.8	10	M
Di-n-octyl phthalate	606	1	D-114	0-52	2.7	10	M
Surrogate - 2-Fluorobiphenyl	606(FID)	1	24-160	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	606(EC)	1	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	606(EC)	1	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
N-Nitrosodimethylamine	607	1	13-109	0-38	1.7	2.0	M
N-Nitrosodi-n-propylamine	607	1	45-146	0-75	1.8	2.0	M
N-Nitrosodiphenylamine	607	1	D-139	0-67	2.1	3.0	M
Surrogate - Triphenylphosphate	607	1	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Aldrin	608	1	42-122	0-40	0.0041	0.050	M
alpha BHC	608	1	37-134	0-28	0.0022	0.050	M
beta BHC	608	1	17-147	0-25	0.0053	0.050	M
delta BHC	608	1	19-140	0-25	0.0019	0.050	M
gamma BHC (Lindane)	608	1	32-127	0-44	0.0019	0.050	M
technical Chlordane	608	1	45-119	0-30	0.061	0.50	M
4,4'-DDD	608	1	31-141	0-25	0.0060	0.10	M
4,4'-DDE	608	1	30-145	0-25	0.0069	0.10	M
4,4'-DDT	608	1	25-160	0-40	0.0074	0.10	M
Dieldrin	608	1	36-146	0-35	0.0023	0.10	M
Endosulfan I	608	1	45-153	0-25	0.0027	0.050	M
Endosulfan II	608	1	D-202	0-25	0.0037	0.10	M
Endosulfan sulfate	608	1	26-144	0-25	0.0053	0.10	M
Endrin	608	1	30-147	0-66	0.0085	0.10	M
Endrin aldehyde	608	1	49-169	0-58	0.0079	0.10	M
Heptachlor	608	1	34-111	0-43	0.0025	0.050	M
Heptachlor epoxide	608	1	37-142	0-25	0.0085	0.050	M
Toxaphene	608	1	41-126	0-30	0.55	5.0	M
PCB 1016	608	1	50-114	0-30	0.15	1.0	M
PCB 1221	608	1	15-178	0-30	0.27	2.0	M
PCB 1232	608	1	10-215	0-30	0.21	1.0	M
PCB 1242	608	1	39-150	0-30	0.25	1.0	M
PCB 1248	608	1	38-158	0-30	0.18	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL▲ (ug/L)	TC▼
PCB 1254	608	1	29-131	0-30	0.11	1.0	M
PCB 1260	608	1	8-127	0-30	0.12	1.0	M
Surrogate - Dibutylchlorendate (DBC)	608	1	10-155	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	608	1	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	608	1	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Chloroneb	608.1	10	49-125	0-30	0.091	0.40	M
Chloropropylate	608.1	10	51-125	0-30	0.070	0.50	M
Chlorobenzilate (MS)	608.1	10	53-125	0-30	0.17	0.50	M
Etridiazole	608.1	10	60-125	0-30	0.0018	0.020	M
PCNB	608.1	10	60-125	0-30	0.0033	0.60	M
Propachlor	608.1	10	51-125	0-30	0.020	0.50	M
Chlorothalonil	608.2	57	55-125	0-30	0.016	0.20	M
DCPA (Dacthal)	608.2	57	50-150	0-40	0.0031	0.50	M
Dichloran	608.2	57	56-110	0-40	0.017	5.0	M
Methoxychlor	608.2	57	50-140	0-40	0.0047	0.50	M
Permethrin	608.2	57	50-130	0-40	0.081	1.0	M
Surrogate - Dibutylchlorendate (DBC)	608.1/608.2	10/57	10-155	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	608.1/608.2	10/57	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	608.1/608.2	10/57	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
2,4-Dinitrotoluene	609(FID)	1	6-125	0-40	2.5	10	M
	609(ECD)	1	6-125	0-40	0.075	0.30	M
2,6-Dinitrotoluene	609(FID)	1	8-126	0-40	2.5	10	M
	609(ECD)	1	8-126	0-40	0.075	0.30	M
Isophorone	609	1	D-117	0-40	1.2	10	M
Nitrobenzene	609	1	6-118	0-40	1.5	10	M
Surrogate - 2-Fluorobiphenyl	609(FID)	1	10-130	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	609(ECD)	1	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	609(ECD)	1	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Gas Chromatography (FID)							
Acenaphthene	610	1	D-124	0-25	1.7	10	M
Acenaphthylene	610	1	D-139	0-30	1.9	10	M
Anthracene#1	610	1	D-126	0-28	1.8	10	M
Benzo(a)anthracene#2	610	1	12-135	0-38	2.0	10	M
Benzo(a)pyrene	610	1	D-128	0-40	1.2	10	M
Benzo(b)fluoranthene#3	610	1	6-150	0-51	2.8	10	M
Benzo(k)fluoranthene#3	610	1	6-150	0-51	2.8	10	M
Benzo(g,h,i)perylene	610	1	D-116	0-61	1.6	10	M
Chrysene#2	610	1	12-135	0-38	2.0	10	M
Fluoranthene	610	1	14-123	0-25	1.7	10	M
Fluorene	610	1	D-142	0-25	1.7	10	M
Indeno(1,2,3-cd) pyrene#4	610	1	D-116	0-52	2.9	10	M
Dibenzo(a,h)anthracene#4	610	1	D-116	0-52	1.7	10	M
Naphthalene	610	1	D-122	0-28	1.6	10	M
Phenanthrene#1	610	1	D-126	0-28	1.9	10	M
Pyrene	610	1	D-140	0-28	1.7	10	M
Surrogate- 2-Fluorobiphenyl	610	1	10-130	NA	NA	NA	M
Surrogate-o-Terphenyl	610	1	38-156	NA	NA	NA	M

*# = where the number is the same for any 2 compounds, these compounds cannot be routinely resolved chromatographically and are therefore reported as a combined result.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
HPLC (UV and Fluroresence)							
Acenaphthene	610	1	D-124	0-25	0.38	1.0	M
Acenaphthylene	610	1	D-139	0-30	0.17	1.0	M
Anthracene	610	1	D-126	0-28	0.0060	0.20	M
Benzo(a)anthracene	610	1	12-135	0-38	0.013	0.20	M
Benzo(b)fluoranthene	610	1	6-150	0-51	0.0046	0.20	M
Benzo(k)fluoranthene	610	1	6-150	0-51	0.0056	0.20	M
Benzo(g,h,i)perylene	610	1	D-116	0-61	0.035	0.50	M
Benzo(a)pyrene	610	1	D-128	0-40	0.062	0.20	M
Chrysene	610	1	12-135	0-40	0.012	0.20	M
Dibenzo(a,h)anthracene	610	1	D-116	0-52	0.043	0.50	M
Fluoranthene	610	1	14-123	0-25	0.014	0.50	M
Fluorene (MS)	610	1	D-142	0-25	0.080	0.50	M
Indeno(1,2,3-cd)pyrene	610	1	D-116	0-52	0.019	0.50	M
Naphthalene	610	1	D-122	0-28	0.15	1.0	M
Phenanthrene	610	1	D-126	0-28	0.015	0.20	M
Pyrene	610	1	D-140	0-28	0.035	0.50	M
Surrogate-Terphenyl-d14	610	1	24-152	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
Bis(2-chloroethoxy) methane	611	1	12-128	0-50	1.0	5.0	M
Bis(2-chloroethyl)ether	611	1	11-152	0-50	1.8	20	M
Bis(2-chloroisopropyl) ether	611	1	9-165	0-50	2.5	10	M
4-Bromophenyl phenyl ether	611	1	D-189	0-50	1.3	5.0	M
4-Chlorophenyl phenyl ether	611	1	D-170	0-50	8.8	40	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	611	1	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	611	1	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
2-Chloronaphthalene	612	1	9-148	0-50	1.4	10	M
1,2-Dichlorobenzene	612	1	9-160	0-50	0.20	10	M
1,3-Dichlorobenzene	612	1	D-150	0-50	0.24	10	M
1,4-Dichlorobenzene	612	1	13-137	0-50	0.57	10	M
Hexachlorobenzene	612	1	15-159	0-50	0.0032	0.10	M
Hexachlorobutadiene	612	1	D-139	0-50	0.0084	0.10	M
Hexachlorocylcopentadiene	612	1	D-111	0-50	0.0030	0.10	M
Hexachloroethane	612	1	8-139	0-50	0.0038	0.10	M
1,2,4-Trichlorobenzene	612	1	5-149	0-50	0.060	1.0	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	612	1	10-110	NA	NA	NA	M
rrogate - cachlorobiphenyl (DCB)	612	1	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (MS)	613	1	63-137	0-40	0.0042	0.0050	M
Internal Standard - $^{13}C_{12}$-2,3,7,8-TCDD	613	1	> 50	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
Aspon	622.1	8	62-104	0-40	0.25	1.0	M
Azinphos methyl	614/622	52/14	48-162	0-50	0.16	1.0	M
Bolstar	622	14	36-114	0-40	0.17	1.0	M
Chlorpyrifos	622	14	49-109	0-40	0.17	1.0	M
Chlorpyrifos methyl	622	14	53-136	0-40	0.43	1.0	M
Coumaphos	622	14	61-139	0-40	0.19	1.0	M
Demeton	622	14	10-117	0-40	1.1	2.5	M
Demeton-o	614	52	10-117	0-40	1.1	2.5	M
Demeton-s	614	52	37-121	0-40	0.22	2.5	M
Diazinon (MS)	614/622	52/14	40-137	0-40	0.16	1.0	M
Dichlofenthion	622.1	8	62-104	0-40	0.25	1.0	M
Dichlorvos	622	14	11-158	0-40	0.28	2.0	M
Dioxathion	614.1	58	76-127	0-40	2.5	10	M
Disulfoton	614/622	52/14	42-112	0-66	0.17	2.0	M
EPN	614.1	58	48-124	0-40	0.19	1.0	M
Ethion	614/614.1	52/58	62-175	0-40	0.11	0.50	M
Ethoprop	622	14	42-123	0-40	0.16	0.50	M
Famphur	622.1	8	13-128	0-60	0.89	2.0	M
Fenamiphos	614	52	40-160	0-40	0.59	2.0	M
Fenitrothion	622.1	8	61-103	0-40	0.50	2.0	M
Fensulfothion	622	14	31-163	0-40	0.25	5.0	M
Fenthion	622	14	41-115	0-60	0.20	1.0	M
Fonophos	622.1	8	53-133	0-40	0.25	1.0	M
Isofenphos	614	52	40-160	0-40	0.060	0.50	M
Malathion	614	52	10-140	0-40	0.066	1.0	M
Merphos	622	14	50-130	0-40	0.22	1.0	M
Metalaxyl	614	52	38-141	0-72	0.54	1.0	M
Metribuzin	614	52	75-177	0-20	0.11	2.0	M
Mevinphos	622	14	24-166	0-40	0.17	2.0	M
Naled	622	14	10-119	0-40	0.070	5.0	M
Parathion, ethyl (MS)	614	52	28-155	0-34	0.066	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
Parathion, methyl (MS)	614/622	52/14	38-149	0-32	0.19	0.50	M
Phorate	622	14	29-119	0-40	0.12	1.0	M
Phosmet	622.1	8	50-150	0-40	0.25	1.0	M
Ronnel (MS)	622	14	30-98	0-35	0.27	1.0	M
Stirophos (Tetrachlorvinphos)	622	14	48-125	0-40	0.39	1.0	M
Terbufos	614.1	58	40-160	0-40	0.11	0.50	M
Thionazin (MS)	622.1	8	12-139	0-60	0.13	1.0	M
Tokuthion (Prothiofos)	622	14	45-114	0-40	0.22	1.0	M
Trichloronate	622	14	16-123	0-40	0.11	1.0	M
Surrogate - Triphenylphosphate	614/622.1/622	52/8/14	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2,4-D	615	53	20-163	0-65	0.19	0.50	M
Dalapon	615	53	10-160	0-80	0.43	120	M
2,4-DB	615	53	40-140	0-50	0.23	0.50	M
Dicamba	615	53	10-317	0-86	0.12	1.2	M
Dichlorprop	615	53	10-258	0-103	0.12	6.0	M
Dinoseb	615	53	10-143	0-157	0.080	6.0	M
MCPA	615	53	10-231	0-91	15	120	M
MCPP	615	53	10-210	0-91	12	120	M
2,4,5-T	615	53	31-156	0-54	0.020	0.50	M
2,4,5-TP(Silvex)	615	53	41-135	0-45	0.024	0.50	M
Surrogate - 2,4-Dichlorophenylacetic acid (DCAA)	615	53	27-133	NA	NA	NA	M
Surrogate - 2,4-Dichorophenoxybutyric acid (2,4-DB)	615	53	40-140	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Captan (MS)	617	26	55-125	0-40	0.016	0.10	M
Carbophenothion	617	26	50-110	0-40	0.17	1.0	M
Dichloran	617	26	56-110	0-40	0.071	5.0	M
Dicofol	617	26	55-115	0-40	0.0067	0.10	M
Isodrin (MS)	617	26	55-110	0-40	0.0089	0.050	M
Mirex	617	26	54-104	0-40	0.027	0.50	M
PCNB	617	26	54-100	0-40	0.0033	0.020	M
Pendimethalin	617	26	75-146	0-20	0.0021	0.020	M
Perthane	617	26	55-115	0-40	1.2	5.0	M
Strobane	617	26	48-127	0-40	0.50	2.0	M
Trifluralin	617	26	54-124	0-40	0.0067	0.025	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	617	26/27	10-110	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Chloropicrin	618	27	62-134	0-40	0.25	1.0	M
Ethylene dibromide	618	27	48-90	0-40	0.12	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Alachlor	619	7	45-140	0-30	0.14	2.0	M
Ametryn	619	7	60-120	0-40	0.16	2.0	M
Atraton	619	7	50-115	0-40	0.086	5.0	M
Atrazine (MS)	619	7	40-125	0-30	0.13	2.0	M
Benoxacor	619	7	10-150	0-50	4.4	10	M
Bromacil	619	7	55-127	0-30	0.24	2.0	M
Chlordimeform (Galecron)	619	7	10-150	0-50	3.8	10	M
5-Chloroaminotoluene	619	7	10-150	0-50	3.4	10	M
Hexazinone	619	7	50-130	0-30	0.72	2.0	M
Metalachlor	619	7	39-125	0-27	0.11	1.0	M
Metalaxyl	619	7	50-130	0-40	0.25	1.0	M
Metribuzin	619	7	61-141	0-30	0.11	2.0	M
Norflurazon	619	7	54-134	0-30	0.24	2.0	M
Prometon	619	7	55-124	0-40	0.11	2.0	M
Prometryn	619	7	55-120	0-40	0.080	2.0	M
Propazine (MS)	619	7	32-127	0-20	0.080	2.0	M
Secbumeton	619	7	30-130	0-45	0.042	5.0	M
Simetryn	619	7	50-200	0-40	0.059	2.0	M
Simazine	619	7	25-174	0-50	0.19	2.0	M
Terbuthylazine	619	7	60-130	0-40	0.093	2.0	M
Terbutryn	619	7	53-113	0-40	0.066	2.0	M
Triadimefon	619	7	61-125	0-30	0.31	2.0	M
Diphenylamine	620	23	56-125	0-30	0.50	2.0	M
Surrogate - Triphenylphosphate	619/620	7/23	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benzene	624	1	37-151	0-31	0.31	5.0	M
	624(25-mL purge)	1	37-151	0-31	0.33	1.0	M
Bromodichloromethane	624	1	35-155	0-30	0.36	5.0	M
	624(25-mL purge)	1	35-155	0-30	0.33	1.0	M
Bromoform	624	1	45-169	0-30	0.40	5.0	M
	624(25-mL purge)	1	45-169	0-30	0.38	1.0	M
Bromomethane	624	1	D-242	0-32	1.5	10	M
	624(25-mL purge)	1	D-242	0-32	0.62	1.0	M
Carbon tetrachloride	624	1	70-140	0-25	0.49	5.0	M
	624(25-mL purge)	1	70-140	0-25	0.31	1.0	M
Chlorobenzene	624	1	37-160	0-25	0.41	5.0	M
	624(25-mL purge)	1	37-160	0-25	0.36	1.0	M
Chloroethane	624	1	14-230	0-36	1.3	10	M
	624(25-mL purge)	1	14-230	0-36	0.42	1.0	M
2-Chloroethyl vinyl ether	624	1	D-305	0-96	11	50	M
	624(25-mL purge)	1	D-305	0-96	1.8	10	M
Chloroform	624	1	51-138	0-25	0.53	5.0	M
	624(25-mL purge)	1	51-138	0-25	0.39	1.0	M
Chloromethane	624	1	D-273	0-40	1.5	10	M
	624(25-mL purge)	1	D-273	0-40	0.47	1.0	M
Dibromochloromethane	624	1	53-149	0-25	0.32	5.0	M
	624(25-mL purge)	1	53-149	0-25	0.34	1.0	M
1,2-Dichlorobenzene	624	1	18-190	0-25	0.27	5.0	M
	624(25-mL purge)	1	18-190	0-25	0.35	1.0	M
1,3-Dichlorobenzene	624	1	59-156	0-25	0.83	5.0	M
	624(25-mL purge)	1	59-156	0-25	0.38	1.0	M
1,4-Dichlorobenzene	624	1	18-190	0-25	0.79	5.0	M
	624(25-mL purge)	1	18-190	0-25	0.34	1.0	M
1,1-Dichloroethane	624	1	59-155	0-40	0.86	5.0	M
	624(25-mL purge)	1	59-155	0-40	0.43	1.0	M
1,2-Dichloroethane	624	1	49-155	0-26	0.41	5.0	M
	624(25-mL purge)	1	49-155	0-26	0.40	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,1-Dichloroethene	624	1	D-234	0-25	0.71	5.0	M
	624(25-mL purge)	1	D-234	0-25	0.61	1.0	M
trans-1,2-Dichloroethene	624	1	54-156	0-40	0.68	5.0	M
	624(25-mL purge)	1	54-156	0-40	0.63	1.0	M
1,2-Dichloropropane	624	1	D-210	0-25	0.48	5.0	M
	624(25-mL purge)	1	D-210	0-25	0.42	1.0	M
cis-1,3-Dichloropropene	624	1	D-227	0-25	0.29	5.0	M
	624(25-mL purge)	1	D-227	0-25	0.36	1.0	M
trans-1,3-Dichloropropene	624	1	17-183	0-25	0.36	5.0	M
	624(25-mL purge)	1	17-183	0-18	0.36	1.0	M
Ethylbenzene	624	1	37-162	0-25	0.38	5.0	M
	624(25-mL purge)	1	37-162	0-25	0.37	1.0	M
Methylene chloride	624	1	D-221	0-37	0.67	5.0	M
	624(25-mL purge)	1	D-221	0-37	0.36	5.0	M
1,1,2,2-Tetrachloroethane	624	1	46-157	0-25	0.61	5.0	M
	624(25-mL purge)	1	46-157	0-25	0.52	1.0	M
Tetrachloroethene	624	1	64-148	0-25	0.50	5.0	M
	624(25-mL purge)	1	64-148	0-25	0.46	1.0	M
Toluene	624	1	47-150	0-25	0.36	5.0	M
	624(25-mL purge)	1	47-150	0-25	0.33	1.0	M
1,1,1-Trichloroethane	624	1	52-162	0-25	0.41	5.0	M
	624(25-mL purge)	1	52-162	0-25	0.32	1.0	M
1,1,2-Trichloroethane	624	1	52-150	0-25	0.37	5.0	M
	624(25-mL purge)	1	52-150	0-25	0.41	1.0	M
Trichloroethene	624	1	71-157	0-25	0.41	5.0	M
	624(25-mL purge)	1	71-157	0-25	0.38	1.0	M
Trichlorofluoromethane	624	1	17-181	0-65	0.92	5.0	M
	624(25-mL purge)	1	17-181	0-65	0.58	1.0	M
Vinyl chloride	624	1	D-251	0-40	0.88	10	M
	624(25-mL purge)	1	D-251	0-33	0.58	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Surrogate - Toluene-d8	624	1	67-134	NA	NA	NA	M
	624(25-mL purge)	1	67-134	NA	NA	NA	M
Surrogate - p-Bromofluorobenzene	624	1	67-132	NA	NA	NA	M
	624(25-mL purge)	1	67-132	NA	NA	NA	M
Surrogate - Dibromofluoromethane	624	1	64-142	NA	NA	NA	M
	624(25-mL purge)	1	64-132	NA	NA	NA	M
Surrogate - 1,2-Dichloroethane-d4	624	1	70-130	NA	NA	NA	M
	624(25-mL purge)	1	70-130	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	624	1	70-130	NA	NA	NA	M
	624(25-mL purge)	1	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acenaphthene	625	1	47-145	0-30	0.71	10	M
Acenaphthylene	625	1	33-145	0-38	1.8	10	M
Aldrin	625	1	D-166	0-25	2.8	10	M
Anthracene	625	1	27-133	0-27	0.42	10	M
Benzidine	625	1	D-200	0-100	56	80	M
Benzo(a)anthracene	625	1	33-143	0-32	0.59	10	M
Benzo(b)fluoranthene	625	1	24-159	0-31	0.64	10	M
Benzo(k)fluoranthene	625	1	11-162	0-36	0.36	10	M
Benzo(g,h,i)perylene	625	1	D-219	0-32	0.92	10	M
Benzo(a)pyrene	625	1	17-163	0-39	0.58	10	M
alpha-BHC	625	1	10-150	0-50	1.8	10	M
beta-BHC	625	1	24-149	0-25	2.2	10	M
delta-BHC	625	1	D-110	0-25	2.0	10	M
gamma-BHC	625	1	10-150	0-50	2.2	10	M
Bis(2-chloroethoxy) methane	625	1	33-184	0-35	1.7	10	M
Bis(2-chloroethyl) ether	625	1	12-158	0-28	1.3	10	M
Bis(2-chloroisopropyl) ether (2,2-Oxybis(1-chloropropane)	625	1	36-166	0-25	1.3	10	M
Bis(2-ethylhexyl) phthalate	625	1	8-158	0-39	0.61	10	M
4-Bromophenyl phenyl ether	625	1	53-127	0-32	2.0	10	M
Butyl benzyl phthalate	625	1	D-152	0-30	2.2	10	M
Technical Chlordane	625	1	34-136	0-26	12	50	M
Chlordimeform (Galecron)	625	1	10-150	0-50	13	50	M
5-Chloroaminotoluene	625	1	10-150	0-50	7.7	10	M
4-Chloro-3-methylphenol	625	1	22-147	0-29	0.80	10	M
2-Chloronaphthalene	625	1	60-118	0-25	1.8	10	M
2-Chlorophenol	625	1	23-134	0-35	1.4	10	M
4-Chlorophenylphenyl ether	625	1	25-158	0-54	2.1	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Chrysene	625	1	17-168	0-26	0.46	10	M
1,8-Cineole	625	1	50-101	0-25	0.80	10	M
p-Cymene	625	1	52-110	0-25	1.6	10	M
4,4'-DDD	625	1	D-145	0-27	1.9	10	M
4,4'-DDE	625	1	4-136	0-26	2.0	10	M
4,4'-DDT	625	1	D-203	0-39	1.7	10	M
Dibenz(a,h)anthracene	625	1	D-227	0-37	0.87	10	M
Di-n-butyl phthalate	625	1	1-118	0-25	0.65	10	M
1,2-Dichlorobenzene	625	1	32-129	0-41	1.5	10	M
1,3-Dichlorobenzene	625	1	D-172	0-52	1.3	10	M
1,4-Dichlorobenzene	625	1	20-124	0-43	2.3	10	M
'-Dichlorobenzidine	625	1	D-262	0-193	8.0	20	M
2,4-Dichlorophenol	625	1	39-135	0-25	1.6	10	M
Dieldrin	625	1	29-136	0-25	2.1	10	M
Diethyl phthalate	625	1	D-114	0-32	0.86	10	M
2,4-Dimethylphenol	625	1	32-119	0-44	2.1	10	M
Dimethylphthalate	625	1	D-112	0-25	2.5	10	M
4,6-Dinitro-2-methylphenol	625	1	D-181	0-39	3.9	50	M
2,4-Dinitrophenol	625	1	D-191	0-94	2.8	50	M
2,4-Dinitrotoluene	625	1	39-139	0-54	1.5	10	M
2,6-Dinitrotoluene	625	1	50-158	0-37	2.1	10	M
Di-n-octyl phthalate	625	1	4-146	0-32	0.63	10	M
Endosulfan I	625	1	10-150	0-50	2.1	20	M
Endosulfan II	625	1	10-150	0-50	2.1	20	M
Endosulfan sulfate	625	1	D-107	0-25	1.9	20	M
Endrin	625	1	10-150	0-50	2.2	20	M
Endrin aldehyde	625	1	D-209	0-59	18	50	M
Fluoranthene	625	1	26-137	0-27	0.51	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Fluorene	625	1	59-121	0-25	0.68	10	M
Heptachlor	625	1	D-192	0-36	1.6	20	M
Heptachlor epoxide	625	1	26-155	0-25	1.5	20	M
Hexachlorobenzene	625	1	D-152	0-25	0.44	10	M
Hexachlorobutadiene	625	1	24-116	0-28	1.3	10	M
Hexachlorocyclopentadiene	625	1	D-200	0-50	4.7	10	M
Hexachloroethane	625	1	40-113	0-55	1.7	10	M
Indeno(1,2,3-cd)pyrene	625	1	D-171	0-37	0.77	10	M
Isophorone	625	1	21-196	0-25	1.9	10	M
d-Limonene	625	1	36-74	0-25	1.4	10	M
2,4(8)-p-Menthadiene	625	1	22-85	0-42	1.6	10	M
Naphthalene	625	1	21-133	0-36	0.47	10	M
Nitrobenzene	625	1	35-180	0-33	1.6	10	M
2-Nitrophenol	625	1	29-182	0-28	2.5	10	M
4-Nitrophenol	625	1	D-132	0-39	2.4	50	M
N-Nitrosodimethylamine	625	1	10-150	0-41	1.5	10	M
N-Nitrosodiphenylamine/Diphenylamine (requires floracil cleanup to separate N-Nitrosodiphenyamine from Diphenylamine)	625	1	10-150	0-50	1.4	10	M
N-Nitrosodi-n-propylamine	625	1	D-230	0-39	1.4	10	M
PCB-1016	625	1	D-164	0-50	120	500	M
PCB-1221	625	1	10-150	0-50	120	500	M
PCB-1232	625	1	44-94	0-50	120	500	M
PCB-1242	625	1	60-102	0-50	120	500	M
PCB-1248	625	1	65-83	0-50	120	500	M
PCB-1254	625	1	10-150	0-50	120	500	M
PCB-1260	625	1	10-116	0-50	120	500	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
Pentachlorophenol	625	1	14-176	0-37	3.2	50	M
beta-Phellandrene	625	1	33-65	0-25	1.9	10	M
Phenanthrene	625	1	54-120	0-27	0.40	10	M
Phenol	625	1	5-112	0-37	1.0	10	M
cis-Pinane	625	1	50-103	0-29	2.9	10	M
alpha-Pinene	625	1	12-105	0-25	1.3	100	M
beta-Pinene	625	1	DL-155	0-56	2.0	100	M
Pyrene	625	1	52-115	0-36	0.89	10	M
Pyridine	625	1	10-150	0-50	22	200	M
alpha-Terpinene	625	1	DL-94	0-96	1.2	10	M
Terpineol	625	1	50-150	0-25	0.82	10	M
[illegible]pinolene	625	1	28-81	0-45	1.7	10	M
o-Toluidine	625	1	10-150	0-50	8.5	10	M
Toxaphene	625	1	10-200	0-80	500	2000	M
1,2,4-Trichlorobenzene	625	1	44-142	0-28	1.4	10	M
2,4,6-Trichlorophenol	625	1	37-144	0-30	1.8	10	M
Surrogate - Nitrobenzene-d5	625	1	10-169	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	625	1	23-130	NA	NA	NA	M
Surrogate - Phenol-d5	625	1	16-139	NA	NA	NA	M
Surrogate - 2-Fluorophenol	625	1	20-124	NA	NA	NA	M
Surrogate - 2,4,6-Tribromophenol	625	1	24-135	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	625	1	27-147	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benfluralin	627	9	40-140	0-40	0.0025	0.010	M
Ethalfluralin	627	9	40-140	0-50	0.50	2.0	M
Isopropalin	627	9	48-140	0-50	0.025	0.10	M
Profluralin	627	9	55-140	0-50	0.050	0.20	M
Trifluralin (MS)	627	9	17-140	0-50	0.0025	0.010	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene	627	9	10-110	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Cyanizine	629	25	27-133	0-40	0.12	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Amobam	630	63	70-130	0-20	♦	♦	M
Ferbam	630	63	70-130	0-20	♦	♦	M
Mancozeb	630	63	70-130	0-20	♦	♦	M
Maneb	630	63	70-130	0-20	♦	♦	M
Metham	630	63	70-130	0-20	♦	♦	M
Nabam	630	63	70-130	0-20	♦	♦	M
Polyram	630	63	70-130	0-20	♦	♦	M
Zineb	630	63	70-130	0-20	♦	♦	M
Ziram	630	63	70-130	0-20	1.5	20	M

♦ All compounds reported as Ziram

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
Benomyl (as Carbendazim)	631	55	13-137	0-50	0.046	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
Aminocarb	632	13	60-125	0-30	0.25	1.0	M
Barban	632	13	55-125	0-30	0.21	1.0	M
Bromacil	632	13	52-125	0-30	0.19	2.0	M
Carbaryl (MS)	632	13	55-125	0-30	0.19	2.0	M
Carbofuran	632	13	55-125	0-30	0.45	10	M
Chlorphropham	632	13	55-125	0-30	0.21	1.0	M
Diuron (MS)	632	13	55-125	0-30	0.061	0.20	M
Fenuron	632	13	60-125	0-30	0.067	5.0	M
Fluomethuron	632	13	59-125	0-40	0.095	1.0	M
Linuron	632	13	55-125	0-30	0.058	0.50	M
Methomyl	632	13	52-132	0-30	0.30	5.0	M
Methiocarb	632	13	51-137	0-30	0.37	5.0	M
Monuron	632	13	56-132	0-30	0.089	1.0	M
Neburon	632	13	54-126	0-30	0.029	1.0	M
Oxamyl	632	13	57-125	0-30	0.24	10	M
Propham	632	13	50-125	0-30	0.21	1.0	M
Propoxur	632	13	56-125	0-30	2.1	5.0	M
Siduron	632	13	55-125	0-30	0.25	1.0	M
Swep	632	13	58-125	0-30	0.076	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Bromacil	633	41	52-125	0-30	0.50	2.0	M
DEET	633	41	52-125	0-30	1.2	5.0	M
Hexazinone	633	41	52-125	0-30	0.12	0.50	M
Metribuzin	633	41	50-125	0-30	0.25	1.0	M
Terbacil	633	41	50-130	0-30	1.2	5.0	M
Triadimefon	633	41	48-125	0-30	0.25	1.0	M
Tricyclazole	633	41	53-125	0-30	1.2	5.0	M
Surrogate - Triphenylphosphate	633	41	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Butylate (MS)	634	15	38-145	0-76	0.28	2.0	M
Cycloate	634	15	46-159	0-47	0.24	2.0	M
EPTC	634	15	46-154	0-55	0.42	2.0	M
Molinate (MS)	634	15	37-127	0-74	0.21	2.0	M
Pebulate	634	15	22-172	0-50	0.23	2.0	M
Vernolate	634	15	39-147	0-45	0.19	2.0	M
Surrogate - Triphenylphosphate	634	15	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Rotenone	635	19	59-125	0-30	0.33	2.0	M
Bensulide	636	16	22-140	0-50	0.096	0.50	M
Oryzalin	638	21	50-130	0-30	0.50	1.0	M
Bendiocarb	639	20	10-165	0-50	0.60	3.0	M
Bentazon	643	59	40-130	0-40	1.1	5.0	M
Picloram	644	64	44-138	0-40	0.12	0.50	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Alachlor (MS)	645	28	45-140	0-30	0.25	1.0	M
Butachlor	645	28	50-124	0-40	0.25	1.0	M
Diphenamid	645	28	57-119	0-40	0.25	1.0	M
Fluridone	645	28	45-154	0-40	0.25	1.0	M
Lethane	645	28	33-153	0-50	0.25	1.0	M
Norflurazon	645	28	48-110	0-40	0.25	1.0	M
Surrogate - Triphenylphosphate	645	28	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Monochlorobiphenyls	680	93	30-130	0-50	0.044	0.30	M
Dichlorobiphenyls	680	93	30-130	0-50	0.035	0.30	M
Trichlorobiphenyls	680	93	30-130	0-50	0.035	0.30	M
Tetrachlorobiphenyls	680	93	40-140	0-50	0.053	0.60	M
Pentachlorobiphenyls	680	93	40-140	0-50	0.029	0.60	M
Hexachlorobiphenyls	680	93	40-140	0-50	0.037	0.60	M
Heptachlorobiphenyls	680	93	40-140	0-50	0.042	0.90	M
Octachlorobiphenyls	680	93	40-140	0-50	0.064	0.90	M
Nonachlorobiphenyls	680	93	30-130	0-50	0.11	1.5	M
Decachlorobiphenyl	680	93	30-130	0-50	0.11	1.5	M
Surrogate- Decachlorobiphenyl-13C10	680	93	30-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
Chloroform	1624	1	40-150	0-25	0.91	5.0	M
Internal Standard-Chloroform-13C	1624	1	18-172	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
2,4,6-Trichlorophenol	1653	94	72-146	0-37	0.37	2.5	M
2,4,5-trichlorophenol	1653	94	82-148	0-33	0.070	2.5	M
2,3,4,6-Tetrachlorophenol	1653	94	80-132	0-26	0.57	2.5	M
3,4,6-Trichloroguaicol	1653	94	74-140	0-33	0.26	2.5	M
3,4,5-Trichloroguaicol	1653	94	80-134	0-27	0.31	2.5	M
4,5,6-Trichloroguaicol	1653	94	88-116	0-25	0.16	2.5	M
3,4,6-Trichloroatechol	1653	94	64-149	0-43	0.80	5.0	M
Pentachlorophenol	1653	94	84-120	0-25	0.57	5.0	M
3,4,5-Trichloroatechol	1653	94	72-128	0-28	0.92	5.0	M
Tetrachloroguaicol	1653	94	81-126	0-25	0.85	5.0	M
Trichlorosyringol	1653	94	66-174	0-27	0.52	2.5	M
Tetrachlorocatechol	1653	94	81-132	0-32	0.13	5.0	M
Internal Standard-3,4,5-Trichlorophenol	1653	94	56-116 (1) 24-167 (2)	NA	NA	NA	M
Internal Standard-4,5,6-Trichloroguaaiacol-13C6	1653	94	48-131 (1) 51-139 (2)	NA	NA	NA	M
Internal Standard-Pentachlorophenol-13C6	1653	94	8-143 (1) 27-167 (2)	NA	NA	NA	M
Internal Standard-Tetrachloroguaiacol-13C6	1653	94	35-120 (1) 27-161 (2)	NA	NA	NA	M
Internal Standard-Tetrachlorocatechol-13C6	1653	94	14-118 (1) 0-184 (2)	NA	NA	NA	M

(1) Recovery limits for the internal standards with ascorbic acid ; (2) Recovery limits for the internal standards without ascorbic acid.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Benzyl chloride	8010(5030)	2	50-150	0-30	0.25	5.0	M
Bromobenzene	8010(5030)	2	46-195	0-56	0.20	5.0	M
Bromodichloromethane	8010(5030)	2	68-136	0-54	0.28	1.0	M
Bromoform	8010(5030)	2	74-133	0-40	0.28	5.0	M
Bromomethane	8010(5030)	2	65-136	0-78	0.57	1.0	M
Carbon tetrachloride	8010(5030)	2	54-143	0-50	0.21	1.0	M
Chlorobenzene (MS)	8010(5030)	2	47-142	0-25	0.10	1.0	M
Chloroethane	8010(5030)	2	38-170	0-52	0.14	1.0	M
Chloroform	8010(5030)	2	31-178	0-36	0.27	1.0	M
1-Chlorohexane	8010(5030)	2	50-150	0-30	0.19	1.0	M
2-Chloroethylvinyl ether	8010(5030)	2	D-124	0-50	0.56	10	M
Chloromethane	8010(5030)	2	26-134	0-57	0.35	1.0	M
2-Chlorotoluene	8010(5030)	2	50-150	0-30	0.17	5.0	M
4-Chlorotoluene	8010(5030)	2	50-150	0-30	0.21	5.0	M
Dibromochloromethane	8010(5030)	2	68-120	0-56	0.22	1.0	M
1,2-Dibromoethane (EDB)	8010(5030)	2	34-168	0-77	0.20	2.0	M
Dibromomethane	8010(5030)	2	41-147	0-59	0.78	2.0	M
1,2-Dichlorobenzene	8010(5030)	2	62-134	0-39	0.16	1.0	M
1,3-Dichlorobenzene	8010(5030)	2	68-123	0-28	0.20	1.0	M
1,4-Dichlorobenzene	8010(5030)	2	65-131	0-42	0.23	1.0	M
Dichlorodifluoromethane	8010(5030)	2	57-124	0-50	0.62	1.0	M
1,1-Dichloroethane	8010(5030)	2	80-109	0-25	0.25	1.0	M
1,2-Dichloroethane	8010(5030)	2	61-132	0-58	0.20	1.0	M
1,1-Dichloroethene (MS)	8010(5030)	2	38-164	0-35	0.23	1.0	M
cis-1,2-Dichloroethene	8010(5030)	2	40-138	0-39	0.68	1.0	M
trans-1,2-Dichloroethene	8010(5030)	2	58-133	0-43	0.29	1.0	M
1,2-Dichloropropane	8010(5030)	2	70-131	0-45	0.18	1.0	M
cis-1,3-Dichloropropene	8010(5030)	2	66-129	0-45	0.28	1.0	M
trans-1,3--Dichloropropene	8010(5030)	2	72-113	0-55	0.20	1.0	M
Methylene chloride (Dichloromethane)	8010(5030)	2	55-142	0-40	1.0	5.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
1,1,2,2-Tetrachloroethane	8010(5030)	2	71-132	0-48	0.18	1.0	M
1,1,1,2-Tetrachloroethane	8010(5030)	2	62-141	0-41	0.46	1.0	M
Tetrachloroethene	8010(5030)	2	53-150	0-57	0.14	1.0	M
1,1,1-Trichloroethane	8010(5030)	2	74-119	0-47	0.34	1.0	M
1,1,2-Trichloroethane	8010(5030)	2	74-113	0-53	0.16	1.0	M
Trichloroethene (MS)	8010(5030)	2	63-121	0-48	0.30	1.0	M
Trichlorofluoromethane	8010(5030)	2	49-114	0-37	0.20	1.0	M
1,2,3-Trichloropropane	8010(5030)	2	61-148	0-48	0.18	1.0	M
Vinyl chloride	8010(5030)	2	44-173	0-61	0.31	1.0	M
Surrogate - Bromochloromethane	8010(5030)	2	30-171	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Chloropicrin	8011	51	60-140	0-40	0.0025	0.010	M
1,2-Dibromoethane (EDB)	8011	51/2	60-140	0-40	0.0061	0.020	M
1,2-Dibromo 3-chloropropane (DBCP)	8011	51/2	60-140	0-40	0.0041	0.020	M
1,1-Dichloropropane	8011	51	60-140	0-40	0.50	2.0	M
1,3-Dichloropropene	8011	51	60-140	0-40	0.25	1.0	M
Methyl isothiocyanate	8011	51	60-140	0-40	5.0	20	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC∀
Acetone (MS)	8015(5030)	2	40-130	0-30	6.8	25	M
2-Butanone (MEK) (MS)	8015(5030)	2	60-130	0-40	8.8	25	M
Diethyl ether (Ethyl ether)	8015(5030)	2	10-130	0-50	2.0	25	M
2-Hexanone	8015(5030)	2	50-150	0-50	1.6	25	M
4-Methyl-2-pentanone (MIBK) (MS)	8015(5030)	2	65-125	0-40	4.0	25	M
Methyl t-butyl ether (MTBE)	8015(5030)	2	50-150	0-30	3.6	25	M
Mineral Spirits	8015 (modified volatiles) (5030)	2/12	40-140	0-50	12	50	M
Gasoline	GRO	70/2	50-150	0-20	15	36	M
	8015(modified volatiles) (5030)	2/12	13-147	0-40	17	50	M
Lacolene	8015 (modified volatiles) (5030)	2/12	40-140	0-40	50	200	M
Surrogate - a,a,a-Trifluorotoluene	8015 (5030)	2/12	23-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Petroleum hydrocarbons	FL-PRO	83	41-101	0-20	100	300	M
	8015 (modified extractable) (3510/3520)	2	30-139	0-40	100	300	M
Diesel	DRO	69/2	40-140	0-40	75	100	M
	8015 (modified extractable) (3510/3520)	12/2	10-114	0-40	75	300	M
Heavy oil	8015 (modified extractable) (3510/3520)	12/2	30-165	0-40	510	3000	M
Kerosene	8015 (modified extractable) (3510/3520)	12/2	10-133	0-60	36	300	M
Mineral Spirits	8015 (modified extractable) (3510/3520)	2	42-145	0-46	88	300	M
Surrogate - 2-Fluorobiphenyl	8015 (modified extractable) (3510/3520)	2/12	10-130	NA	NA	NA	M
Surrogate - o-Terphenyl	DRO	69/12	38-156	NA	NA	NA	M
	8015 (modified extractable) (3510/3520)	2	38-156	NA	NA	NA	M
	FL-PRO	83	38-156	NA	NA	NA	M
Surrogate-Nonatricontane (C39)	FL-PRO	83	24-137	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
tert-Amyl alcohol	8015 (DAI*)	2	49-181	0-50	530	1000	M
sec-Butanol	8015 (DAI*)	2	37-182	0-50	390	1000	M
n-Butanol	8015 (DAI*)	2	50-150	0-50	700	1000	M
tert-Butanol	8015 (DAI*)	2	67-183	0-50	480	1000	M
n-Butyl acetate	8015 (DAI*)	2	50-150	0-50	350	5000	M
sec-Butyl acetate	8015 (DAI*)	2	50-150	0-50	290	5000	M
Butyl cellosolve	8015 (DAI*)	2	50-150	0-50	390	5000	M
Ethyl cellosolve (2-Ethoxyethanol)	8015 (DAI*)	2	20-180	0-50	ND	20000	M
Cellosolve acetate	8015 (DAI*)	2	50-150	0-50	430	5000	M
Cyclohexanone	8015 (DAI*)	2	50-150	0-50	670	5000	M
Diacetone alcohol	8015 (DAI*)	2	50-150	0-50	680	5000	M
1,4-Dioxane	8015 (DAI*)	2	50-150	0-50	320	1000	M
Ethanol (MS)	8015 (DAI*)	2	60-129	0-50	840	1000	M
Ethyl acetate	8015 (DAI*)	2	43-160	0-50	630	5000	M
Methanol (MS)	8015 (DAI*)	2	61-128	0-50	800	1000	M
n-Propanol	8015 (DAI*)	2	50-150	0-50	680	1000	M
Isopropanol (MS)	8015 (DAI*)	2	61-148	0-50	510	1000	M
Diethylene glycol	8015 (DAI*)	2	45-112	0-50	1200	5000	M
Ethylene glycol (MS)	8015 (DAI*)	2	35-132	0-50	890	5000	M
Isoamyl acetate	8015 (DAI*)	2	50-150	0-50	490	5000	M
Isobutanol	8015 (DAI*)	2	50-150	0-50	710	1000	M
Isobutyl acetate	8015 (DAI*)	2	67-166	0-50	930	5000	M
Isopropyl acetate	8015 (DAI*)	2	67-166	0-50	460	5000	M
Mesityl oxide	8015 (DAI*)	2	50-150	0-50	260	5000	M
Methyl acetate	8015 (DAI*)	2	46-170	0-50	910	5000	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
2-Nitropropane	8015 (DAI*)	2	50-150	0-50	520	5000	M
n-Propyl acetate (MS)	8015 (DAI*)	2	24-158	0-50	460	5000	M
Propylene glycol (MS)	8015 (DAI*)	2	60-126	0-50	600	5000	M
Tetraethylene glycol	8015 (DAI*)	2	50-150	0-50	1200	10000	M
Tetrahydrofuran (MS)	8015 (DAI*)	2	67-146	0-50	290	5000	M
Triethylene glycol	8015 (DAI*)	2	50-150	0-50	2200	5000	M

* DAI = Direct Aqueous Injection

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Benzene (MS)	8020(5030)	2	56-144	0-31	0.27	1.0	M
Chlorobenzene (MS)	8020(5030)	2	57-153	0-25	0.21	1.0	M
1,2-Dichlorobenzene	8020(5030)	2	62-134	0-25	0.61	1.0	M
1,3-Dichlorobenzene	8020(5030)	2	50-141	0-25	0.70	1.0	M
1,4-Dichlorobenzene	8020(5030)	2	42-143	0-25	0.51	1.0	M
Ethylbenzene	8020(5030)	2	52-128	0-29	0.23	1.0	M
Methyl t-butyl ether(MTBE)	8020(5030)	2	44-144	0-30	1.9	10	M
Styrene	8020(5030)	2	70-130	0-30	0.057	1.0	M
Toluene (MS)	8020(5030)	2	67-124	0-25	0.29	1.0	M
Xylenes, m- and p-	8020(5030)	2	64-134	0-30	0.64	1.0	M
Xylene, o-	8020(5030)	2	64-134	0-30	0.24	1.0	M
Xylenes (total)	8020(5030)	2	64-134	0-30	0.88	2.0	M
Surrogate - a,a,a-Trifluorotoluene	8020(5030)	2	23-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benzene (MS)	8021(5030)	2	56-144	0-31	0.27	1.0	M
Bromobenzene	8021(5030)	2	46-195	0-56	0.20	5.0	M
Bromochloromethane	8021(5030)	2	34-128	0-52	0.27	1.0	M
Bromodichloromethane	8021(5030)	2	68-136	0-54	0.28	1.0	M
Bromoform	8021(5030)	2	74-133	0-40	0.28	5.0	M
Bromomethane	8021(5030)	2	65-136	0-78	0.57	1.0	M
n-Butylbenzene	8021(5030)	2	50-150	0-25	0.17	1.0	M
sec-Butylbenzene	8021(5030)	2	50-150	0-25	0.14	1.0	M
tert-Butylbenzene	8021(5030)	2	49-188	0-48	0.18	1.0	M
Carbon tetrachloride	8021(5030)	2	54-143	0-50	0.21	1.0	M
Chlorobenzene (MS)	8021(5030)	2	47-142	0-25	0.10	1.0	M
Chloroethane	8021(5030)	2	38-170	0-52	0.14	1.0	M
2-Chloroethylvinyl ether	8021(5030)	2	D-124	0-50	0.56	10	M
Chloroform	8021(5030)	2	31-178	0-36	0.27	1.0	M
Chloromethane	8021(5030)	2	26-134	0-57	0.35	1.0	M
2-Chlorotoluene	8021(5030)	2	50-150	0-30	0.17	5.0	M
4-Chlorotoluene	8021(5030)	2	50-150	0-30	0.21	5.0	M
Dibromochloromethane	8021(5030)	2	68-120	0-56	0.22	1.0	M
1,2-Dibromo-3-chloropropane (DBCP)	8021(5030)	2	24-145	0-56	0.25	5.0	M
1,2-Dibromoethane (EDB)	8021(5030)	2	34-168	0-77	0.20	2.0	M
Dibromomethane	8021(5030)	2	41-147	0-59	0.78	2.0	M
1,2-Dichlorobenzene	8021(5030)	2	62-134	0-39	0.16	1.0	M
1,3-Dichlorobenzene	8021(5030)	2	68-123	0-28	0.20	1.0	M
1,4-Dichlorobenzene	8021(5030)	2	65-131	0-42	0.23	1.0	M
Dichlorodifluoromethane	8021(5030)	2	57-124	0-50	0.62	1.0	M
1,1-Dichloroethane	8021(5030)	2	75-125	0-25	0.25	1.0	M
1,2-Dichloroethane	8021(5030)	2	61-132	0-58	0.20	1.0	M
1,1-Dichloroethene (MS)	8021(5030)	2	38-164	0-35	0.23	1.0	M
cis-1,2-Dichloroethene	8021(5030)	2	40-138	0-39	0.68	1.0	M
trans-1,2-Dichloroethene	8021(5030)	2	58-133	0-43	0.29	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
1,2-Dichloropropane	8021(5030)	2	70-131	0-45	0.18	1.0	M
1,3-Dichloropropane	8021(5030)	2	53-150	0-57	0.22	1.0	M
2,2-Dichloropropane	8021(5030)	2	40-138	0-39	0.10	1.0	M
1,1-Dichloropropene	8021(5030)	2	42-141	0-50	0.081	1.0	M
cis-1,3-Dichloropropene	8021(5030)	2	66-129	0-45	0.28	1.0	M
trans-1,3-Dichloropropene	8021(5030)	2	72-125	0-55	0.20	1.0	M
Ethylbenzene	8021(5030)	2	52-128	0-29	0.23	1.0	M
Hexachlorobutadiene	8021(5030)	2	52-145	0-41	0.090	1.0	M
Isopropylbenzene	8021(5030)	2	50-150	0-27	0.060	1.0	M
p-Isopropyltoluene	8021(5030)	2	50-150	0-25	0.052	1.0	M
Methylene chloride (Dichloromethane)	8021(5030)	2	55-142	0-40	1.0	5.0	M
Naphthalene	8021(5030)	2	67-133	0-42	0.71	1.0	M
n-Propylbenzene	8021(5030)	2	50-150	0-25	0.087	1.0	M
Styrene	8021(5030)	2	70-130	0-30	0.057	1.0	M
1,1,1,2-Tetrachloroethane	8021(5030)	2	62-141	0-41	0.46	1.0	M
1,1,2,2-Tetrachloroethane	8021(5030)	2	71-132	0-48	0.18	1.0	M
Tetrachloroethene (Tetrachloroethylene)	8021(5030)	2	53-150	0-57	0.14	1.0	M
Toluene (MS)	8021(5030)	2	67-124	0-25	0.29	1.0	M
1,2,3-Trichlorobenzene	8021(5030)	2	56-108	0-26	0.074	1.0	M
1,2,4-Trichlorobenzene	8021(5030)	2	44-139	0-53	0.16	1.0	M
1,1,1-Trichloroethane	8021(5030)	2	74-119	0-47	0.34	1.0	M
1,1,2-Trichloroethane	8021(5030)	2	74-113	0-53	0.16	1.0	M
Trichloroethene (Trichloroethylene) (MS)	8021(5030)	2	63-121	0-48	0.30	1.0	M
Trichlorofluoromethane	8021(5030)	2	49-140	0-37	0.20	1.0	M
1,2,3-Trichloropropane	8021(5030)	2	61-148	0-48	0.18	2.0	M
1,2,4-Trimethylbenzene	8021(5030)	2	32-132	0-44	0.10	1.0	M
1,3,5-Trimethylbenzene	8021(5030)	2	50-150	0-25	0.089	1.0	M
Vinyl Chloride	8021(5030)	2	44-173	0-61	0.31	1.0	M
o-Xylene	8021(5030)	2	64-134	0-30	0.24	1.0	M
m&p-Xylene	8021(5030)	2	64-134	0-30	0.64	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Surrogate* - 2-Bromo-1-chloropropane	8021(5030)	2	70-130	NA	NA	NA	M
Surrogate - Fluorobenzene	8021(5030)	2	50-136	NA	NA	NA	M
Surrogate* - 1-Bromo-3-chloropropane	8021(5030)	2	50-136	NA	NA	NA	M
Surrogate- Bromochloromethane	8021(5030)	2	30-171	NA	NA	NA	M
Surrogate- a,a,a-Trifluorotoluene	8021(5030)	2	23-164	NA	NA	NA	M

* - either of these 2 surrogates may be analyzed.; only one surrogate is required for each detector. Bromochloromethane may be used as a surrogate if not a target compound .

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acrolein	8030(5030)	2	88-118	0-30	12	20	M
Acrylonitrile	8030(5030)	2	71-135	0-30	4.4	20	M
Surrogate - a,a,a-Trifluorotoluene	8030(5030)	2	23-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2-Chlorophenol (MS)	8040/8041(3510/3520)	2	10-164	0-28	1.2	10	M
4-Chloro-3-methylphenol (MS)	8040/8041(3510/3520)	2	10-165	0-33	1.2	10	M
2,4-Dichlorophenol	8040/8041(3510/3520)	2	56-106	0-21	1.3	10	M
2,6-Dichlorophenol	8040/8041(3510/3520)	2	68-110	0-23	1.4	10	M
2,4-Dimethylphenol	8040/8041(3510/3520)	2	56-111	0-30	1.3	10	M
2,4-Dinitrophenol	8040/8041(3510/3520)	2	28-119	0-36	1.1	50	M
2-Methyl-4,6-dinitrophenol	8040/8041(3510/3520)	2	28-154	0-33	1.1	50	M
3- and 4-Methylphenol (m & p cresol)	8040(3520)/ 8041(3510/3520)	2	10-150	0-50	3.3	10	M
2-Methylphenol (o-cresol)	8040(3520)/ 8041(3510/3520)	2	10-150	0-50	1.8	10	M
Cresols (total)	8040/8041(3510/3520)	2	NA	NA	5.1	10	
2-Nitrophenol	8040/8041(3510/3520)	2	49-111	0-26	1.0	10	M
4-Nitrophenol (MS)	8040/8041(3510/3520)	2	10-171	0-33	1.2	50	M
Pentachlorophenol (MS)	8040/8041(3510/3520)	2	10-216	0-28	1.3	50	M
Phenol (MS)	8040/8041(3510/3520)	2	10-147	0-56	1.0	10	M
2,3,4,5-Tetrachlorophenol	8040(3520)/ 8041(3510/3520)	2	50-150	0-40	2.5	20	M
2,3,4,6-Tetrachlorophenol	8040(3520)/ 8041(3510/3520)	2	50-150	0-40	3.1	20	M
Tetrachlorophenols (2,3,4,5 & 2,3,4,6)	8040/8041(3510/3520)	2	50-150	0-40	5.6	20	M
2,4,5-Trichlorophenol	8040(3520)/ 8041(3510/3520)	2	53-119	0-40	4.4	10	M
2,4,6-Trichlorophenol	8040/8041(3510/3520)	2	56-114	0-30	1.9	10	M
Trichlorophenols (2,4,5 & 2,4,6)	8040/8041(3510/3520)	2	53-119	0-40	6.3	10	M
Surrogate - 2,4,6-Tribromophenol	8040/8041(3510/3520)	2	14-144	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Bis(2-ethylhexyl) phthalate (MS)	8060/8061(3510/3520)	2	28-139	0-82	1.2	10	M
Butyl benzyl phthalate (MS)	8060/8061(3510/3520)	2	42-152	0-73	1.3	10	M
Diethyl phthalate (MS)	8060/8061(3510/3520)	2	43-150	0-47	1.8	10	M
Dimethyl phthalate (MS)	8060/8061(3510/3520)	2	40-148	0-63	1.8	10	M
Di-n-butyl phthalate (MS)	8060/8061(3510/3520)	2	41-154	0-46	1.8	10	M
Di-n-octyl phthalate (MS)	8060/8061(3510/3520)	2	29-136	0-52	2.7	10	M
Surrogate - 2-Fluorobiphenyl	8060/8061(3510/3520)-FID	2	25-109	NA	NA	NA	M
Surrogate - 2,3,4,6-Tetrachloro-m-xylene (TCMX)	8060/8061(3510/3520)-EC	2	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8060/8061(3510/3520)-EC	2	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (%Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
N-Nitrosodimethylamine	8070(3510/3520)	2	13-109	0-38	1.7	2.0	M
N-Nitrosodi-n-propylamine	8070(3510/3520)	2	45-146	0-75	1.8	2.0	M
1,3-Dinitrobenzene	8070(3520)	2	67-115	0-30	0.96	3.0	M
N-Nitrosodiphenylamine	8070(3510/3520)	2	10-139	0-67	2.1	3.0	M
p-Dimethylaminoazobenzene	8070(3520)	2	69-140	0-48	0.94	3.0	M
Surrogate - Tripehnylphosphate	8070(3510/3520)	2	16-164	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Alachlor	8081(3510/3520)	2	62-128	0-30	0.41	2.0	M
Aldrin (MS - Except CLP OLC02.1)	8080/8081(3510/3520)	2	21-125	0-40	0.0041	0.050	M
	CLP OLM01.9/OLM03.1	62/85	40-120	0-22	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
Benfluralin	8080(3520)	2	40-140	0-40	0.0025	0.020	M
alpha BHC	8080/8081(3510/3520)	2	45-117	0-28	0.0022	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
beta BHC	8080/8081(3510/3520)	2	45-128	0-25	0.0053	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
delta BHC	8080/8081(3510/3520)	2	10-163	0-25	0.0019	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
gamma BHC (Lindane) (MS - All methods)	8080/8081(3510/3520)	2	37-132	0-44	0.0019	0.050	M
	CLP OLM01.9/OLM03.1	62/85	56-123	0-15	0.050	0.050	M
	CLP OLC02.1	6	56-123	NA	0.010	0.010	M
Captafol	8081(3510/3520)	2	20-180	0-50	0.025	0.10	M
alpha Chlordane	8081(3510/3520)	2	10-139	0-25	0.0028	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
gamma Chlordane (MS - CLP OLC02.1)	8081(3510/3520)	2	51-130	0-26	0.0026	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	33-130	NA	0.010	0.010	M
technical Chlordane	8080(3510/3520)	2	54-140	0-30	0.061	0.50	M
Chlorobenzilate	8081(3510/3520)	2	50-150	0-40	0.081	0.50	M
Chloroneb	8081(3510/3520)	2	49-125	0-30	0.091	0.40	M
Chloropropylate	8081(3510/3520)	2	51-125	0-30	0.17	0.50	M
Chlorothalonil	8081(3510/3520)	2	55-125	0-30	0.050	0.20	M
Dacthal (DCPA)	8081(3510/3520)	2	50-150	0-25	0.014	0.020	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC▽
4,4'-DDD	8080/8081(3510/3520)	2	47-139	0-25	0.0060	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	NA	NA	0.020	0.020	M
4,4'-DDE (MS - CLP OLC02.1)	8080/8081(3510/3520)	2	41-117	0-25	0.0069	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	50-150	NA	0.020	0.020	M
4,4'-DDT (MS - Except CLP OLC02.1)	8080/8081(3510/3520)	2	47-139	0-40	0.0074	0.10	M
	CLP OLM01.9/OLM03.1	62/85	38-127	0-27	0.10	0.10	M
	CLP OLC02.1	6	NA	NA	0.020	0.020	M
Dicofol (Kelthane)	8081(3510/3520)	2	55-115	0-40	0.0067	0.050	M
Dieldrin (MS - All methods)	8080/8081(3510/3520)	2	31-140	0-35	0.0023	0.10	M
	CLP OLM01.9/OLM03.1	62/85	52-126	0-18	0.10	0.10	M
	CLP OLC02.1	6	33-130	NA	0.020	0.020	M
Endosulfan I	8080/8081(3510/3520)	2	33-135	0-25	0.0027	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
Endosulfan II	8080/8081(3510/3520)	2	49-123	0-25	0.0037	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	NA	NA	0.020	0.020	M
Endosulfan sulfate (MS - CLP OLC02.1)	8080/8081(3510/3520)	2	46-137	0-25	0.0053	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	50-120	NA	0.020	0.020	M
Endrin (MS - All methods)	8080/8081(3510/3520)	2	34-148	0-66	0.0085	0.10	M
	CLP OLM01.9/OLM03.1	62/85	56-121	0-21	0.10	0.10	M
	CLP OLC02.1	6	56-121	NA	0.020	0.020	M
Endrin aldehyde	8080/8081(3510/3520)	2	43-117	0-58	0.0079	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	NA	NA	0.020	0.020	M
Endrin ketone	8081(3510/3520)	2	42-122	0-25	0.011	0.10	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.10	0.10	M
	CLP OLC02.1	6	NA	NA	0.020	0.020	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Etradiazole	8081(3520)	2	60-125	0-30	0.0018	0.020	M
Heptachlor (MS - Except CLP OLC02.1)	8080/8081(3510/3520)	2	23-126	0-43	0.0025	0.050	M
	CLP OLM01.9/OLM03.1	62/85	40-131	0-20	0.050	0.050	M
	CLP OLC02.1	6	NA	NA	0.010	0.010	M
Heptachlor epoxide (MS - CLP OLC02.1)	8080/8081(3510/3520)	2	49-115	0-25	0.0085	0.050	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.050	0.050	M
	CLP OLC02.1	6	74-150	NA	0.010	0.010	M
Hexachlorobenzene	8081(3510/3520)	2	25-112	0-33	0.0028	0.050	M
Isodrin	8081(3510/3520)	2	55-110	0-40	0.0036	0.050	M
Isodrin	8081(3510/3520)	2	10-150	0-50	0.045	0.50	M
Methoxychlor	8080/8081(3510/3520)	2/26	51-137	0-40	0.032	0.50	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	0.50	0.50	M
	CLP OLC02.1	6	NA	NA	0.10	0.10	M
Mirex	8081(3510/3520)	2	52-112	0-37	0.28	0.50	M
PCNB	8081(3510/3520)	2	60-125	0-30	0.0033	0.60	M
Pendimethalin	8080A/8081/3520	2	50-146	0-25	0.0021	0.050	M
Permethrin	8081(3510/3520)	2	50-130	0-40	0.081	1.0	M
Propachlor	8081(3510/3520)	2	51-125	0-30	0.15	0.50	M
Toxaphene	8080/8081(3510/3520)	2	12-130	0-30	0.55	5.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	5.0	5.0	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Trifluralin	8081(3510/3520)	2	54-124	0-40	0.0067	0.020	M
PCB 1016	8080/8082(3510/3520)	2	43-139	0-30	0.15	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
PCB 1221	8080/8082(3510/3520)	2	15-178	0-30	0.27	2.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	2.0	2.0	M
	CLP OLC02.1	6	NA	NA	0.40	0.40	M
PCB 1232	8080/8082(3510/3520)	2	10-215	0-30	0.21	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M
PCB 1242	8080/8082(3510/3520)	2	39-150	0-30	0.25	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M
PCB 1248	8080/8082(3510/3520)	2	38-158	0-30	0.18	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M
PCB 1254	8080/8082(3510/3520)	2	66-122	0-30	0.11	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M
PCB 1260	8080/8082(3510/3520)	2	31-152	0-30	0.12	1.0	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.0	1.0	M
	CLP OLC02.1	6	NA	NA	0.20	0.20	M

NOTE: If only PCBs are requested, PCB1016 and PCB1260 are the matrix spiking compounds.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Surrogate - Dibutylchlorendate (DBC)	8080(3510/3520)	2	26-149	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080/8081/8082 (33510/3520)	2	10-110	NA	NA	NA	M
	CLP OLM01.9	62	60-150	NA	NA	NA	M
	CLP OLM03.1	85	30-150	NA	NA	NA	M
	CLP OLC02.1	6	30-150	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8080/8081/8082 (3510/3520)	2	10-134	NA	NA	NA	M
	CLP OLM01.9	62	60-150	NA	NA	NA	M
	CLP OLM03.1	85	30-150	NA	NA	NA	M
	CLP OLC02.1	6	30-150	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Individual Congeners (*)							
2,4'-Dichlorobiphenyl (8)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',5-Trichlorobiphenyl (18)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,4,4'-Trichlorobiphenyl (28)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,5'-Tetrachlorobiphenyl (44)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',5,5'-Tetrachlorobiphenyl (52)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,3',4,4'-Tetrachlorobiphenyl (66)	8082(3550)	2	50-150	0-50	0.025	0.10	M
3,3',4,4'-Tetrachlorobiphenyl (77)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',4,5,5'-Pentachlorobiphenyl (101)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,3,3',4,4'-Pentachlorobiphenyl (105)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',4,5,5'-Pentachlorobiphenyl (101)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,3',4,4',5-Pentachlorobiphenyl (118)	8082(3550)	2	50-150	0-50	0.025	0.10	M
3,3',4,4',5-Pentachlorobiphenyl (126)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,3',4,4'-Hexachlorobiphenyl (128)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,4,4',5'-Hexachlorobiphenyl (138)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',4,4',5,5'-Hexachlorobiphenyl (153)	8082(3550)	2	50-150-	0-50	0.025	0.10	M
2,3,3',4,4',5-Hexachlorobiphenyl (156)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,3,3',4,4',6-Hexachlorobiphenyl (158)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	8082(3550)	2	50-150	0-50	0.025	0.10	M
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	8082(3550)	2	50-150	0-50	0.025	0.10	M
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	8082(3550)	2	50-150	0-50	0.025	0.10	M
Decachlorobiphenyl (209)	8082(3550)	2	50-150	0-50	0.025	0.10	M
Surrogate - 2,4,5,6-Tetrachloro-m- xylene (TCMX)	8082(3550)	2	10-110	NA	NA	NA	M
Surrogate- Octachloronaphthalene	8082(3550)	2	25-150	NA	NA	NA	M

*These congeners are representative of the 209 individual PCBs that may be determined using Method 8082. The number in parenthesis after the compound name is the PCB congener number. See the previous section for PCBs as Aroclors.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
2,4-Dinitrotoluene (MS)	8090(3510/3520)(FID)	2	10-125	0-40	2.5	10	M
	8090/8091(3510/3520)(ECD)		10-125	0-40	0.12	0.30	M
2,6-Dinitrotoluene (MS)	8090(3510/3520)(FID)	2	10-126	0-40	2.5	10	M
	8090/8091(3510/3520)(ECD)		10-126	0-40	0.077	0.30	M
Isophorone (MS)	8090(3510/3520)	2	10-117	0-40	2.1	10	M
Nitrobenzene (MS)	8090/8091(3510/3520)	2	10-118	0-40	1.6	10	M
Surrogate - 2-Fluorobiphenyl	8090(3510/3520)(FID)	2	25-109	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8090/8091(3510/3520)(ECD)	2	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8090/8091(3510/3520)(ECD)	2	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Anthracene*4	8100(3510/3520)	2	29-164	0-28	1.8	10	M
Acenaphthene (MS)	8100(3510/3520)	2	27-133	0-25	1.7	10	M
Acenaphthylene	8100(35100/3520)	2	27-130	0-30	1.9	10	M
Benzo(a)anthracene*1	8100(3510/3520)	2	35-142	0-38	2.0	10	M
Benzo(a)pyrene (MS)	8100(3510/3520)	2	30-136	0-40	1.2	10	M
Benzo(b)fluoranthene*2	8100(3510/3520)	2	32-141	0-51	2.8	10	M
Benzo(k)fluoranthene*2	8100(3510/3520)	2	32-141	0-51	2.8	10	M
Benzo(g,h,i)perylene	8100(3510/3520)	2	27-143	0-61	1.6	10	M
Carbazole	8100(3510/3520)	2	16-140	0-40	1.9	10	M
Chrysene*1	8100(3510/3520)	2	35-142	0-38	2.0	10	M
Dibenzo(a,h)anthracene*3	8100(3510/3520)	2	33-154	0-52	1.7	10	M
Fluoranthene	8100(3510/3520)	2	37-145	0-25	1.7	10	M
Fluorene (MS)	8100(3510/3520)	2	30-140	0-25	1.7	10	M
Indeno(1,2,3-cd) pyrene*3	8100(3510/3520)	2	33-154	0-52	2.9	10	M
1-Methyl naphthalene	8100(3510/3520)	2	10-145	0-50	1.4	10	M
2-Methyl naphthalene	8100(3510/3520)	3	14-138	0-50	1.2	10	M
Naphthalene (MS)	8100(3510/3520)	2	16-108	0-28	1.6	10	M
Phenanthrene*4	8100(3510/3520)	2	33-146	0-28	1.9	10	M
Pyrene (MS)	8100(3510/3520)	2	36-146	0-28	1.7	10	M
Surrogate - 2-Fluorobiphenyl	8100(3510/3520)	2	10-130	NA	NA	NA	M
Surrogate - o-Terphenyl	8100(3510/3520)	2	38-156	NA	NA	NA	M

*# = Where the number is the same for any 2 compounds, these compounds cannot be routinely resolved chromatographically and are therefore reported as a combined result.

NOTE: 8100(mod) and DRO parameters have been moved to 8015(extractables), the SW-846 Update III reference for petroleum products.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Bis(2-chloroethoxy)methane	8110/8111 (3510/3520)	2	12-128	0-50	1.0	5.0	M
Bis(2-chloroethyl)ether	8110/8111 (3510/3520)	2	11-152	0-50	1.8	20	M
Bis(2-chloroisopropyl)ether	8110/8111 (3510/3520)	2	9-165	0-50	2.5	10	M
4-Bromophenyl phenyl ether	8110/8111 (3510/3520)	2	D-189	0-50	1.3	5.0	M
4-Chlorophenyl phenyl ether	8110/8111 (3510/3520)	2	D-170	0-50	8.8	40	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8110/8111 (3510/3520)	2	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8110/8111 (3510/3520)	2	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2-Chloronaphthalene	8120/8121 (3510/3520)	2	9-148	0-50	1.4	10	M
1,2-Dichlorobenzene	8120/8121 (3510/3520)	2	9-160	0-50	0.20	10	M
1,3-Dichlorobenzene	8120/8121 (3510/3520)	2	D-150	0-50	0.24	10	M
1,4-Dichlorobenzene	8120/8121 (3510/3520)	2	13-137	0-50	0.57	10	M
Hexachlorobenzene	8120/8121 (3510/3520)	2	15-159	0-50	0.0032	0.10	M
Hexachlorobutadiene	8120/8121 (3510/3520)	2	D-139	0-50	0.0084	0.10	M
Hexachlorocylcopentadiene	8120/8121 (3510/3520)	2	D-111	0-50	0.0030	0.10	M
Hexachloroethane	8120/8121 (3510/3520)	2	8-139	0-50	0.0038	0.10	M
1,2,4-Trichlorobenzene	8120/8121 (3510/3520)	2	5-149	0-50	0.060	1.0	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8120/8121 (3510/3520)	2	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8120/8121 (3510/3520)	2	10-134	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL▲ (ug/L)	TC▼
Acephate(1)	1657	72	25-140	0-50	1.2	5.0	M
Methamidophos(1)	1657	72	36-106	0-46	0.10	2.0	M
Alachlor	8141(3510/3520)	2	46-139	0-30	0.14	1.0	M
Ametryn	8141(3510/3520)	2	60-120	0-40	0.16	2.0	M
Atrazine (MS)	8141(3510/3520)	2	39-130	0-30	0.13	2.0	M
Azinphos methyl	8141(3510/3520)	2	48-162	0-50	0.16	1.0	M
Benoxacor	8141(3510/3520)	2	10-150	0-50	4.4	10	M
Bolstar	8141(3510/3520)	2	36-114	0-40	0.26	1.0	M
Butachlor	8141(3510/3520)	2	50-150	0-40	0.35	1.0	M
Carbophenothion	8141(3510/3520)	2	69-122	0-40	0.23	1.0	M
Chlordimeform (Galecron)	8141(3510/3520)	2	10-150	0-50	3.8	10	M
5-Chloroaminotoluene	8141(3510/3520)	2	10-150	0-50	3.4	10	M
Chlorpyrifos	8141(3510/3520)	2	49-109	0-40	0.17	1.0	M
Chlorpyrifos methyl	8141(3510/3520)	2	53-136	0-40	0.17	1.0	M
Coumaphos	8141(3510/3520)	2	61-139	0-40	0.19	1.0	M
Demeton-o	8141(3510/3520)	2	10-117	0-40	1.1	2.5	M
Demeton-s	8141(3510/3520)	2	37-121	0-40	0.35	2.5	M
Demeton-o+s	8141(3510/3520)	2	10-117	0-40	1.1	2.5	M
Diazinon (MS)	8141(3510/3520)	2	40-137	0-40	0.17	1.0	M
Dichlofenthion	8141(3510/3520)	2	38-118	0-40	0.11	1.0	M
Dichlorvos	8141(3510/3520)	2	11-158	0-40	0.28	2.0	M
Dimethoate	8141(3510/3520)	2	14-101	0-40	0.11	2.0	M
Dioxathion	8141(3510/3520)	2	26-127	0-40	1.5	10	M
Disulfoton	8141(3510/3520)	2	42-112	0-66	0.17	2.0	M
EPN	8141(3510/3520)	2	48-124	0-40	0.19	1.0	M
Ethion	8141(3510/3520)	2	62-175	0-40	0.12	0.50	M
Ethoprop	8141(3510/3520)	2	42-123	0-40	0.27	0.50	M
Famphur	8141(3510/3520)	2	13-128	0-60	0.25	2.0	M
Fenamiphos	8141	2	40-160	0-40	0.59	2.0	M
Fensulfothion	8141(3510/3520)	2	31-163	0-40	0.27	5.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Fenthion	8141(3510/3520)	2	41-115	0-60	0.23	1.0	M
Isofenphos	8141(3510/3520)	2	40-160	0-40	0.060	0.50	M
Malathion	8141(3510/3520)	2	10-140	0-40	0.071	1.0	M
Merphos	8141(3510/3520)	2	32-138	0-40	0.22	1.0	M
Metolachlor	8141(3510/3520)	2	53-133	0-40	0.11	1.0	M
Metrabuzin	8141(3510/3520)	2	50-150	0-40	0.11	1.0	M
Mevinphos	8141(3510/3520)	2	24-166	0-40	0.23	2.0	M
Monocrotophos	8141(3510/3520)	2	43-126	0-50	2.9	10	M
Naled	8141(3510/3520)	2	10-119	0-40	0.14	5.0	M
Parathion, ethyl (MS)	8141(3510/3520)	2	28-155	0-34	0.083	1.0	M
Parathion, methyl (MS)	8141(3510/3520)	2	38-149	0-32	0.19	0.50	M
Phorate	8141(3510/3520)	2	28-119	0-40	0.30	1.0	M
Prometon	8141(3510/3520)	2	55-124	0-40	0.11	2.0	M
Prometryn	8141(3510/3520)	2	36-155	0-40	0.23	2.0	M
Propazine	8141(3510/3520)	2	51-127	0-30	0.25	2.0	M
Ronnel (MS)	8141(3510/3520)	2	30-130	0-35	0.26	1.0	M
Simazine	8141(3510/3520)	2	39-149	0-50	0.19	2.0	M
Stirophos (Tetrachlorvinphos)	8141(3510/3520)	2	48-125	0-40	0.39	1.0	M
Sulfotepp	8141(3510/3520)	2	40-157	0-40	0.17	0.50	M
Terbufos	8141(3510/3520)	2	40-160	0-40	0.16	1.0	M
Terbutylazine	8141(3510/3520)	2	60-130	0-40	0.33	2.0	M
Terbutryn	8141(3510/3520)	2	53-113	0-40	0.066	2.0	M
Thionazin (MS)	8141(3510/3520)	2	12-139	0-60	0.21	1.0	M
Tokuthion (Prothiofos)	8141(3510/3520)	2	45-114	0-40	0.22	1.0	M
Trichloronate	8141(3510/3520)	2	16-123	0-40	0.12	1.0	M
Surrogate - Triphenylphosphate	8141(3510/3520)	2	16-164	NA	NA	NA	M

(1) Determined by NPD

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Bentazon	8151	2	50-150	0-48	0.50	2.0	M
2,4-D (MS)	8150/8151	2	10-180	0-65	0.19	0.50	M
2,4-DB	8150/8151	2	10-123	0-50	0.23	0.50	M
2,4,5-T (MS)	8150/8151	2	28-127	0-54	0.020	0.50	M
2,4,5-TP (Silvex) (MS)	8150/8151	2	41-130	0-45	0.024	0.50	M
Dalapon	8150/8151	2	17-130	0-80	0.43	120	M
Dicamba	8150/8151	2	13-143	0-86	0.12	1.2	M
Dichlorprop	8150/8151	2	25-150	0-103	0.12	6.0	M
Dinoseb	8150/8151	2	10-138	0-157	0.080	6.0	M
MCPA	8150/8151	2	10-210	0-91	15	120	M
MCPP	8150/8151	2	12-208	0-91	12	120	M
Pentachlorophenol	8151	2	13-118	0-80	0.025	1.0	M
Picloram	8151	2	10-210	0-40	0.020	0.50	M
Surrogate - 2,4-Dichlorophenylacetic acid (DCAA)	8150/8151	2	27-133	NA	NA	NA	M
Surrogate - 2,4-Dichlorophenoxy butyric acid (2,4-DB)	8150/8151	2	40-140	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acetone	8240(5030)/8260(5030)	2	10-161	0-40	4.1	50	M
	8240(5030)/8260(5030)(25-mL purge)	2	10-161	0-40	3.3	25	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Acetonitrile	8240(5030)/8260(5030)	2	52-170	0-40	393	1000	M
	8240(5030)/8260(5030)(25-mL purge)	2	52-170	0-40	14	200	M
Acrolein	8240(5030)/8260(5030)	2	60-132	0-40	55	100	M
	8240(5030)/8260(5030) (25-mL purge)	2	60-132	0-40	9.2	20	M
Acrylonitrile	8240(5030)/8260(5030)	2	77-108	0-40	18	100	M
	8240(5030)/8260(5030) (25-mL purge)	2	77-108	0-40	8.7	20	M
Benzene (MS - All Methods)	8240(5030)/8260(5030)	2	52-143	0-31	0.31	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	52-143	0-31	0.33	1.0	M
	CLP OLM01.9/OLM03.1	62/8	76-127	0-11	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Benzyl chloride	8240(5030)/8260(5030)	2	10-130	0-70	25	100	M
	8240(5030)/8260(5030)(25-mL purge)	2	10-130	0-70	12	50	M
Bromobenzene	8260(5030)	2	50-150	0-40	0.55	5.0	M
	8260(5030)(25-mL purge)	2	50-150	0-40	0.26	1.0	M
Bromochloromethane	8260(5030)	2	50-150	0-40	0.37	5.0	M
	8260(5030)(25-mL purge)	2	50-150	0-40	0.51	1.0	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Bromodichloromethane	8240(5030)/8260(5030)	2	62-143	0-30	0.36	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	62-143	0-30	0.33	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Bromoform (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	50-142	0-30	0.40	5.0	M
	8240(5030)/8260(5030)(25-mL purge	2	50-142	0-30	0.38	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Bromomethane	8240(5030)/8260(5030)	2	34-181	0-32	1.5	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	34-181	0-32	0.62	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2-Butanone (MEK)	8240(5030)/8260(5030)	2	57-120	0-40	5.1	25	M
	8240(5030)/8260(5030)(25-mL purge)	2	57-120	0-40	5.1	10	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
n-Butylbenzene	8260(5030)	2	69-126	0-40	0.54	5.0	M
	8260(5030)(25-mL purge)	2	69-126	0-40	0.42	1.0	M
sec-Butylbenzene	8260(5030)	2	67-130	0-40	0.51	5.0	M
	8260(5030)(25-mL purge)	2	67-130	0-40	0.37	1.0	M
tert-Butylbenzene	8260(5030)	2	71-130	0-40	0.56	5.0	M
	8260(5030)(25-mL purge)	2	71-130	0-40	0.36	1.0	M
Carbon disulfide	8240(5030)/8260(5030)	2	56-124	0-40	0.67	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	56-124	0-40	0.18	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Carbon tetrachloride (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	45-172	0-25	0.49	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	45-172	0-25	0.31	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Chlorobenzene (MS - except CLP OLC02.1)	8240(5030)/8260(5030)	2	60-127	0-25	0.41	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	60-127	0-25	0.36	1.0	M
	CLP OLM01.9/OLM03.1	62/8	75-130	0-13	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
2-Chloro-1,3-butadiene (Chloroprene)	8240(5030)/8260(5030)	2	21-163	0-50	0.83	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	21-163	0-50	0.47	1.0	M
Chloroethane	8240(5030)/8260(5030)	2	44-170	0-36	1.3	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	44-170	0-36	0.42	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
2-Chloroethyl vinyl ether	8240(5030)/8260(5030)	2	12-237	0-96	11	50	M
	8240(5030)/8260(5030)(25-mL purge)	2	12-237	0-96	1.8	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Chloroform	8240(5030)/8260(5030)	2	74-123	0-25	0.53	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	74-123	0-25	0.39	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Chloromethane	8240(5030)/8260(5030)	2	41-137	0-40	1.5	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	41-137	0-40	0.47	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
3-Chloropropene (Allyl chloride)	8240(5030)/8260(5030)	2	50-150	0-40	1.5	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	50-150	0-40	0.25	1.0	M
2-Chlorotoluene	8260(5030)	2	71-124	0-25	1.3	5.0	M
	8260(5030)(25-mL purge)	2	71-124	0-25	0.34	1.0	M
4-Chlorotoluene	8260(5030)	2	75-119	0-25	1.2	5.0	M
	8260(5030)(25-mL purge)	2	75-119	0-25	0.34	1.0	M
Cyclohexanone	8260(5030)(25mL purge)	2	58-170	0-56	59	250	M
Dibromochloromethane	8240(5030)/8260(5030)	2	52-140	0-25	0.32	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	52-140	0-25	0.34	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,2-Dibromo-3-chloropropane (DBCP)	8240(5030)/8260(5030)	2	46-140	0-40	1.6	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	46-140	0-40	0.43	1.0	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,2-Dibromoethane (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	57-145	0-40	0.55	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	57-145	0-40	0.44	1.0	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Dibromomethane	8240(5030)/8260(5030)	2	54-147	0-40	0.54	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	54-147	0-40	0.44	1.0	M
1,2-Dichlorobenzene	8260(5030)	2	83-115	0-25	0.27	5.0	M
	8260(5030)(25-mL purge)	2	83-115	0-25	0.35	1.0	M
	CLP OLC02.1	6	60-140	NA	NA	1.0	M
1,3-Dichlorobenzene	8260(5030)	2	81-113	0-25	0.83	5.0	M
	8260(5030)(25-mL purge)	2	81-113	0-25	0.38	1.0	M
	CLP OLC02.1	6	60-140	NA	NA	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,4-Dichlorobenzene (MS - CLP OLC02.1)	8260(5030)	2	84-114	0-25	0.79	5.0	M
	8260(5030)(25-mL purge)	2	84-114	0-25	0.34	1.0	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
trans-1,4-Dichloro-2-butene	8240(5030)/8260(5030)	2	11-129	0-40	5.7	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	11-129	0-40	1.2	2.0	M
Dichlorodifluoromethane	8240(5030)/8260(5030)	2	10-210	0-40	1.0	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	10-210	0-40	0.42	1.0	M
1,1-Dichloroethane	8240(5030)/8260(5030)	2	58-132	0-40	0.86	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	58-132	0-40	0.43	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,2-Dichloroethane (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	53-158	0-26	0.41	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	53-158	0-26	0.40	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Dichloroethene(Total -sum of cis- and trans- isomers)	8260(5030)	2	13-192	0-40	0.48	5.0	M
	8260(5030)(25-mL purge)	2	13-192	0-40	0.50	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
cis-1,2-Dichloroethene	8240(5030)/8260	2	13-192	0-40	0.48	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	13-192	0-40	0.50	1.0	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
trans-1,2-Dichloroethene	8240(5030)/8260	2	58-136	0-40	0.68	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	58-136	0-40	0.63	1.0	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,1-Dichloroethene (MS - except CLP OLC02.1)	8240(5030)/8260(5030)	2	38-155	0-25	0.71	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	38-155	0-25	0.61	1.0	M
	CLP OLM01.9/OLM03.1	62/8	61-145	0-14	10	10	M
	CLP OLC02.1	5	NA	NA	1.0	1.0	M
1,2-Dichloropropane (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	71-129	0-25	0.48	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	71-129	0-25	0.42	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,3-Dichloropropane	8260(5030)	2	62-136	0-40	0.49	5.0	M
	8260(5030)(25-mL purge)	2	62-136	0-40	0.41	1.0	M
2,2-Dichloropropane	8260(5030)	2	10-183	0-40	1.1	5.0	M
	8260(5030)(25-mL purge)	2	10-183	0-40	0.32	1.0	M
1,1-Dichloropropene	8260(5030)	2	68-136	0-40	0.57	5.0	M
	8260(5030)(25-mL purge)	2	68-136	0-40	0.36	1.0	M
cis-1,3-Dichloropropene (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	60-127	0-25	0.29	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	60-127	0-25	0.36	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
trans-1,3-Dichloropropene	8240(5030)/8260(5030)	2	47-132	0-25	0.36	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	47-132	0-25	0.36	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Diethyl ether	8260(5030)	2	50-150	0-40	2.5	10	M
	8260(5030)(25-mL purge)	2	50-150	0-40	0.50	2.0	M
Ethanol	8260(5030)(25-mL purge)	2	40-160	0-40	250	1000	M
Ethylbenzene	8240(5030)/8260(5030)	2	59-131	0-25	0.38	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	59-131	0-25	0.37	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Ethyl methacrylate	8240(5030)/8260(5030)	2	37-139	0-40	0.53	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	37-139	0-40	0.42	1.0	M
Ethylene oxide	8240(5030)/8260(5030)25-mL purge)	2	DL-169	0-164	99	120	M
Hexachlorobutadiene	8260(5030)	2	66-138	0-40	0.76	5.0	M
	8260(5030)(25-mL purge)	2	66-138	0-40	0.39	1.0	M
2-Hexanone	8240(5030)/8260(5030)	2	50-136	0-40	6.7	25	M
	8240(5030)/8260(5030)(25-mL purge)	2	50-136	0-40	4.5	10	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Iodomethane	8240(5030)/8260(5030)	2	37-137	0-40	0.67	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	37-137	0-40	0.37	1.0	M
Isobutyl alcohol	8240(5030)/8260(5030)	2	51-179	0-40	310	1000	M
	8240(5030)/8260(5030)(25-mL purge)	2	51-179	0-40	11	200	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Isopropylbenzene	8260(5030)	2	68-128	0-40	0.70	5.0	M
	8260(5030)(25-mL purge)	2	68-128	0-40	0.36	1.0	M
p-Isopropyltoluene	8260(5030)	2	71-128	0-40	0.37	5.0	M
	8260(5030)(25-mL purge)	2	71-128	0-40	0.36	1.0	M
Methacrylonitrile	8240(5030)/8260(5030)	2	76-111	0-40	8.4	100	M
	8240(5030)/8260(5030)(25-mL purge)	2	76-111	0-40	8.1	20	M
Methylene chloride	8240(5030)/8260(5030)	2	69-120	0-37	0.67	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	69-120	0-37	0.36	5.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	2.0	2.0	M
Methylmethacrylate	8240(5030)	2	50-130	0-40	0.66	5.0	M
	8240(5030)(25-mL purge)	2	50-130	0-40	0.55	1.0	M
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260(5030)	2	57-134	0-40	5.7	25	M
	8240(5030)/8260(5030)(25-mL purge)	2	57-134	0-40	3.5	10	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Methyl t-butyl ether (MTBE)	8260(5030)	2	50-150	0-40	2.5	10	M
	8260(5030)(25-mL purge)	2	50-150	0-40	0.85	10	M
Naphthalene	8260(5030)	2	56-136	0-40	1.7	5.0	M
	8260(5030)(25-mL purge)	2	56-136	0-40	0.45	1.0	M
n-Octane	8260	2	50-150	0-40	1.2	5.0	M
Pentachloroethane	8240(5030)/8260(5030)	2	10-276	0-65	11	25	M
	8240(5030)/8260(5030)(25-mL purge)	2	10-276	0-65	4.2	5	M
Propionitrile (ethylcyanide)	8240(5030)/8260(5030)	2	63-112	0-40	7.2	100	M
	8240(5030)/8260(5030)(25-mL purge)	2	63-112	0-40	13	20	M
n-Propylbenzene	8260(5030)	2	66-125	0-40	0.59	5.0	M
	8260(5030)(25-mL purge)	2	66-125	0-40	0.35	1.0	M
Styrene	8240(5030)/8260(5030)	2	57-133	0-40	0.40	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	57-133	0-40	0.40	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,1,1,2-Tetrachloroethane	8240(5030)/8260(5030)	2	61-130	0-40	0.47	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	61-130	0-40	0.17	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,1,2,2-Tetrachloroethane	8240(5030)/8260(5030)	2	49-136	0-25	0.61	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	49-136	0-25	0.52	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
Tetrachloroethene (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	52-137	0-25	0.50	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	52-137	0-25	0.46	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Toluene (MS - except CLP OLC02.1)	8240(5030)/8260(5030)	2	76-128	0-25	0.36	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	76-128	0-25	0.33	1.0	M
	CLP OLM01.9/OLM03.1	62/8	76-125	0-13	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,2,3-Trichlorobenzene	8260(5030)	2	77-124	0-40	0.58	5.0	M
	8260(5030)(25-mL purge)	2	77-124	0-40	0.47	1.0	M
1,2,4-Trichlorobenzene	8260(5030)	2	66-128	0-40	0.60	5.0	M
	8260(5030)(25-mL purge)	2	66-128	0-40	0.42	1.0	M
	CLP OLC02.1	6	50-150	0-40	1.0	1.0	M
1,1,1-Trichloroethane	8240(5030)/8260(5030)	2	30-162	0-25	0.41	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	30-162	0-25	0.32	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
1,1,2-Trichloroethane (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	62-137	0-25	0.37	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	62-137	0-25	0.41	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Trichloroethene (MS - All methods)	8240(5030)/8260(5030)	2	10-213	0-40	0.41	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	10-213	0-40	0.38	1.0	M
	CLP OLM01.9/OLM03.1	62/8	71-120	0-14	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Trichlorofluoromethane	8240(5030)/8260(5030)	2	45-162	0-65	0.92	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	45-162	0-65	0.58	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,2,3-Trichloropropane	8240(5030)/8260(5030)	2	64-133	0-40	0.55	5.0	M
	8240(5030)/8260(5030)(25-mL purge)	2	64-133	0-40	0.34	1.0	M
1,1,2-Trichloro-1,2,2-trifluoroethane	8240(5030)	2	82-130	0-25	0.26	5.0	M
	8240(5030)(25-mL purge)	2	82-130	0-25	0.57	1.0	M
1,2,4-Trimethylbenzene	8260(5030)	2	78-117	0-25	0.53	5.0	M
	8260(5030)(25-mL purge)	2	78-117	0-25	0.33	1.0	M
1,3,5-Trimethylbenzene	8260(5030)	2	50-150	0-40	0.41	5.0	M
	8260(5030)(25-mL purge)	2	50-150	0-40	0.35	1.0	M
Vinyl acetate	8240(5030)/8260(5030)	2	65-120	0-40	0.80	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	65-120	0-40	0.52	2.0	M
Vinyl chloride (MS - CLP OLC02.1)	8240(5030)/8260(5030)	2	36-159	0-40	0.88	10	M
	8240(5030)/8260(5030)(25-mL purge)	2	36-159	0-40	0.58	1.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	60-140	NA	1.0	1.0	M
Xylenes (total)	8240(5030)/8260(5030)	2	56-139	0-40	1.1	5.0	M
	8240(5030)/8260(5030) (25-mL purge)	2	56-139	0-40	0.74	2.0	M
	CLP OLM01.9/OLM03.1	62/8	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	1.0	1.0	M
o-Xylene	8260(5030)	2	57-133	0-40	0.29	5.0	M
	8260(5030)(25-mL purge)	2	57-133	0-40	0.39	1.0	M
m+p-Xylene	8260(5030)	2	56-139	0-40	0.71	5.0	M
	8260(5030)(25-mL purge)	2	56-139	0-40	0.46	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Surrogate - Toluene-d8	8240(5030)/8260(5030)	2	67-134	NA	NA	NA	M
	8240(5030)/8260(5030)(25-mL purge)	2	67-134	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/8	67-134	NA	NA	NA	M
Surrogate p-Bromofluorobenzene	8240(5030)/8260(5030)	2	67-132	NA	NA	NA	M
	8240(5030)/8260(5030)(25-mL purge)	2	67-132	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/8	86-115	NA	NA	NA	M
	CLP OLC02.1	6	80-120	NA	NA	NA	M
Surrogate-Dibromofluoromethane	8260(5030)	2	64-142	NA	NA	NA	M
	8260(5030)(25-mL purge)	2	64-142	NA	NA	NA	M
Surrogate-1,2-Dichloroethane-d4	8240(5030)	2	70-130	NA	NA	NA	M
	8240(5030)(25-mL purge)	2	70-130	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/8	76-114	NA	NA	NA	M
Surrogate-1,2-Dichlorobenzene-d4	8260(5030)	2	70-130	NA	NA	NA	M
	8260(5030)(25-mL purge)	2	70-130	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acenaphthene (MS - Except CLP OLC02.1)	8270(3510/3520)	2	14-104	0-30	0.71	10	M
	CLP OLMO 1.9/3.1	62/85	46-118	0-31	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Acenaphthylene	8270(3510/3520)	2	34-152	0-38	1.8	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Acetophenone	8270(3510/3520)	2	10-150	0-50	1.3	10	M
2-Acetylaminofluorene	8270(3510/3520)	2	25-150	0-50	0.83	10	M
Aldrin	8270(3510/3520)	2	30-160	0-25	2.8	10	M
4-Aminobiphenyl	8270(3510/3520)	2	10-150	0-50	1.2	10	M
Aniline	8270(3510/3520)	2	10-150	0-50	9.5	20	M
Anthracene	8270(3510/3520)	2	54-110	0-27	0.42	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Aramite	8270(3510/3520)	2	40-150	0-50	1.5	10	M
Benzidine	8270(3510/3520)	2	10-200	0-100	56	80	M
Benzoic acid	8270(3510/3520)	2	10-150	0-50	7.4	50	M
Benzo(a)anthracene	8270(3510/3520)	2	53-104	0-32	0.59	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	64-100	0-25	0.042	0.10	M
Benzo(b)fluoranthene	8270(3510/3520)	2	37-124	0-31	0.64	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	60-103	0-25	0.036	0.10	M
Benzo(k)fluoranthene	8270(3510/3520)	2	60-165	0-36	0.085	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	63-101	0-25	0.038	0.10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Benzo(g,h,i)perylene	8270(3510/3520)	2	29-121	0-32	0.92	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Benzo(a)pyrene (MS - CLP OLC02.1)	8270(3510/3520)	2	36-116	0-39	0.58	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	50-120	NA	5.0	5.0	M
	SIM	73	48-100	0-25	0.036	0.10	M
Benzyl alcohol	8270(3510/3520)	2	10-150	0-50	2.2	10	M
Benzyl chloride	8270(3510/3520)	2	10-150	0-50	2.5	10	M
alpha-BHC	8270(3510/3520)	2	10-150	0-50	1.8	10	M
beta-BHC	8270(3510/3520)	2	50-150	0-40	2.2	10	M
delta-BHC	8270(3510/3520)	2	50-150	0-40	2.0	10	M
gamma-BHC	8270(3510/3520)	2	50-150	0-40	2.2	10	M
Biphenyl (Diphenyl)	8270(3510/3520)	2	70-118	0-25	2.2	10	M
Bis(2-chloroethoxy) methane	8270(3510/3520)	2	30-158	0-35	1.7	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Bis(2-chloroethyl) ether (MS- CLP OLC02.1)	8270(3510/3520)	2	37-143	0-28	1.3	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	50-110	NA	5.0	5.0	M
Bis(2-chloroisopropyl) ether (2,2-Oxybis(1-chloropropane)	8270(3510/3520)	2	10-152	0-25	1.3	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Bis(2-ethylhexyl) phthalate	8270(3510/3520)	2	23-124	0-39	0.61	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
4-Bromophenyl phenyl ether	8270(3510/3520)	2	55-133	0-32	2.0	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Butyl benzyl phthalate	8270(3510/3520)	2	30-168	0-30	2.2	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Carbazole	8270(3510/3520)	2	10-169	0-50	2.2	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
technical Chlordane	8270(3520)	2	34-136	0-26	12	50	M
4-Chloroaniline (MS - CLP OLC02.1)	8270(3510/3520)	2	10-150	0-50	1.4	20	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	10-120	NA	5.0	5.0	M
4-Chloro-3-methyl-phenol (MS - Except CLP OLC02.1)	8270(3510/3520)	2	23-111	0-29	0.82	10	M
	CLP OLMO 1.9/3.1	62/85	23-97	0-42	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
1-Chloronaphthalene	8270(3510/3520)	2	10-150	0-50	2.5	10	M
2-Chloronaphthalene	8270(3510/3520)	2	72-106	0-25	1.8	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
2-Chlorophenol (MS - All methods)	8270(3510/3520)	2	25-125	0-35	1.4	10	M
	CLP OLMO 1.9/3.1	62/85	27-123	0-40	10	10	M
	CLP OLC02.1	6	50-110	NA	5.0	5.0	M
4-Chlorophenylphenyl ether	8270(3510/3520)	2	50-163	0-54	2.1	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Chrysene	8270(3510/3520)	2	43-116	0-26	0.46	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	72-109	0-25	0.044	0.10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,8-Cineole	8270(3510/3520)	2	50-101	0-25	0.80	10	M
p-Cymene	8270(3510/3520)	2	52-110	0-25	1.6	10	M
2-Methyl phenol (o-Cresol)	8270(3510/3520)	2	10-150	0-50	1.5	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
3 -Methyl phenol (m- Cresol)	8270(3510/3520)	2	10-150	0-50	1.5	10	M
4-Methyl phenol (p-Cresol)	8270(3510/3520)	2	10-150	0-50	1.5	10	M
3 and 4-Methyl phenol (m- and p-Cresol)	8270(3510/3520)	2	10-150	0-50	1.5	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
4,4'-DDD	8270(3510/3520)	2	25-198	0-27	1.9	10	M
4,4'-DDE	8270(3510/3520)	2	49-172	0-26	2.0	10	M
4,4'-DDT	8270(3510/3520)	2	40-184	0-39	1.7	10	M
Diallate	8270(3510/3520)	2	10-150	0-50	2.3	10	M
Dibenz(a,h)anthracene	8270(3510/3520)	2	36-119	0-37	0.83	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	47-117	0-25	0.042	0.10	M
Dibenzofuran	8270(3510/3520)	2	10-150	0-50	2.3	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Dibenzo(a,e)pyrene	8270(3510/3520)	2	29-177	0-60	2.5	10	M
Di-n-butyl phthalate	8270(3510/3520)	2	28-118	0-25	0.65	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
1,2-Dichlorobenzene	8270(3510/3520)	2	39-124	0-41	1.5	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
1,3-Dichlorobenzene	8270(3510/3520)	2	10-156	0-52	1.3	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
1,4-Dichlorobenzene (MS - All methods)	8270(3510/3520)	2	10-124	0-43	2.3	10	M
	CLP OLMO 1.9/3.1	62/85	36-97	0-28	10	10	M
3,3'-Dichlorobenzidine	8270(3510/3520)	2	10-139	0-193	8.0	20	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
2,4-Dichlorophenol	8270(3510/3520)	2	42-140	0-25	1.6	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
2,6-Dichlorophenol	8270(3510/3520)	2	10-150	0-50	1.3	10	M
Dieldrin	8270(3510/3520)	2	10-209	0-25	2.1	10	M
Di(2-ethylhexyl)adipate	8270(3520)	2	35-130	0-50	0.36	10	M
Diethyl phthalate (MS - CLP OLC02.1)	8270(3510/3520)	2	25-116	0-32	0.86	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	50-120	NA	5.0	5.0	M
p-(Dimethylamino)azobenzene	8270(3510/3520)	2	10-150	0-50	0.54	10	M
7,12-Dimethylbenz(a)anthracene	8270(3510/3520)	2	10-150	0-50	0.70	10	M
3,3'-Dimethylbenzidine	8270(3510/3520)	2	10-200	0-100	3.4	10	M
a,a-Dimethylphenethylamine	8270(3510/3520)	2	10-200	0-50	500	2000	M
2,4-Dimethylphenol	8270(3510/3520)	2	34-113	0-44	2.1	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Dimethylphthalate	8270(3510/3520)	2	10-127	0.25	2.1	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
m-Dinitrobenzene	8270(3510/3520)	2	10-150	0-50	1.3	10	M
p-Dinitrobenzene	8270(3510/3520)	2	44-125	0-58	8.0	50	M
4,6-Dinitro-2-methylphenol	8270(3510/3520)	2	43-145	0-39	3.9	50	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
2,4-Dinitrophenol	8270(3510/3520)	2	10-145	0-94	2.8	50	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
2,4-Dinitrotoluene (MS - All methods)	8270(3510/3520)	2	52-111	0-54	1.5	10	M
	CLP OLMO 1.9/3.1	62/85	24-96	0-38	10	10	M
	CLP OLC02.1	6	30-120	NA	5.0	5.0	M
2,6-Dinitrotoluene	8270(3510/3520)	2	61-134	0-37	2.1	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270(3510/3520)	2	10-150	0-50	3.8	10	M
Di-n-octyl phthalate	8270(3510/3520)	2	10-374	0-32	0.63	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Diphenylamine (requires floracil cleanup to separate from N- Nitrososdiphenylamine)	8270(3510/3520)	2	15-135	0-50	2.6	10	M
1,4-Dioxane	8270(3510/3520)	2	10-150	0-50	1.6	10	M
1,2-Diphenyl hydrazine	8270(3510/3520)	2	10-150	0-50	1.9	10	M
Endosulfan I	8270(3510/3520)	2	10-150	0-50	2.1	20	M
Endosulfan II	8270(3510/3520)	2	10-150	0-50	2.1	20	M
Endosulfan sulfate	8270(3510/3520)	2	45-171	0-25	1.9	20	M
Endrin	8270(3510/3520)	2	10-150	0-50	2.2	20	M
Endrin aldehyde	8270(3510/3520)	2	10-234	0-59	18	50	M
Endrin ketone	8270(3510/3520)	2	10-150	0-50	12	50	M
Ethyl carbamate	8270(3510/3520)	2	52-100	0-25	2.5	10	M
Ethyl methanesulfonate	8270(3510/3520)	2	10-150	0-50	1.4	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Fluoranthene	8270(3510/3520)	2	55-108	0-27	0.51	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Fluorene	8270(3510/3520)	2	50-131	0-25	0.60	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Heptachlor	8270(3510/3520)	2	33-178	0-36	1.6	20	M
Heptachlor epoxide	8270(3510/3520)	2	48-184	0-25	1.5	20	M
Hexachlorobenzene (MS - CLP OLC02.1)	8270(3510/3520)	2	46-121	0-25	0.44	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	40-120	NA	5.0	5.0	M
Hexachlorobutadiene	8270(3510/3520)	2	10-138	0-28	1.3	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Hexachlorocyclopentadiene	8270(3510/3520)	2	D-113	0-50	4.7	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Hexachloroethane (MS - CLP OLC02.1)	8270(3510/3520)	2	10-101	0-55	1.7	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	20-110	NA	5.0	5.0	M
Hexachlorophene(1)	8270(3510/3520)	2	10-200	0-80	210	5000	M
Hexachloropropene	8270(3510/3520)	2	10-150	0-50	1.6	10	M
Indeno(1,2,3-cd)pyrene	8270(3510/3520)	2	36-123	0-37	0.77	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
	SIM	73	38-100	0-35	0.043	0.10	M

(1) Exhibits poor chromatographic behavior.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
Isophorone (MS - CLP OLC02.1)	8270(3510/3520)	2	32-120	0-25	1.9	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	50-110	NA	5.0	5.0	M
Isosafrole	8270(3510/3520)	2	10-150	0-50	1.2	10	M
Kepone	8270(3510/3520)	2	10-150	0-50	5.3	10	M
d-Limonene	8270(3510/3520)	2	36-74	0-25	1.4	10	M
Methapyrilene	8270(3510/3520)	2	10-150	0-50	500	2000	M
4,4-Methylbis(2-chloroaniline)	8270(3510/3520)	2	39-121	0-73	92	500	M
3-Methylcholanthrene	8270(3510/3520)	2	10-150	0-50	0.75	10	M
Methylmethanesulfonate	8270(3510/3520)	2	10-150	0-50	1.2	10	M
2-Methylnaphthalene	8270(3510/3520)	2	10-150	0-50	1.7	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
1-Methylnaphthalene	8270(3510/3520)	2	10-150	0-50	1.7	10	M
2,4(8)-p-Menthadiene	8270(3510/3520)	2	22-85	0-42	1.6	10	M
Naphthalene (MS - CLP OLC02.1)	8270(3510/3520)	2	47-118	0-36	0.47	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	30-110	NA	5.0	5.0	M
1,4-Naphthoquinone	8270(3510/3520)	2	10-150	0-50	4.5	10	M
1-Naphthylamine	8270(3510/3520)	2	10-150	0-50	0.70	10	M
2-Naphthylamine	8270(3510/3520)	2	10-150	0-50	0.60	10	M
Nicotine	8270(3510/3520)	2	10-150	0-50	25	100	M
2-Nitroaniline	8270(3510/3520)	2	10-150	0-50	2.2	50	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
3-Nitroaniline	8270(3510/3520)	2	10-150	0-50	1.9	50	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL▲ (ug/L)	TC∀
4-Nitroaniline	8270(3510/3520)	2	10-150	0-50	2.0	50	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
Nitrobenzene	8270(3510/3520)	2	26-129	0-33	1.6	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
2-Nitrophenol	8270(3510/3520)	2	48-142	0-28	2.5	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
4-Nitrophenol (MS - Except CLP OLC02.1)	8270(3510/3520)	2	13-133	0-39	2.4	50	M
	CLP OLMO 1.9/3.1	62/85	10-80	0-50	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
4-Nitroquinoline-1-oxide	8270(3510/3520)	2	10-150	0-50	1.0	20	M
N-Nitrosodi-n-butylamine	8270(3510/3520)	2	10-150	0-50	1.3	10	M
N-Nitrosodiethylamine	8270(3510/3520)	2	10-150	0-50	1.4	10	M
N-Nitrosodimethylamine	8270(3510/3520)	2	58-133	0-41	1.5	10	M
N-Nitrosodi-n-propylamine (MS - All methods)	8270(3510/3520)	2	34-137	0-39	1.4	10	M
	CLP OLMO 1.9/3.1	62/85	41-116	0-38	10	10	M
	CLP OLC02.1	6	30-110	NA	5.0	5.0	M
N-nitrosodiphenylamine/ Diphenylamine (MS - CLP OLC02.1)	8270(3510/3520)	2	15-135	0-50	2.6	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	30-110	NA	5.0	5.0	M
N-Nitrosodiphenylamine (requires floracil cleanup to separate from Diphenylamine)	8270(3510/3520)	2	15-135	0-50	2.6	10	M
N-Nitrosomethylethylamine	8270(3510/3520)	2	10-150	0-50	2.2	10	M
N-Nitrosomorpholine	8270(3510/3520)	2	10-150	0-50	1.4	10	M
N-Nitrosopiperidine	8270(3510/3520)	2	10-150	0-50	1.2	10	M
N-Nitrosopyrrolidine	8270(3510/3520)	2	10-150	0-50	1.7	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
5-Nitro-o-toluidine	8270(3510/3520)	2	10-150	0-50	5.1	10	M
PCB-1016	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1221	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1232	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1242	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1248	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1254	8270(3510/3520)	2	10-150	0-50	120	500	M
PCB-1260	8270(3510/3520)	2	10-150	0-50	120	500	M
Pentachlorobenzene	8270(3510/3520)	2	10-150	0-50	1.1	10	M
Pentachloronitrobenzene	8270(3520)	2	10-150	0-50	1.0	10	M
Pentachlorophenol (MS - All methods)	8270(3510/3520)	2	19-123	0-37	3.2	50	M
	CLP OLMO 1.9/3.1	62/85	9-103	0-50	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
	SIM	73	10-102	0-50	0.60	1.0	M
beta-Phellandrene	8270(3510/3520)	2	33-65	0-25	1.9	10	M
Phenacetin	8270(3510/3520)	2	10-150	0-50	0.92	10	M
Phenanthrene	8270(3510/3520)	2	53-110	0-27	0.40	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Phenol (MS - All methods)	8270(3510/3520)	2	32-110	0-37	1.0	10	M
	CLP OLMO 1.9/3.1	62/85	12-110	0-42	10	10	M
	CLP OLC02.1	6	40-120	NA	5.0	5.0	M
Phenyl ether (Diphenyl oxide)	8270(3510/3520)	2	74-116	0-25	2.0	10	M
p-Phenylenediamine	8270(3510/3520)	2	10-200	0-50	500	2000	M
2-Picoline	8270(3510/3520)	2	10-150	0-50	1.2	10	M
cis-Pinane	8270(3510/3520)	2	50-103	0-29	2.9	10	M
alpha-Pinene	8270(3510/3520)	2	12-105	0-25	1.3	100	M
beta-Pinene	8270(3510/3520)	2	DL-155	0-56	2.0	100	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC^
Pronamide	8270(3510/3520)	2	10-150	0-50	1.2	10	M
Pyrene (MS - Except CLP OLC02.1)	8270(3510/3520)	2	43-131	0-36	0.89	10	M
	CLP OLMO 1.9/3.1	62/85	26-127	0-31	10	10	M
	CLP OLC02.1	6	NA	NA	5.0	5.0	M
Pyridine	8270(3510/3520)	2	D-134	0-50	0.61	50	M
Resorcinol	8270 (3510/3520)	2	6-110	0-54	2.2	200	M
Safrole	8270(3510/3520)	2	10-150	0-50	4.6	10	M
Strychnine	8270(3510/3520)	2	10-150	0-50	25	100	M
alpha-Terpinene	8270(3510/3520)	2	DL-94	0-96	1.2	10	M
Terpineol	8270(3510/3520)	2	50-150	0-50	0.82	10	M
Terpinolene	8270(3510/3520)	2	20-150	0-45	1.7	10	M
1,2,4,5-Tetrachlorobenzene	8270(3510/3520)	2	10-150	0-50	1.5	10	M
2,3,4,5-Tetrachlorophenol	8270(3510/3520)	2	10-150	0-50	3.6	10	M
2,3,4,6-Tetrachlorophenol	8270(3510/3520)	2	34-118	0-31	2.2	10	M
Tetrachlorophenols (2,3,4,5 and 2,3,4,6)	8270(3510/3520)	2	10-150	0-50	3.6	10	M
o-Toluidine	8270(3510/3520)	2	10-150	0-50	1.1	10	M
Toxaphene	8270(3510/3520)	2	10-200	0-80	500	2000	M
1,2,4-Trichlorobenzene (MS - All methods)	8270(3510/3520)	2	17-121	0-28	1.4	10	M
	CLP OLMO 1.9/3.1	62/85	39-98	0-28	10	10	M
2,4,5-Trichlorophenol	8270(3510/3520)	2	45-113	0-25	1.9	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	25	25	M
	CLP OLC02.1	6	NA	NA	20	20	M
2,4,6-Trichlorophenol (MS - CLP OLC02.1)	8270(3510/3520)	2	50-103	0-30	1.8	10	M
	CLP OLMO 1.9/3.1	62/85	NA	NA	10	10	M
	CLP OLC02.1	6	40-120	NA	5.0	5.0	M
Trichlorophenols (2,4,5 and 2,4,6)	8270(3510/3520)	2	45-113	0-25	1.9	10	M
o,o,o-Triethyl-phosphorothioate	8270(3510/3520)	2	10-150	0-50	1.3	10	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
1,3,5-Trinitrobenzene	8270(3510/3520)	2	10-150	0-50	0.61	10	M
Surrogate - Nitrobenzene-d5	8270(3510/3520)	2	10-169	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	35-114	NA	NA	NA	M
	CLP OLC02.1	6	40-112	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	8270(3510/3520)	2	23-130	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	43-116	NA	NA	NA	M
	CLP OLC02.1	6	42-110	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	8270(3510/3520)	2	27-147	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	33-141	NA	NA	NA	M
	CLP OLC02.1	6	24-140	NA	NA	NA	M
Surrogate - Phenol-d5	8270(3510/3520)	2	16-139	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	10-110	NA	NA	NA	M
	CLP OLC02.1	6	17-113	NA	NA	NA	M
Surrogate - 2-Fluorophenol	8270(3510/3520)	2	20-124	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	21-110	NA	NA	NA	M
	CLP OLC02.1	6	16-108	NA	NA	NA	M
Surrogate - 2,4,6-Tribromophenol	8270(3510/3520)	2	24-135	NA	NA	NA	M
	CLP OLMO 1.9/3.1	62/85	10-123	NA	NA	NA	M
	CLP OLC02.1	6	18-126	NA	NA	NA	M
Surrogate - 2-Chlorophenol-d4	CLP OLMO 1.9/3.1	62/85	33-110	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	CLP OLMO 1.9/3.1	62/85	16-110	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCY
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (MS)	8280	2	47-155	0-40	0.0012	0.0050	M
	8270(screen)	2	NA	NA	10	10	M
Polychlorinated Dibenzo-p-dioxin and Dibenzofuran classes							
tetra-CDD (MS)	8280	2	47-155	0-40	0.0012	0.0050	M
tetra-CDF (MS)	8280	2	67-154	0-40	0.0013	0.0050	M
penta-CDD (MS)	8280	2	50-168	0-40	0.0017	0.0050	M
penta-CDF (MS)	8280	2	71-158	0-40	0.0016	0.0050	M
hexa-CDD (MS)	8280	2	72-164	0-40	0.0011	0.0050	M
hexa-CDF (MS)	8280	2	72-175	0-40	0.0015	0.0050	M
hepta-CDD (MS)	8280	2	20-170	0-50	0.0018	0.010	M
hepta-CDF (MS)	8280	2	20-170	0-50	0.0013	0.010	M
octa-CDD (MS)	8280	2	20-170	0-50	0.0013	0.010	M
octa-CDF (MS)	8280	2	20-170	0-50	0.0012	0.010	M
Internal Standard - 2,3,7,8-tetra-CDD-13C12	8280	2	25-150	NA	NA	NA	M
Internal Standard - 2,3,7,8-tetra-CDF-13C12	8280	2	25-150	NA	NA	NA	M
Internal Standard - 1,2,3,6,7,8-hexa-CDD-13C12	8280	2	25-150	NA	NA	NA	M
Internal Standard - 1,2,3,4,6,7,8-hepta-CDF-13C12	8280	2	25-150	NA	NA	NA	M
Internal Standard - octa-CDD-13C12	8280	2	25-150	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acenaphthene (MS)	8310(3510/3520)	2	44-162	0-52	0.38	1.0	M
Acenaphthylene	8310(3510/3520)	2	10-139	0-40	0.17	1.0	M
Anthracene	8310(3510/3520)	2	10-126	0-40	0.0060	0.20	M
Benzo(a)anthracene	8310(3510/3520)	2	12-135	0-40	0.013	0.20	M
Benzo(b)fluoranthene	8310(35103520)	2	6-150	0-40	0.0046	0.20	M
Benzo(k)fluoranthene	8310(3510/3520)	2	10-159	0-40	0.0056	0.20	M
Benzonitrile	8310(3520)	2	10-200	0-40	2.50	10	M
Benzo(g,h,i)perylene	8310(3510/3520)	2	10-120	0-40	0.035	0.50	M
Benzo(a)pyrene	8310(3510/3520)	2	10-128	0-40	0.062	0.20	M
Carbazole	8310 (3510/3520)	2	10-150	0-40	0.25	1.0	M
Chrysene (MS)	8310(3510/3520)	2	10-199	0-40	0.012	0.20	M
Dibenz(a,h)acridine	8310(3520)	2	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	8310(3510/3520)	2	10-110	0-40	0.043	0.50	M
Fluoranthene	8310(3510/3520)	2	41-155	0-54	0.014	0.50	M
Fluorene (MS)	8310(3510/3520)	2	10-142	0-40	0.080	0.50	M
Indene	8310(3520)	2	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	8310(3510/3520)	2	10-116	0-40	0.019	0.50	M
6-Methyl chrysene	8310(3520)	2	NA	NA	NA	NA	
1-Methylnaphthalene	8310 (3510/3520)	2	10-125	0-40	0.15	1.0	M
2-Methylnaphthalene	8310 (3510/3520)	2	10-125	0-40	0.16	1.0	M
Naphthalene (MS)	8310(3510/3520)	2	27-112	0-40	0.15	1.0	M
Phenanthrene	8310(3510/3520)	2	10-155	0-40	0.015	0.20	M
Pyrene (MS)	8310(3510/3520)	2	50-158	0-43	0.035	0.50	M
Thiophenol	8310(3520)	2	NA	NA	NA	NA	
Surrogate - 4-Terphenyl-d14	8310(3510/3520)	2	24-152	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acetaldehyde	8315	2	30-110	0-40	2.9	200	M
Formaldehyde	8315	2	43-142	0-30	3.5	50	M
Acrylamide	8316	2	59-136	0-30	5.9	100	M
Acrylonitrile	8316	2	60-140	0-30	26	200	M
Acrolein	8316	2	60-140	0-30	49	400	M
Aldicarb (Temik) (MS)	8318	2	34-124	0-40	0.0090	1.0	M
Aldicarb sulfone	8318	2	54-116	0-40	0.0089	1.0	M
Aldicarb sulfoxide	8318	2	17-51	0-49	0.0047	1.0	M
Carbaryl (Sevin)	8318	2	55-125	0-40	0.012	1.0	M
Carbofuran (Furadan) (MS)	8318	2	17-77	0-40	0.020	1.0	M
Dioxacarb	8318	2	56-124	0-40	0.013	1.0	M
3-Hydroxycarbofuran	8318	2	47-123	0-40	0.032	1.0	M
Methiocarb (Mesurol)	8318	2	51-137	0-40	0.0064	1.0	M
Methomyl (Lannate)	8318	2	57-125	0-40	0.017	1.0	M
Oxamyl (MS)	8318	2	31-103	0-40	0.011	1.0	M
Promecarb	8318	2	48-122	0-40	0.014	1.0	M
Propoxur (Baygon)	8318	2	47-127	0-40	0.020	1.0	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TC∀
2-Amino-4,6-dinitrotoluene-Low Level∀∀	8330	2	65-135	0-30	0.088	0.30	M
2-Amino-4,6-dinitrotoluene-Low Level	8330(3520)	2	65-135	0-30	0.088	0.30	M
2-Amino-4,6-dinitrotoluene-High Level	8330	2	65-135	0-30	16	100	M
4-Amino-2,6-dinitrotoluene-Low Level∀∀	8330	2	37-140	0-30	0.071	0.50	M
4-Amino-2,6-dinitrotoluene-Low Level	8330(3520)	2	37-140	0-30	0.071	0.50	M
4-Amino-2,6-dinitrotoluene-High Level	8330	2	37-140	0-30	20	100	M
1,3-Dinitrobenzene (MS)-Low Level∀∀	8330	2	17-113	0-30	0.048	0.30	M
1,3-Dinitrobenzene (MS)-Low Level	8330(3520)	2	17-113	0-30	0.048	0.30	M
1,3-Dinitrobenzene (MS)-High Level	8330	2	52-120	0-30	5.2	50	M
2,4-Dinitrotoluene (MS)-Low Level∀∀	8330	2	16-104	0-30	0.082	0.30	M
2,4-Dinitrotoluene (MS)-Low Level	8330(3520)	2	16-104	0-30	0.082	0.30	M
2,4-Dinitrotoluene (MS)-High Level	8330	2	60-140	0-30	14	100	M
2,6-Dinitrotoluene-Low Level∀∀	8330	2	60-140	0-30	0.087	0.50	M
2,6-Dinitrotoluene-Low Level	8330(3520)	2	60-140	0-30	0.087	0.50	M
2,6-Dinitrotoluene-High Level	8330	2	60-140	0-30	25	100	M
Diphenylamine-High Level	8330	2	65-140	0-30	1.0	10	M
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)-Low Level∀∀	8330	2	54-166	0-30	0.050	1.0	M
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)-Low Level	8330(3520)	2	54-166	0-30	0.050	1.0	M
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)-High Level	8330	2	54-166	0-30	15	100	M
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)-Low Level∀∀	8330	2	41-165	0-30	0.12	0.50	M
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)-Low Level	8330(3520)	2	41-165	0-30	0.12	0.50	M
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)-High Level	8330	2	41-165	0-30	13	100	M
Nitrobenzene-Low Level∀∀	8330	2	52-152	0-30	0.033	0.30	M
Nitrobenzene-Low Level	8330(3520)	2	52-152	0-30	0.033	0.30	M
Nitrobenzene-High Level	8330	2	52-152	0-30	10	50	M
Nitroglycerin-High Level	8332/8332	2	43-137	0-22	7.1	30	M
n-Nitrosodiphenylamine-High Level	8330	2	55-121	0-30	2.1	10	M
2-Nitrotoluene (MS)-Low Level∀∀	8330	2	18-108	0-30	0.12	0.50	M
2-Nitrotoluene (MS)-Low Level	8330(3520)	2	18-108	0-30	0.12	0.50	M
2-Nitrotoluene (MS)-High Level	8330	2	50-144	0-30	22	100	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RL^ (ug/L)	TC~
3-Nitrotoluene-Low Level∀∀	8330	2	50-144	0-30	0.066	0.50	M
3-Nitrotoluene-Low Level	8330(3520)	2	50-144	0-30	0.066	0.50	M
3-Nitrotoluene-High Level	8330	2	55-165	0-30	35	100	M
4-Nitrotoluene-Low Level∀∀	8330	2	54-166	0-30	0.13	0.50	M
4-Nitrotoluene-Low Level	8330(3520)	2	54-166	0-30	0.13	0.50	M
4-Nitrotoluene-High Level	8330	2	54-166	0-30	50	100	M
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)-Low Level∀∀	8330	2	54-162	0-30	0.062	1.0	M
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)-Low Level	8330(3520)	2	54-162	0-30	0.062	1.0	M
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)-High Level	8330	2	54-162	0-30	15	100	M
Pentaerythritol tetranitrate (PETN)-High Level	8330	2	41-159	0-30	13	20	M
1,3,5-Trinitrobenzene-Low Level∀∀	8330	2	50-150	0-30	0.031	0.30	M
1,3,5-Trinitrobenzene-Low Level	8330(3520)	2	50-150	0-30	0.031	0.30	M
1,3,5-Trinitrobenzene-High Level	8330	2	50-150	0-30	9.8	50	M
2,4,6-Trinitrotoluene-Low Level∀∀	8330	2	50-170	0-30	0.10	0.30	M
2,4,6-Trinitrotoluene-Low Level	8330(3520)	2	50-170	0-30	0.10	0.30	M
2,4,6-Trinitrotoluene-High Level	8330	2	50-170	0-30	15	100	M
Surrogate - 3,4-Dinitrotoluene-Low Level∀∀	8330	2	26-165	NA	NA	NA	M
Surrogate - 3,4-Dinitrotoluene-Low Level	8330(3520)	2	27-107	NA	NA	NA	M
Surrogate - 3,4-Dinitrotoluene-High Level	8330	2	65-125	NA	NA	NA	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Acrylic acid	SL-SOP	68	25-150	0-40	12	50	M
Asulam	SL-SOP	68	34-155	0-34	0.50	2.0	M
Ethylenethiourea	SL-SOP	68	60-111	0-36	1.2	5.0	M
Maleic acid/Maleic anhydride	SL-SOP	68	60-140	0-30	2.5	10	M
Nitrocellulose	SL-SOP	68	30-110	0-52	130	600	M
Phthalic acid/Phthalic anhydride	SL-SOP	68	66-127	0-30	1.0	10	M
Resorcinol	SL-SOP	68	52-140	0-40	2.9	20	M
Thiodiglycol	SL-SOP	68	57-141	0-32	25	100	M

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/L)	RLA (ug/L)	TCV
Dissolved Gases In Water (GC/FID)							
Methane	SL SOP	95	75-125	0-30	0.040	0.19	M
Ethane	SL SOP	95	75-125	0-30	0.050	0.35	M
Propane	SL SOP	95	75-125	0-30	0.13	0.51	M
Butane	SL SOP	95	75-125	0-30	0.17	0.68	M
Pentane	SL SOP	95	75-125	0-30	0.21	0.84	M
Hexane	SL SOP	95	75-125	0-30	0.25	1.0	M
Ethene	SL SOP	95	75-125	0-30	0.051	0.33	M
1-Propene	SL SOP	95	75-125	0-30	0.25	0.49	M
1-Butene	SL SOP	95	75-125	0-30	0.25	0.65	M
1-Pentene	SL SOP	95	75-125	0-30	0.25	0.82	M
1-Hexene	SL SOP	95	75-125	0-30	0.25	0.98	M
Dissolved Gases In Water (GC/TCD)							
Carbon dioxide	SL SOP	95	75-125	0-30	32	128	M
Carbon monoxide	SL SOP	95	75-125	0-30	21	82	M
Methane	SL SOP	95	75-125	0-30	3.0	47	M
Ethane	SL SOP	95	75-125	0-30	12	88	M
Ethene	SL SOP	95	75-125	0-30	5.4	82	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCY
Aluminum (ICP)	6010(3050)	2	75-125	0-20	3.2	20	M
	6010(3051)	2	75-125	0-20	1.9	20	M
	CLP ILM02.1/3.0/4.0	45	70-130	0-20	40	40	M
Antimony (ICP)	6010(3050)	2	75-125	0-20	1.9	5.0	M
	6010(3050)-T	2	75-125	0-20	0.42	5.0	M
	6010(3051)	2	75-125	0-20	1.6	5.0	M
	6010(3051)-T	2	75-125	0-20	0.42	5.0	M
	CLP ILM02.1/3.0/4.0	45	70-130	0-20	12	12	M
Antimony (GFAA)	7041(3050)	2	80-120	0-20	0.11	1.0	M
	7041(3051)	2	80-120	0-20	0.16	1.0	M
Arsenic (ICP)	6010(3050)	2	75-125	0-20	1.9	10	M
	6010(3050)-T	2	75-125	0-20	0.39	1.0	M
	6010(3051)	2	75-125	0-20	2.1	10	M
	6010(3051)-T	2	75-125	0-20	0.35	1.0	M
Arsenic (GFAA)	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	2.0	2.0	M
	7060(3050)	2	80-120	0-20	0.27	1.0	M
	7060(3051)	2	80-120	0-20	0.12	1.0	M
	7062(3050)	2	80-120	0-20	0.25	1.0	M
Barium (ICP)	6010(3050)	2	75-125	0-20	0.42	1.0	M
	6010(3051)	2	75-125	0-20	0.19	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	40	40	M
Beryllium (ICP)	6010(3050)	2	75-125	0-20	0.11	0.50	M
	6010(3051)	2	75-125	0-20	0.023	0.50	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1.0	1.0	M
Boron	6010(3050)	2	75-125	0-20	0.59	5.0	M
	6010(3051)	2	75-125	0-20	0.54	5.0	M
Cadmium (ICP)	6010(3050)	2	75-125	0-20	0.31	0.50	M
	6010(3050)-T	2	75-125	0-20	0.056	0.50	M
	6010(3051)	2	75-125	0-20	0.29	0.50	M
	6010(3051)-T	2	75-125	0-20	0.058	0.50	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1.0	1.0	M
Cadmium (GFAA)	7131 (3050)	2	80-120	0-20	0.0090	0.10	M
	7131 (3051)	2	80-120	0-20	0.0046	0.10	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCY
Calcium (ICP)	6010(3050)	2	75-125	0-20	2.4	50	M
	6010 (3051)	2	75-125	0-20	2.8	50	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1000	1000	M
Chromium (ICP)	6010(3050)	2	75-125	0-20	0.44	1.0	M
	6010(3050)-T	2	75-125	0-20	0.18	1.0	M
	6010(3051)	2	75-125	0-20	0.50	1.0	M
	6010(3051)-T	2	75-125	0-20	0.25	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	2.0	2.0	
Chromium (GFAA)	7191(3050)	2	80-120	0-20	0.50	1.0	M
	7191(3051)	2	80-120	0-20	0.51	1.0	M
Chromium, hexavalent	7196 (3060)	2	80-120	0-30	0.30	1.0	M
Cobalt (ICP)	6010 (3050)	2	75-125	0-20	0.41	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.13	1.0	M
	6010 (3051)	2	75-125	0-20	0.26	1.0	M
	6010 (3051)-T	2	75-125	0-20	0.14	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	10	10	
Copper (ICP)	6010 (3050)	2	75-125	0-20	0.78	2.5	M
	6010 (3050)-T	2	75-125	0-20	0.22	2.5	M
	6010 (3051)	2	75-125	0-20	0.31	2.5	M
	6010 (3051)-T	2	75-125	0-20	0.22	2.5	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	5.0	5.0	M
Iron (ICP)	6010 (3050)	2	75-125	0-20	3.9	5.0	M
	6010 (3051)	2	75-125	0-20	0.96	5.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	20	20	M
Lead (ICP)	6010 (3050)	2	75-125	0-20	1.0	5.0	M
	6010 (3050)-T	2	75-125	0-20	0.20	5.0	M
	6010 (3051)	2	75-125	0-20	2.0	5.0	M
	6010 (3051)-T	2	75-125	0-20	0.16	5.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	20	20	M
Lead (GFAA)	7421(3050)	2	80-120	0-20	0.14	0.50	M
	7421(3051)	2	80-120	0-20	0.16	0.50	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Lithium (GFAA)	7430(3050)	2	70-130	0-20	2.5	10	M
	7430(3051)	2	70-130	0-20	2.5	10	M
Magnesium (ICP)	6010 (3050)	2	75-125	0-20	1.8	50	M
	6010 (3051)	2	75-125	0-20	2.0	50	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1000	1000	M
Manganese (ICP)	6010(3050)	2	75-125	0-20	0.18	1.0	M
	6010 (3051)	2	75-125	0-20	0.093	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	3.0	3.0	M
Mercury (CVAA)	7471	2	75-125	0-20	0.0020	0.020	M
	3112B	4	70-130	0-20	0.0020	0.020	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	0.10	0.10	M
Molybdenum (ICP)	6010(3050)	2	75-125	0-20	0.23	1.0	M
	6010(3050)-T	2	75-125	0-20	0.098	1.0	M
	6010(3051)	2	75-125	0-20	0.12	1.0	M
	6010(3051)-T	2	75-125	0-20	0.098	1.0	M
Nickel (ICP)	6010(3050)	2	75-125	0-20	1.1	4.0	M
	6010 (3051)	2	75-125	0-20	0.65	4.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	8.0	8.0	M
Potassium (ICP)	6010(3050)	2	75-125	0-20	35	100	M
	6010 (3051)	2	75-125	0-20	70	100	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1000	1000	M
Selenium (ICP)	6010(3050)	2	75-125	0-20	5.4	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	1.0	M
	6010(3051)	2	75-125	0-20	5.0	50	M
	6010 (3051)-T	2	75-125	0-20	0.46	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1.0	1.0	M
Selenium (GFAA)	7740(3050)	2	80-120	0-20	0.13	1.0	M
	7740 (3051)	2	80-120	0-20	0.38	1.0	M
	7742(3050)	2	80-120	0-20	0.38	1.0	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCY
Silica (acid extractable)	6010(3050)	2	70-130	0-30	38	50	M
Silver (ICP)	6010(3050)	2	75-125	0-20	0.20	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.14	1.0	M
	6010(3051)	2	75-125	0-20	0.14	1.0	M
	6010 (3051)-T	2	75-125	0-20	0.14	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	3.0	3.0	M
Silver (GFAA)	7761 (3050)	2	80-120	0-20	0.016	0.10	M
	7761 (3051)	2	80-120	0-20	0.037	0.10	M
Sodium (ICP)	6010(3050)	2	75-125	0-20	8.3	50	M
	6010 (3051)	2	75-125	0-20	4.0	50	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	1000	1000	M
Strontium	6010(3050)	2	70-130	0-20	0.84	1.0	M
	6010(3051)	2	70-130	0-20	0.62	1.0	M
Thallium (ICP)	6010(3050)	2	75-125	0-20	8.1	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	2.0	M
	6010(3051)	2	75-125	0-20	8.7	50	M
	6010 (3051)-T	2	75-125	0-20	0.46	2.0	M
Thallium (GFAA)	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	2.0	2.0	M
	7841 (3050)	2	80-120	0-20	0.14	1.0	M
	7841 (3051)	2	80-120	0-20	0.13	1.0	M
Tin (ICP)	6010(3050)	2	75-125	0-20	1.3	5.0	M
	6010(3051)	2	75-125	0-20	1.5	5.0	M
Titanium	6010(3050)	2	70-130	0-20	0.25	1.0	M
	6010(3051)	2	70-130	0-20	0.25	1.0	M
Vanadium (ICP)	6010 (3050)	2	75-125	0-20	0.23	1.0	M
	6010 (3051)	2	75-125	0-20	0.32	1.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	10	10	M
Zinc (ICP)	6010 (3050)	2	75-125	0-20	0.45	2.0	M
	6010 (3051)	2	75-125	0-20	0.38	2.0	M
	CLP ILMO 2.1/3.0/4.0	45	70-130	0-20	4.0	4.0	M

ICP = inductively coupled (argon) plasma atomic emission spectrophotometer
GFAA = graphite furnace atomic adsorption spectrophotometer
FLAA = flame atomic adsorption spectrophotometer
CVAA = cold vapor atomic adsorption spectrophotometer
-T = trace ICP

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Ammonia (as N)	EPA-CE:3-140	46	75-125	0-30	0.20	0.50	M
	350.3(EPA-CE)	3/46	75-125	0-30	0.030	0.50	M
BOD	EPA-CE:3-380	46	60-140	0-40	NA	200	M
BTU	D240-87	38	70-130	0-30	NA	200 BTU/lb	M
Carbon, total organic	EPA-CE [Walkley-Black]	46 [43]	60-140	0-40	64	500	M
	9060	2	60-140	0-40	50	100	M
Cation exchange capacity	9080/EPA-CE:3-20	2/46	70-130	0-40	NA	0.0033 meq/100 g	M
	9081	2	70-130	0-40	NA	0.0033 meq/100 g	M
Chloride (extractable)(1)	9251	2	75-125	0-30	4.0	20	M
	9252	2	75-125	0-30	17	20	M
	4500-Cl⁻C	4	75-125	0-30	5.0	20	M
Chloride, total	9251(5050)	2	70-130	0-40	NA	200	M
	9056(5050)	2	70-130	0-40	NA	200	M
COD	EPA-CE:3-373	46	60-140	0-40	NA	100	M
Coliform, fecal	9221C(EPA:62)	4/67	NA	0-200	NA	3 MPN/g	
Coliform, total	9221B(EPA:62)	4/67	NA	0-200	NA	3 MPN/g	
Cyanide, amenable to chlorination	9012(9013)	2	NA	0-50	NA	1.0	M
	9010(9013)	2	NA	0-40	NA	1.0	M
Cyanide, total	9012(9013)	2	75-125	0-30	0.59	1.0	M
	9010/9010(9013)	2	75-125	0-30	0.14	1.0	M
	CLP ILM02.1/3.0/4.0	45	85-115	0-25	0.30	0.30	M
Cyanide, reactive	7.3.3.2/9014	2	NA	0-50	NA	10mg HCN/ Kg Waste	
EP Toxicity	1310 Followed by requested procedure(s): metals: 6010 mercury: 7470 pesticides: 8080 herbicicdes: 8150 VOC: 8240 BNA:8270	2	Table 5.1	Table 5.1	Table 5.1	Table 5.1	M
Fluoride (extractable)(1)	340.2/4500FC	3/4	75-125	0-25	0.40	4.0	M
Halogens, total	9056(5050)	2	70-130	0-40	NA	200	M
	9251(5050)	2	70-130	0-40			
Halogens, total organic (EOX)	EPA-600/4-84-008	44	60-140	0-50	8.6	10	M
Hydrogen ion (pH)	9045	2	63-158	0-40	NA	NA	
Ignitability	1010	2	NA	NA	NA	NA	
Nitrate (as N)(extractable)	4500 NO_3^-F (EPA-CE:3-183)	4/46	75-125	0-30	NA	5.0	M

[1]Extraction procedures for solids and semisolids are contained in Sections 8.2 and 8.3

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCY
Nitrate-Nitrite(as N) (Extractable)(1)	4500 NO_3F (EPA-CE:3-183)	4/46	75-125	0-30	1.2	5.0	M
Nitrite (as N)(Extractable)(1)	4500 NO_3F (EPA-CE:3-183)	4/46	75-125	0-30	1.2	5.0	M
Nitrogen, organic	EPA-CE:3-205	46	NA	NA	NA	50	
Nitrogen, total	TKN + NO_3/NO_2	46	NA	NA	NA	55	
Nitrogen, total Kjeldahl	EPA-CE:3-201	46	65-135	0-50	17	50	M
Oil and Grease	9070(9071)	2	60-140	0-50	59	100	M
	413.2(9071)	3(2)	60-140	0-50	2.3	10	M
Orthophosphate(as P) (extractable)(1)	365.1/4500P' F	3/4	75-125	0-30	0.31	5.0	M
Paint filter liquids	9095	2	NA	0-40	NA	NA	
Petroleum hydrocarbons	418.1(3550)(sonication)	3/2	60-140	0-50	2.0	10	M
	418.1(3540)(soxhlet)	3/2	60-140	0-50	3.5	10	M
	FL-PRO (sonication)	83	62-204	0-25	4	10	M
	FL-PRO (soxhlet)	83	41-224	0-25	4	10	M
	5520F(5520D/E)	4	60-140	0-50	40	200	M
	9073(9071)	2	60-140	0-50	3.5	10	M
Phenolics, total recoverable	9065(EPA-CE:3-355)	2 (46)	60-140	0-40	0.76	1.0	M
Phosphorus, total (as P)	EPA-CE:3-213	46	60-140	0-40	24	25	M
	EPA-CE:3-212	46	60-140	0-40	6.3	25	M
Radionuclides, alpha	9310	2	64-145	0-31	NA	NA	M
Radionuclides, beta	9310	2	67-140	0-28	NA	NA	M
Radionuclides, tritium	MEM - Method I	80	NA	NA	NA	NA	
Residue, fixed (% ash)	EPA-CE:3-59	46	NA	0-40	NA	0.10%	
Solids, total	EPA-CE:3-58/2540G	46/4	NA	0-30	NA	0.10%	
Solids, volatile	EPA-CE:3-59/2540G	46/4	75-125	0-30	NA	0.10%	M
Specific gravity	EPA-CE:3-61	46	NA	0-10	NA	NA	
Streptococcus, fecal	9230B (EPA:III.D-135)	4/67	NA	NA	NA	3 MPN/g	
Sulfate (extractable)(1)	9056	2	75-125	0-30	10	100	M
	9038	2	75-125	0-30	12	100	M
	375.3	3	75-125	0-30	25	100	M
Sulfide	9030/9034/ 4500S_2E	2/4	50-150	0-50	2.2	25	M
Sulfide, acid volatile	SL-SOP	68	50-150	0-50	4.5	10	M
Sulfide, reactive	7.3.4.2/9030	2	NA	0-50	NA	50mg H_2S/ Kg Waste	
Sulfur	D129-64/9056(5050)	38/2	70-130	0-30	NA	170	M

[1]Extraction procedures for solids and semisolids are contained in Sections 8.2 and 8.3

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Synthetic Precipitation Leaching Procedure	1312 followed by requested analytical procedure(s): metals:6010 mercury: 7470 pessticides: 8080/8081, herbicides: 8150/8151, VOC:8240/8260 BNA: 8270 cyanide: 9010/9012	2	Table 5.1	Table 5.1	Table 5.1	Table 5.1	M
Toxicity Charactersistic Leaching Procedure	1311 followed by requested analytical procedure(s): metals: 6010 mercury: 7470 pesticides: 8080/8081, herbicides: 8150/8151 VOC: 8240/8260 BNA:8270	2	Table 5.3	Table 5.3	Table 5.3	Table 5.3	M
Water (Karl Fisher)	E203-75	38	NA	0-30	NA	50	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Benzyl chloride	8010(5030/5035)	2	35-140	0-30	1.2	25	M
	8010 (5030/5035ext)	2	35-140	0-30	48	1000	M
Bromobenzene	8010(5030/5035)	2	43-179	0-56	2.5	5.0	M
	8010 (5030/5035ext)	2	43-179	0-56	100	200	M
Bromodichloromethane	8010(5030/5035)	2	74-171	0-54	0.68	5.0	M
	8010 (5030/5035ext)	2	74-171	0-54	27	200	M
Bromoform	8010(5030/5035)	2	74-148	0-40	1.6	25	M
	8010 (5030/5035ext)	2	74-148	0-40	64	1000	M
Bromomethane	8010(5030/5035)	2	19-221	0-78	1.8	5.0	M
	8010 (5030/5035ext)	2	19-221	0-78	72	200	M
Carbon tetrachloride	8010(5030/5035)	2	76-142	0-50	0.59	5.0	M
	8010 (5030/5035ext)	2	76-142	0-50	24	200	M
Chlorobenzene (MS)	8010(5030/5035)	2	56-122	0-25	0.51	5.0	M
	8010 (5030/5035ext)	2	56-122	0-25	20	200	M
Chloroethane	8010(5030/5035)	2	34-227	0-52	4.3	5.0	M
	8010 (5030/5035ext)	2	34-227	0-52	170	200	M
Chloroform	8010(5030/5035)	2	63-181	0-36	0.71	5.0	M
	8010 (5030/5035ext)	2	63-181	0-36	28	200	M
1-Chlorohexane	8010(5030/5035)	2	50-150	0-30	1.2	5.0	M
	8010 (5030/5035ext)	2	50-150	0-30	48	200	M
2-Chloroethylvinyl ether	8010(5030/5035)	2	48-192	0-80	1.2	50	M
	8010 (5030/5035ext)	2	48-192	0-80	48	2000	M
Chloromethane	8010(5030/5035)	2	29-173	0-53	1.4	5.0	M
	8010 (5030/5035ext)	2	29-173	0-53	56	200	M
2-Chlorotoluene	8010 (5030/5035)	2	70-140	0-27	1.5	5.0	M
	8010 (5030/5035ext)	2	70-140	0-27	60	200	M
3-Chlorotoluene	8010 (5030/5035)	2	70-130	0-30	1.5	5.0	M
	8010 (5030/5035ext)	2	70-130	0-30	60	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
4-Chlorotoluene	8010(5030/5035)	2	77-136	0-27	1.4	5.0	M
	8010 (5030/5035ext)	2	77-136	0-27	56	200	M
Dibromochloromethane	8010(5030/5035)	2	70-161	0-56	0.85	5.0	M
	8010 (5030/5035ext)	2	70-161	0-56	34	200	M
1,2-Dibromoethane (EDB)	8010(5030/5035)	2	34-168	0-77	2.6	5.0	M
	8010 (5030/5035ext)	2	34-168	0-77	100	200	M
Dibromomethane	8010(5030/5035)	2	37-214	0-59	6.2	25	M
	8010 (5030/5035ext)	2	37-214	0-59	250	1000	M
1,2-Dichlorobenzene	8010(5030/5035)	2	57-118	0-39	0.76	5.0	M
	8010 (5030/5035ext)	2	57-118	0-39	30	200	M
1,3-Dichlorobenzene	8010(5030/5035)	2	57-117	0-28	0.59	5.0	M
	8010 (5030/5035ext)	2	57-117	0-28	24	200	M
1,4-Dichlorobenzene	8010(5030/5035)	2	59-117	0-42	0.97	5.0	M
	8010 (5030/5035ext)	2	59-117	0-42	39	200	M
Dichlorodifluoromethane	8010(5030/5035)	2	27-207	0-50	1.8	5.0	M
	8010 (5030/5035ext)	2	27-207	0-50	72	200	M
1,1-Dichloroethane	8010(5030/5035)	2	49-209	0-36	0.54	5.0	M
	8010 (5030/5035ext)	2	49-209	0-36	22	200	M
1,2-Dichloroethane	8010(5030/5035)	2	49-207	0-58	0.62	5.0	M
	8010 (5030/5035ext)	2	49-207	0-58	25	200	M
1,1-Dichloroethene (MS)	8010(5030/5035)	2	56-185	0-35	2.6	5.0	M
	8010 (5030/5035ext)	2	56-185	0-35	100	200	M
cis-1,2-Dichloroethene	8010(5030/5035)	2	40-138	0-39	0.84	5.0	M
	8010 (5030/5035ext)	2	40-138	0-39	34	200	M
trans-1,2-Dichloroethene	8010 (5030/5035)	2	64-139	0-43	0.93	5.0	M
	8010 (5030/5035ext)	2	64-139	0-43	37	200	M
1,2-Dichloroethene (total)	8010(5030/5035)	2	14-256	0-39	2.6	5.0	M
	8010 (5030/5035ext)	2	14-256	0-39	100	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC✓
Dichloromethane (Methylene chloride)	8010(5030/5035)	2	40-224	0-40	2.1	10	M
	8010 (5030/5035ext)	2	40-224	0-40	84	400	M
1,2-Dichloropropane	8010(5030/5035)	2	62-178	0-45	0.54	5.0	M
	8010 (5030/5035ext)	2	62-178	0-45	22	200	M
cis-1,3-Dichloropropylene	8010(5030/5035)	2	44-146	0-45	0.72	5.0	M
	8010 (5030/5035ext)	2	44-146	0-45	29	200	M
trans-1,3-Dichloropropylene	8010(5030/5035)	2	30-152	0-55	0.78	5.0	M
	8010 (5030/5035ext)	2	30-152	0-55	31	200	M
1,1,2,2-Tetrachloroethane	8010(5030/5035)	2	58-160	0-48	1.1	5.0	M
	8010 (5030/5035ext)	2	58-160	0-48	44	200	M
1,1,1,2-Tetrachloroethane	8010(5030/5035)	2	75-145	0-41	1.2	5.0	M
	8010 (5030/5035ext)	2	70-130	0-41	48	200	M
Tetrachloroethene	8010(5030/5035)	2	26-162	0-57	0.57	5.0	M
	8010 (5030/5035ext)	2	26-162	0-57	23	200	M
1,1,1-Trichloroethane	8010(5030/5035)	2	72-170	0-47	0.69	5.0	M
	8010 (5030/5035ext)	2	72-170	0-47	28	200	M
1,1,2-Trichloroethane	8010(5030/5035)	2	61-182	0-53	0.61	5.0	M
	8010 (5030/5035ext)	2	61-182	0-53	24	200	M
Trichloroethene (MS)	8010(5030/5035)	2	56-133	0-26	0.38	5.0	M
	8010 (5030/5035ext)	2	56-133	0-26	15	200	M
Trichlorofluoromethane	8010(5030/5035)	2	48-165	0-37	3.7	5.0	M
	8010 (5030/5035ext)	2	48-165	0-37	150	200	M
1,2,3-Trichloropropane	8010(5030/5035)	2	50-150	0-48	1.2	5.0	M
	8010 (5030/5035ext)	2	50-150	0-48	48	200	M
Vinyl chloride	8010(5030/5035)	2	20-216	0-61	1.1	5.0	M
	8010 (5030/5035ext)	2	20-216	0-61	44	200	M
Surrogate - Bromochloromethane	8010(5030) 8010(5030ext)	2	43-127	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5ml methanol; 125uL of extract analyzed

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC▽
Acetone	8015(5030/5035)	2	40-130	0-30	31	130	M
	8015(5030/5035ext)	2	40-130	0-30	1200	5200	M
2-Butanone (MEK)	8015(5030/5035)	2	60-130	0-40	20	130	M
	8015(5030/5035ext)	2	60-130	0-40	800	5200	M
Diethyl ether (MS)	8015(5030/5035)	2	10-130	0-50	32	130	M
	8015(5030/5035ext)	2	10-130	0-50	1300	5200	M
2-Hexanone	8015(5030/5035)	2	50-150	0-40	50	130	M
	8015(5030/5035ext)	2	50-150	0-40	2000	5200	M
4-Methyl-2-pentanone (MIBK) (MS)	8015(5030/5035)	2	65-125	0-40	32	130	M
	8015(5030/5035ext)	2	65-125	0-40	1300	5200	M
Methyl t-butyl ether (MTBE)	8015(5030/5035)	2	50-150	0-30	23	50	M
	8015(5030/5035ext)	2	50-150	0-30	920	2000	M
Lacolene	8015(modified voaltiles) (5030/5035)	2/12	60-140	0-30	100	250	M
	8015(modified volatiles) (5030/5035ext)	2/12	60-140	0-30	4000	10000	
Mineral spirits	8015(modified volatiles) (5030/5035)	2/12	60-140	0-30	65	250	M
	8015(modified volatiles) (5030/5035ext)	2/12	60-140	0-30	2600	10000	M
Gasoline/GRO	GRO	2/70	50-150	0-20	40	180	M
	GRO(ext)	2/70	50-150	0-20	1600	7200	M
	8015 (modified volatiles) (5030/5035)	2/12	10-149	0-40	100	250	M
	8015 (modified) volatiles (5030/5035ext)	2/12	10-149	0-40	4000	10000	M
Surrogate - a,a,a-Trifluorotoluene	8015/8015ext	2/12/70	41-156	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5ml methanol; 125uL of extract analyzed

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC∀
Petroleum hydrocarbons	FL-PRO(sonication)	83	62-204	0-25	4000	10000	M
	FL-PRO(Soxhlet)	83	41-224	0-25	4000	10000	M
	8015 (modified extractable) (3550)	2	40-140	0-40	4000	10000	M
Diesel/DRO	DRO	2/69	40-140	0-40	800	3300	M
	8015 (modified extractable) (3550)	2/12	10-127	0-40	2500	10000	M
Heavy oil	8015 (modified extractable) (3550)	2/12	40-140	0-40	1000	20000	M
Kerosene	8015 (modified extractable) (3550)	2/12	40-140	0-40	25000	10000	M
Mineral Spirits	8015 (modified extractable) (3550)	2/12	40-140	0-40	25000	10000	M
Surrogate - 2-Fluorobiphenyl	8015 (modified extractable) (3550)	2/12/69	10-152	NA	NA	NA	M
Surrogate - o-Terphenyl	DRO	2/69	15-154	NA	NA	NA	M
	8015 (modified extractable) (3550)	2/12	15-154	NA	NA	NA	M
	FL-PRO(sonication)	83	15-154	NA	NA	NA	M
	FL-PRO(Soxhlet)	83	57-115	NA	NA	NA	M
Surrogate-Nonatricontane (C39)	FL-PRO(sonication)	83	30-118	NA	NA	NA	M
	FL-PRO(Soxhlet)	83	61-153	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
tert-Amyl alcohol	8015 (DAI*)	2	49-181	0-50	530	1000	M
sec-Butanol	8015 (DAI*)	2	37-182	0-50	390	1000	M
n-Butanol	8015 (DAI*)	2	50-150	0-50	700	1000	M
tert-Butanol	8015 (DAI*)	2	67-133	0-50	480	1000	M
n-Butyl acetate	8015 (DAI*)	2	50-150	0-50	350	5000	M
sec-Butyl acetate	8015 (DAI*)	2	50-150	0-50	290	5000	M
Butyl cellosolve	8015 (DAI*)	2	50-150	0-50	390	5000	M
Ethyl cellosolve	8015 (DAI*)	2	20-180	0-50	ND	20000	M
Cellosolve acetate	8015 (DAI*)	2	50-150	0-50	430	5000	M
Cyclohexanone	8015 (DAI*)	2	50-150	0-50	670	5000	M
Diacetone alcohol	8015 (DAI*)	2	50-150	0-50	680	5000	M
1,4-Dioxane	8015 (DAI*)	2	50-150	0-50	320	1000	M
Ethanol (MS)	8015 (DAI*)	2	60-129	0-50	840	1000	M
Ethyl acetate	8015 (DAI*)	2	43-160	0-50	630	5000	M
Methanol (MS)	8015 (DAI*)	2	61-128	0-50	800	1000	M
n-Propanol	8015 (DAI*)	2	50-150	0-50	680	1000	M
Isopropanol (MS)	8015 (DAI*)	2	61-148	0-50	510	1000	M
Diethylene glycol	8015 (DAI*)	2	45-112	0-50	1000	5000	M
Ethylene glycol (MS)	8015 (DAI*)	2	35-132	0-50	1900	5000	M
Isoamyl acetate	8015 (DAI*)	2	50-150	0-50	490	10000	M
Isobutanol	8015 (DAI*)	2	50-150	0-50	710	1000	M
Isobutyl acetate	8015 (DAI*)	2	50-150	0-50	490	5000	M
Isopropyl acetate	8015 (DAI*)	2	50-150	0-50	460	5000	M
Mesityl oxide	8015 (DAI*)	2	50-150	0-50	260	5000	M
Methyl acetate	8015 (DAI*)	2	46-170	0-50	810	5000	M
2-Nitropropane	8015 (DAI*)	2	50-150	0-50	520	5000	M
n-Propyl acetate (MS)	8015 (DAI*)	2	24-158	0-50	460	5000	M
Propylene glycol (MS)	8015 (DAI*)	2	60-126	0-50	590	5000	M
Tetraethylene glycol	8015 (DAI*)	2	50-150	0-50	4200	5000	M
Tetrahydrofuran (MS)	8015 (DAI*)	2	67-146	0-50	290	5000	M
Triethylene glycol	8015 (DAI*)	2	50-150	0-50	3300	5000	M
Vinyl Acetate	8015 (DAI*)	2	50-150	0-50	1300	5000	M

(DAI) = Direct Aqueous (Extract) Injection

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC∀
Benzene (MS)	8020(5030/5035)	2	54-154	0-27	0.24	5.0	M
	8020(5030/5035ext)	2	54-154	0-27	9.6	200	M
Chlorobenzene (MS)	8020(5030/5035)	2	56-122	0-25	3.1	5.0	M
	8020(5030/5035ext)	2	56-122	0-25	120	200	M
1,2-Dichlorobenzene	8020(5030/5035)	2	37-154	0-30	2.9	5.0	M
	8020(5030/5035ext)	2	37-154	0-30	120	200	M
1,3-Dichlorobenzene	8020(5030/5035)	2	50-141	0-30	2.1	5.0	M
	8020(5030/5035ext)	2	50-141	0-30	84	200	M
1,4-Dichlorobenzene	8020(5030/5035)	2	42-143	0-30	3.7	5.0	M
	8020(5030/5035ext)	2	42-143	0-30	150	200	M
Ethylbenzene	8020(5030/5035)	2	32-160	0-30	3.0	5.0	M
	8020(5030/5035ext)	2	32-160	0-30	120	200	M
Methyl tert-butyl ether (MTBE)	8020(5030/5035)	2	47-140	0-30	24	50	M
	8020(5030/5035ext)	2	47-140	0-30	960	2000	M
Toluene (MS)	8020(5030/5035)	2	55-143	0-26	3.2	5.0	M
	8020(5030/5035ext)	2	55-143	0-26	130	200	M
Xylenes (total)	8020(5030/5035)	2	50-150	0-30	1.1	5.0	M
	8020(5030/5035ext)	2	50-150	0-30	.44	200	M
m & p-Xylene	8020(5030/5035)	2	50-150	0-30	0.87	5.0	M
	8020(5030/5035ext)	2	50-150	0-30	35	200	M
o-Xylene	8020(5030/5035)	2	50-150	0-30	0.71	5.0	M
	8020(5030/5035ext)	2	50-150	0-30	28	200	M
Surrogate - a,a,a-Trifluorotoluene	8020(5030/5035ext)	2	41-156	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5ml methanol; 125uL extract analyzed

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Benzene (MS)	8021(5030/5035)	2	54-154	0-31	0.37	5.0	M
	8021 (5030/5035ext)	2	54-154	0-31	15	200	M
Bromobenzene	8021(5030/5035)	2	43-179	0-56	2.5	5.0	M
	8021 (5030/5035ext)	2	43-179	0-56	100	200	M
Bromochloromethane	8021(5030/5035)	2	34-128	0-52	1.4	5.0	M
	8021 (5030/5035ext)	2	34-128	0-52	56	200	M
Bromodichloromethane	8021(5030/5035)	2	74-171	0-54	0.68	5.0	M
	8021 (5030/5035ext)	2	74-171	0-54	27	200	M
Bromoform	8021(5030/5035)	2	74-148	0-40	1.6	25	M
	8021 (5030/5035ext)	2	74-148	0-40	64	1000	M
Bromomethane	8021(5030/5035)	2	19-221	0-78	1.8	5.0	M
	8021 (5030/5035ext)	2	19-221	0-78	72	200	M
n-Butylbenzene	8021(5030/5035)	2	50-150	0-25	0.85	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	34	200	M
sec-Butylbenzene	8021(5030/5035)	2	50-150	0-25	0.70	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	28	200	M
tert-Butylbenzene	8021(5030/5035)	2	49-188	0-48	0.90	5.0	M
	8021 (5030/5035ext)	2	49-188	0-48	36	200	M
Carbon tetrachloride	8021(5030/5035)	2	76-142	0-50	0.59	5.0	M
	8021 (5030/5035ext)	2	76-142	0-50	24	200	M
Chlorobenzene (MS)	8021(5030/5035)	2	56-122	0-25	0.51	5.0	M
	8021 (5030/5035ext)	2	56-122	0-25	20	200	M
Chloroethane	8021(5030/5035)	2	34-227	0-52	4.3	5.0	M
	8021 (5030/5035ext)	2	34-227	0-52	170	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Chloroform	8021(5030/5035)	2	63-181	0-36	0.71	5.0	M
	8021 (5030/5035ext)	2	63-181	0-36	28	200	M
Chloromethane	8021(5030/5035)	2	29-173	0-53	1.4	5.0	M
	8021 (5030/5035ext)	2	29-173	0-53	56	200	M
2-Chlorotoluene	8021(5030/5035)	2	70-140	0-27	1.5	5.0	M
	8021 (5030/5035ext)	2	70-140	0-27	60	200	M
4-Chlorotoluene	8021(5030/5035)	2	77-136	0-27	1.4	5.0	M
	8021 (5030/5035ext)	2	77-136	0-27	56	200	M
Dibromochloromethane	8021(5030/5035)	2	70-161	0-56	0.85	5.0	M
	8021 (5030/5035ext)	2	70-161	0-56	34	200	M
1,2-Dibromo-3-chloropropane	8021(5030/5035)	2	24-145	0-56	1.2	5.0	M
	8021 (5030/5035ext)	2	24-145	0-56	48	200	M
1,2-Dibromoethane (EDB)	8021(5030/5035)	2	34-168	0-77	2.6	5.0	M
	8021 (5030/5035ext)	2	34-168	0-77	100	200	M
Dibromomethane	8021(5030/5035)	2	37-214	0-59	2.6	5.0	M
	8021 (5030/5035ext)	2	37-214	0-59	100	200	M
1,2-Dichlorobenzene	8021(5030/5035)	2	57-118	0-39	0.76	5.0	M
	8021 (5030/5035ext)	2	57-118	0-39	30	200	M
1,3-Dichlorobenzene	8021(5030/5035)	2	57-117	0-28	0.59	5.0	M
	8021 (5030/5035ext)	2	57-117	0-28	24	200	M
1,4-Dichlorobenzene	8021(5030/5035)	2	59-117	0-42	0.97	5.0	M
	8021 (5030/5035ext)	2	59-117	0-42	39	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Dichlorodifluoromethane	8021(5030/5035)	2	27-207	0-50	1.8	5.0	M
	8021 (5030/5035ext)	2	27-207	0-50	72	200	M
1,1-Dichloroethane	8021(5030/5035)	2	48-209	0-36	0.54	5.0	M
	8021 (5030/5035ext)	2	48-209	0-36	110	200	M
1,2-Dichloroethane	8021(5030/5035)	2	49-207	0-58	0.62	5.0	M
	8021 (5030/5035ext)	2	49-207	0-58	25	200	M
1,1-Dichloroethene (MS)	8021(5030/5035)	2	56-185	0-35	2.6	5.0	M
	8021 (5030/5035ext)	2	56-185	0-35	100	200	M
cis-1,2-Dichloroethene	8021(5030/5035)	2	40-138	0-39	0.84	5.0	M
	8021 (5030/5035ext)	2	40-138	0-39	34	200	M
trans-1,2-Dichloroethene	8021(5030/5035)	2	64-139	0-43	0.93	5.0	M
	8021 (5030/5035ext)	2	64-139	0-43	37	200	M
1,2-Dichloropropane	8021(5030/5035)	2	62-178	0-45	0.54	5.0	M
	8021 (5030/5035ext)	2	62-178	0-45	22	200	M
1,3-Dichloropropane	8021(5030/5035)	2	53-150	0-57	2.5	5.0	M
	8021 (5030/5035ext)	2	53-150	0-57	100	200	M
2,2-Dichloropropane	8021(5030/5035)	2	40-138	0-39	2.4	5.0	M
	8021 (5030/5035ext)	2	40-138	0-39	96	200	M
1,1-Dichloropropene	8021(5030/5035)	2	42-141	0-50	3.1	5.0	M
	8021 (5030/5035ext)	2	42-141	0-50	120	200	M
cis-1,3-Dichloropropene	8021(5030/5035)	2	44-146	0-45	0.72	5.0	M
	8021 (5030/5035ext)	2	44-146	0-45	29	200	M
trans-1,3-Dichloropropene	8021(5030/5035)	2	30-152	0-55	0.78	5.0	M
	8021 (5030/5035ext)	2	30-152	0-55	31	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Ethylbenzene	8021(5030/5035)	2	68-118	0-29	0.40	5.0	M
	8021 (5030/5035ext)	2	68-118	0-29	16	200	M
Hexachlorobutadiene	8021(5030/5035)	2	52-145	0-41	1.8	5.0	M
	8021 (5030/5035ext)	2	52-145	0-41	72	200	M
Isopropylbenzene	8021(5030/5035)	2	50-150	0-27	0.80	5.0	M
	8021 (5030/5035ext)	2	50-150	0-27	32	200	M
p-Isopropyltoluene	8021(5030/5035)	2	50-150	0-25	1.0	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	40	200	M
Methylene chloride	8021(5030/5035)	2	40-224	0-40	2.1	10	M
	8021 (5030/5035ext)	2	40-224	0-40	84	400	M
Naphthalene	8021(5030/5035)	2	67-133	0-42	3.4	5.0	M
	8021 (5030/5035ext)	2	67-133	0-42	140	200	M
n-Propylbenzene	8021(5030/5035)	2	50-150	0-25	0.75	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	30	200	M
Styrene	8021(5030/5035)	2	81-108	0-25	2.0	5.0	M
	8021 (5030/5035ext)	2	81-108	0-25	80	200	M
1,1,1,2-Tetrachloroethane	8021(5030/5035)	2	75-145	0-41	0.83	5.0	M
	8021 (5030/5035ext)	2	75-145	0-41	33	200	M
1,1,2,2-Tetrachloroethane	8021(5030/5035)	2	58-166	0-48	1.1	5.0	M
	8021 (5030/5035ext)	2	58-166	0-48	44	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC∇
Tetrachloroethene	8021(5030/5035)	2	53-150	0-57	0.57	5.0	M
	8021 (5030/5035ext)	2	53-150	0-57	23	200	M
Toluene (MS)	8021(5030/5035)	2	64-144	0-25	0.34	5.0	M
	8021 (5030/5035ext)	2	64-144	0-25	14	200	M
1,2,3-Trichlorobenzene	8021(5030/5035)	2	50-150	0-26	1.3	5.0	M
	8021 (5030/5035ext)	2	50-150	0-26	52	200	M
1,2,4-Trichlorobenzene	8021(5030/5035)	2	44-139	0-53	1.5	5.0	M
	8021 (5030/5035ext)	2	44-139	0-53	60	200	M
1,1,1-Trichloroethane	8021(5030/5035)	2	72-170	0-47	0.69	5.0	M
	8021 (5030/5035ext)	2	72-170	0-47	28	200	M
1,1,2-Trichloroethane	8021(5030/5035)	2	61-182	0-53	0.61	5.0	M
	8021 (5030/5035ext)	2	61-182	0-53	24	200	M
Trichloroethene (MS)	8021(5030/5035)	2	56-133	0-25	0.38	5.0	M
	8021 (5030/5035ext)	2	56-133	0-25	15	200	M
Trichlorofluoromethane	8021(5030/5035)	2	48-165	0-37	3.7	5.0	M
	8021 (5030/5035ext)	2	48-165	0-37	150	200	M
1,2,3-Trichloropropane	8021(5030/5035)	2	50-150	0-48	1.6	5.0	M
	8021 (5030/5035ext)	2	50-150	0-48	64	200	M
1,2,4-Trimethylbenzene	8021(5030/5035)	2	32-132	0-44	1.0	5.0	M
	8021 (5030/5035ext)	2	32-132	0-44	40	200	M
1,3,5-Trimethylbenzene	8021(5030/5035)	2	50-150	0-25	1.6	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	64	200	M
Vinyl Chloride	8021(5030/5035)	2	20-216	0-61	1.1	5.0	M
	8021 (5030/5035ext)	2	20-216	0-61	44	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
o-Xylene	8021(5030/5035)	2	50-150	0-25	0.40	5.0	M
	8021 (5030/5035ext)	2	50-150	0-25	16	200	M
m&p-Xylene	8021(5030/5035)	2	62-138	0-49	0.42	5.0	M
	8021 (5030/5035ext)	2	62-138	0-49	17	200	M
Surrogate* - 2-Bromo-1-chloropropane	8021(5030/5035)	2	70-130	NA	NA	NA	M
	8021 (5030/5035ext)	2	70-130	NA	NA	NA	M
Surrogate - Fluorobenzene	8021(5030/5035)	2	43-137	NA	NA	NA	M
	8021 (5030/5035ext)	2	43-137	NA	NA	NA	M
Surrogate* - 1-Bromo-3-chloropropane	8021(5030/5035)	2	43-137	NA	NA	NA	M
	8021 (5030/5035ext)	2	43-137	NA	NA	NA	M
Surrogate- Bromochloromethane	8021(5030/5035)	2	43-127	NA	NA	NA	M
	8021 (5030/5035ext)	2	43-127	NA	NA	NA	M
Surrogate- a,a,a-Trifluorotoluene	8021(5030/5035)	2	41-156	NA	NA	NA	M
	8021 (5030/5035ext)	2	41-156	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5ml methanol; 125uL of extract analyzed.
*either of these two surrogates may be used. Bromochlormethane may be used as a surrogate if not reported as a target compound.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acrolein	8030(5030/5035)	2	50-150	0-50	45	100	M
	8030 (5030/5035ext)	2	50-150	0-50	1800	4000	M
Acrylonitrile	8030(5030/5035)	2	50-150	0-50	47	100	M
	8030 (5030/5035ext)	2	50-150	0-50	1900	4000	M
Surrogate - a,a,a-Trifluorotoluene	8030(5030/5035/ 5035ext)	2	41-156	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5ml methanol; 125uL of extract analyzed.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	RE	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC^^
2-Chlorophenol (MS)	8040/8041(3550)	2	27-150	0-26	186	330	M
4-Chloro-3-methylphenol (MS)	8040/8041(3550)	2	10-145	0-39	146	330	M
2,4-Dichlorophenol	8040/8041(3550)	2	10-159	0-40	159	330	M
2,6-Dichlorophenol	8040/8041(3550)	2	38-129	0-25	64	330	M
2,4-Dimethylphenol	8040/8041(3550)	2	24-118	0-40	131	330	M
2,4-Dinitrophenol	8040/8041(3550)	2	12-145	0-65	143	1700	M
2-Methyl-4,6-dinitrophenol	8040/8041(3550)	2	30-136	0-40	154	1700	M
3 and 4-Methyl phenol (m & p cresol)	8040/8041(3550)	2	10-150	0-50	180	330	M
2-Methyl phenol (o-cresol)	8040/8041(3550)	2	10-150	0-50	92	330	M
Cresols (total)	8040/8041(3550)	2	10-150	0-50	82	330	M
2-Nitrophenol	8040/8041(3550)	2	43-117	0-40	127	330	M
4-Nitrophenol (MS)	8040/8041(3550)	2	10-183	0-34	218	1700	M
Pentachlorophenol (MS)	8040/8041(3550)	2	10-234	0-80	225	1700	M
Phenol (MS)	8040/8041(3550)	2	10-138	0-30	146	330	M
2,3,4,6-Tetrachlorophenol	8040/8041(3550)	2	50-150	0-40	160	330	M
2,3,4,5-Tetrachlorophenol	8040/8041(3550)	2	50-150	0-40	120	330	M
Tetrachlorophenols (2,3,4,5 + 2,3,4,6)	8040/8041(3550)	2	NA	NA	160	330	
2,4,6-Trichlorophenol	8040/8041(3550)	2	53-119	0-40	201	330	M
2,4,5-Trichlorophenol	8040/8041(3550)	2	53-119	0-40	100	330	M
Trichlorophenols (2,4,5 + 2,4,6)	8040/8041(3550)	2	NA	NA	100	330	
Surrogate - 2,4,6-Tribromophenol	8040/8041(3550)	2	10-138	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC∀
Butyl benzyl phthalate (MS)	8060/8061(3550)	2	36-209	0-66	28	330	M
Bis(2-ethylhexyl) phthalate (MS)	8060/8061(3550)	2	39-195	0-54	34	330	M
Di-n-butyl phthalate (MS)	8060/8061(3550)	2	34-195	0-41	28	330	M
Diethyl phthalate (MS)	8060/8061(3550)	2	43-154	0-34	21	330	M
Dimethyl phthalate (MS)	8060/8061(3550)	2	37-147	0-31	23	330	M
Di-n-octyl phthalate (MS)	8060/8061(3550)	2	37-147	0-86	35	330	M
Surrogate-2-Flurobiphenyl	8060/8061(3550)	2	10-150	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m- xylene (TCMX)	8060/8061(3550)	2	10-114	NA	NA	NA	M
Surrogate- Decachlorobiphenyl (DCB)	8060/8061(3550)	2	27-128	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC∀
N-Nitrosodimethylamine	8070(3550)	2	13-109	0-50	12	67	M
N-Nitrosodi-n-propylamine	8070(3550)	2	45-146	0-50	6.8	67	M
N-Nitrosodiphenylamine	8070(3550)	2	10-139	0-50	5.7	100	M
Surrogate - Triphenylphosphate	8070(3550)	2	10-137	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC^^
Aldrin (MS)	8080(3550)/8081(3550)	2	10-144	0-38	0.021	1.7	M
	CLP OLM01.9/OLM03.1	62/85	34-132	0-43	1.7	1.7	M
Benfluralin	8080(3550)/8081(3550)	2	40-140	0-40	0.33	0.33	M
alpha-BHC	8080(3550)/8081(3550)	2	22-101	0-40	0.088	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
beta-BHC	8080(3550)/8081(3550)	2	12-120	0-40	0.16	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
gamma-BHC (Lindane) (MS)	8080(3550)/8081(3550)	2	12-138	0-37	0.066	1.7	M
	CLP OLM01.9/OLM03.1	62/85	46-127	0-50	1.7	1.7	M
delta-BHC	8080(3550)/8081(3550)	2	10-142	0-47	0.18	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Captafol	8081(3550)	2	20-180	0-50	0.83	3.3	M
Captan	8081(3550)	2	40-150	0-40	0.25	1.7	M
technical Chlordane	8080(3550)/8081(3550)	2	45-119	0-40	1.7	17	M
alpha Chlordane	8081(3550)	2	45-140	0-40	0.12	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
gamma Chlordane	8081(3550)	2	11-141	0-40	0.078	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Chlorobenzilate	8081(3550)	2	50-150	0-40	1.9	17	M
Chloroneb	8081(3550)	2	49-125	0-30	3.2	13	M
Chloropropylate	8081(3550)	2	51-125	0-30	4.0	16	M
Chlorothalonil	8081(3550)	2	35-130	0-40	1.7	6.7	M
Dacthal (DCPA)	8081(3550)	2	75-127	0-27	0.024	1.7	M
4,4'-DDD	8080(3550)/8081(3550)	2	28-134	0-50	0.22	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
4,4'-DDE	8080(3550)/8081(3550)	2	34-121	0-25	0.13	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
4,4'-DDT (MS)	8080(3550)/8081(3550)	2	29-134	0-26	0.49	3.3	M
	CLP OLM01.9/OlM03.1	62/85	23-134	0-50	3.3	3.3	M
Dicofol (Kelthane)	8081(3550)	2	40-125	0-40	1.7	20	M
Dieldrin (MS)	8080(3550)/8081(3550)	2	28-137	0-30	0.19	3.3	M
	CLP OLM01.9/OLM03.1	62/85	31-134	0-38	3.3	3.3	M
Endosulfan I	8080(3550)/8081(3550)	2	10-141	0-40	0.13	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Endosulfan II	8080(3550)/8081(3550)	2	10-159	0-65	0.22	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	3.3	3.3	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
Endosulfan sulfate	8080(3550)/8081(3550)	2	26-144	0-50	0.91	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	3.3	3.3	M
Endrin (MS)	8080(3550)/8081(3550)	2	33-149	0-32	0.10	3.3	M
	CLP OLM01.9/OLM03.1	62/85	42-139	0-45	3.3	3.3	M
Endrin aldehyde	8080(3550)/8081(3550)	2	10-130	0-86	0.22	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	3.3	3.3	M
Endrin ketone	8081(3550)	2	29-112	0-31	0.42	3.3	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	3.3	3.3	M
Etridiazole	8081(3550)	2	50-125	0-30	0.33	0.33	M
Heptachlor (MS)	8080(3550)/8081(3550)	2	17-138	0-38	0.12	1.7	M
	CLP OLM01.9/OLM03.1	62/85	35-130	0-31	1.7	1.7	M
Heptachlor epoxide	8080(3550)/8081(3550)	2	15-142	0-40	0.099	1.7	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Isodrin	8081(3550)	2	10-150	0-50	0.041	3.3	M
Kepone(1)	8081(3550)	2	10-150	0-50	4.2	17	M
Methoxychlor	8080(3550)/8081(3550)	2	24-152	0-40	1.3	17	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Mirex	8081(3550)	2	20-100	0-50	5.4	33	M
PCNB	8081(3550)	2	40-150	0-40	0.13	3.3	M
Pendimethalin	8081(3550)	2	35-125	0-50	17	67	M
Permethrin (total)	8080(3550)/8081(3550)	2	40-140	0-50	8.2	33	M
Propachlor	8081(3550)	2	51-125	0-30	2.1	16	M
Toxaphene	8080(3550)/8081(3550)	2	41-126	0-50	18	170	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	1.7	1.7	M
Trifluralin	8081(3550)	2	40-140	0-40	0.33	0.33	M
PCB-1016	8080(3550)/8082(3550)	2	34-137	0-44	4.8	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
PCB 1221	8080(3550)/8082(3550)	2	15-178	0-30	23	67	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
PCB 1232	8080(3550)/8082(3550)	2	10-215	0-30	4.0	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M

(1) Kepone exhibits erratic chromatographic behavior.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
PCB-1242	8080(3550)/8082(3550)	2	39-150	0-30	6.0	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
PCB-1248	8080(3550)/8082(3550)	2	38-158	0-30	6.7	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
PCB-1254	8080(3550)/8082(3550)	2	66-122	0-30	2.7	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
PCB-1260	8080(3550)/8082(3550)	2	58-150	0-30	5.6	33	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	33	33	M
Surrogate - Dibutylchlorendate (DBC)	8080(3550)	2	28-148	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080(3550)/8081(3550)/8082(3550)	2	10-114	NA	NA	NA	M
	CLP OLM01.9	62	60-150	NA	NA	NA	
	CLP OLM03.1	85	30-150	NA	NA	NA	M
Surrogate- Decachlorobiphenyl (DCB)	8080(3550)/8081(3550)/8082(3550)	2	27-128	NA	NA	NA	M
	CLP OLM01.9	62	60-150	NA	NA	NA	
	CLP OLM03.1	85	30-150	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Individual Congeners (*)							
2,4'-Dichlorobiphenyl (8)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',5-Trichlorobiphenyl (18)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,4,4'-Trichlorobiphenyl (28)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,5'-Tetrachlorobiphenyl (44)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',5,5'-Tetrachlorobiphenyl (52)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3',4,4'-Tetrachlorobiphenyl (66)	8082(3550)	2	50-150	0-50	0.25	1.0	M
3,3',4,4'-Tetrachlorobiphenyl (77)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',4,5,5'-Pentachlorobiphenyl (101)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3,3',4,4'-Pentachlorobiphenyl (105)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',4,5,5'-Pentachlorobiphenyl (101)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3',4,4',5-Pentachlorobiphenyl (118)	8082(3550)	2	50-150	0-50	0.25	1.0	M
3,3',4,4',5-Pentachlorobiphenyl (126)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,3',4,4'-Hexachlorobiphenyl (128)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,4,4',5'-Hexachlorobiphenyl (138)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',4,4',5,5'-Hexachlorobiphenyl (153)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3,3',4,4',5-Hexachlorobiphenyl (156)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3,3',4,4',6-Hexachlorobiphenyl (158)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,3',4,4',5,5'-Hexachlorobiphenyl (167)	8082(3550)	2	50-150	0-50	0.25	1.0	M
3,3',4,4',5,5'-Hexachlorobiphenyl (169)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,3',4,4',5-Heptachlorobiphenyl (170)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,4,4',5,5'-Heptachlorobiphenyl (180)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,4',5,5',6-Heptachlorobiphenyl (187)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,3',4,4',5,6-Octachlorobiphenyl (195)	8082(3550)	2	50-150	0-50	0.25	1.0	M
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (206)	8082(3550)	2	50-150	0-50	0.25	1.0	M
Decachlorobiphenyl (209)	8082(3550)	2	50-150	0-50	0.25	1.0	M
Surrogate - 2,4,5,6-Tetrachloro-m- xylene (TCMX)	8082(3550)	2	10-114	NA	NA	NA	M
Surrogate- Decachlorobiphenyl (DCB)	8082(3550)	2	27-128	NA	NA	NA	M
Surrogate- Octachloronaphthalene	8082(3550)	2	25-175	NA	NA	NA	M

*These congeners are representitive of the 209 individual PCBs that may be determined using Method 8082. The number in paraenthesis after the compound name is the PCB congener number. PCBs as Aroclors are listed in the previous section.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Monochlorobiphenyls	680/(3550)	93	30-130	0-50	0.68	10	M
Dihlorobiphenyls	680/(3550)	93	30-130	0-50	0.76	10	M
Trichlorobiphenyls	680/(3550)	93	30-130	0-50	0.68	10	M
Tetrachlorobiphenyls	680/(3550)	93	40–140	0-50	1.3	20	M
Pentachlorobiphenyls	680/(3550)	93	40–140	0-50	0.83	20	M
Hexachlorobiphenyls	680/(3550)	93	40–140	0-50	0.89	20	M
Heptachlorobiphenyls	680/(3550)	93	40–140	0-50	1.6	30	M
Octachlorobiphenyls	680/(3550)	93	40–140	0-50	0.95	30	M
Nonachlorobiphenyls	680/(3550)	93	30-130	0-50	1.9	50	M
Decachlorobiphenyl	680/(3550)	93	30-130	0-50	1.9	50	M
Surrogate-Decachlorobiphenyl-13C12	680/(3550)	93	30-130	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
2,4-Dinitrotoluene (MS)	8090(3550)(FID)	2	10-125	0-40	3.9	330	M
	8090/8091(3550)(ECD)	2	10-125	0-40	0.56	10	M
2,6-Dinitrotoluene (MS)	8090(3550)(FID)	2	10-126	0-40	3.0	330	M
	8090/8091(3550)(ECD)	2	10-126	0-40	0.65	10	M
Isophorone (MS)	8090 (3550)	2	10-117	0-40	82	330	M
Nitrobenzene (MS)	8090/8091(3550)	2	10-118	0-40	82	330	M
Surrogate - 2-Fluorobiphenyl	8090(3550)(FID)	2	10-152	NA	NA	NA	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8090/8091(3550)(ECD)	2	10-114	NA	NA	NA	M
Surrogate - Decachlorobiphenyl	8090/8091(3550)(ECD)	2	27-128	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Anthracene*1	8100(3550)	2	38-118	0-32	13	330	M
Acenaphthene (MS)	8100(3550)	2	24-114	0-32	26	330	M
Acenaphthylene	8100(3550)	2	36-114	0-32	20	330	M
Benzo(a)anthracene*2	8100(3550)	2	30-127	0-42	37	330	M
Benzo(a)pyrene (MS)	8100(3550)	2	35-136	0-45	17	330	M
Benzo(b)fluoranthene*3	8100(3550)	2	26-128	0-41	38	330	M
Benzo(k)fluoranthene*3	8100(3550)	2	26-128	0-41	38	330	M
Benzo(g,h,i)perylene	8100(3550)	2	25-126	0-42	32	330	M
Chrysene*2	8100(3550)	2	30-127	0-42	37	330	M
Dibenzo(a,h)anthracene*4	8100(3550)	2	20-131	0-47	50	330	M
Fluoranthene	8100(3550)	2	28-132	0-33	17	330	M
Fluorene (MS)	8100(3550)	2	32-114	0-33	17	330	M
Indeno(1,2,3-cd)Pyrene*4	8100(3550)	2	20-131	0-47	50	330	M
1-Methylnaphthalene	8100(3550)	2	20-140	0-50	21	330	M
2-Methylnaphthalene	8100(3550)	2	20-140	0-50	18	330	M
Napthalene (MS)	8100(3550)	2	10-133	0-45	23	330	M
Phenanthrene*1	8100(3550)	2	38-118	0-32	17	330	M
Pyrene (MS)	8100(3550)	2	39-121	0-32	17	330	M
Surrogate - 2-Fluorobiphenyl	8100(3550)	2	10-152	NA	NA	NA	M
Surrogate - o-Terphenyl	8100(3550)	12	15-154	NA	NA	NA	M

*# = where the number is the same for any 2 compounds, these compounds cannot be routinely resolved chromatographically and are therfore reported as a combined result.

NOTE: 8100(mod) and DRO parameters have been moved to 8015 (extractables). the SW-846 Update III reference fro petroleum products.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Bis(2-chloroethoxy)methane	8110/8111(3550)	2	12-128	0-50	79	170	M
Bis(2-chloroethyl)ether	8110/8111(3550)	2	11-152	0-50	120	670	M
Bis(2-chloroisopropyl)ether	8110/8111(3550)	2	9-165	0-50	58	330	M
4-Bromophenyl phenyl ether	8110/8111(3550)	2	D-189	0-50	46	170	M
4-Chlorophenyl phenyl ether	8110/8111(3550)	2	D-170	0-50	500	1300	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene	8110/8111(3550)	2	10-114	NA	NA	NA	M
Surrogate - Decachlorobiphenyl	8110/8111(3550)	2	27-128	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
2-Chloronaphthalene	8120/8121(3550)	2	9-148	0-50	42	330	M
1,2-Dichlorobenzene	8120/8121(3550)	2	9-160	0-50	28	330	M
1,3-Dichlorobenzene	8120/8121(3550)	2	D-150	0-50	34	330	M
1,4-Dichlorobenzene	8120/8121(3550)	2	13-137	0-50	120	330	M
Hexachlorobenzene	8120/8121(3550)	2	15-159	0-50	0.12	3.3	M
Hexachlorobutadiene	8120/8121(3550)	2	D-139	0-50	0.17	3.3	M
Hexachlorocylcopentadiene	8120/8121(3550)	2	D-111	0-50	0.80	3.3	M
Hexachloroethane	8120/8121(3550)	2	8-139	0-50	0.11	3.3	M
1,2,4-Trichlorobenzene	8120/8121(3550)	2	50-150	0-50	5.8	3.3	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8120/8121(3550)	2	10-114	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8120/8121(3550)	2	27-128	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acephate(1)	1657	72	40-140	0-50	42	167	M
Methamidophos(1)	1657	72	18-98	0-33	15	66	M
Alachlor	8141(3550)	2	40-140	0-30	4.6	33	M
Ametryn	8141(3550)	2	40-140	0-50	8.5	66	M
Atrazine	8141(3550)	2	57-123	0-39	11	66	M
Azinphos methyl	8141(3550)	2	16-129	0-50	7.0	66	M
Benoxacor	8141(3550)	2	48-113	0-46	132	330	M
Bolstar	8141(3550)	2	58-156	0-40	7.5	33	M
Bromacil	8141(3550)	2	40-140	0-50	6.1	66	M
Butylate	8141(3550)	2	38-145	0-76	73	66	M
Carbophenothion (Trithion)	8141(3550)	2	11-175	0-40	6.2	66	M
Chlorpyrifos	8141(3550)	2	22-11	0-40	8.0	33	M
Chlordimeform	8141(3550)	2	DL-121	0-67	115	330	M
5-Chloroaminotoluene	8141(3550)	2	37-106	0-42	132	330	M
Cyanazine	8141(3550)	2	40-150	0-23	22	33	M
Coumaphos	8141(3550)	2	51-147	0-40	7.6	330	M
Cycloate	8141(3550)	2	46-159	0-47	28	66	M
Demeton-O	8141(3550)	2	36-120	0-40	21	83	M
Demeton-S	8141(3550)	2	17-131	0-40	7.4	83	M
Diazinon (MS)	8141(3550)	2	41-128	0-30	7.8	33	M
Dichlofenthion	8141(3550)	2	10-132	0-50	6.9	33	M
Dichlorvos	8141(3550)	2	10-93	0-40	10	66	M
Dimethoate	8141(3550)	2	38-120	0-40	10	66	M
Disulfoton	8141(3550)	2	10-134	0-93	8.2	66	M
Dioxathion	8141(3550)	2	40-140	0-50	38	330	M
EPN	8141(3550)	2	48-124	0-30	7.5	33	M
EPTC	8141(3550)	2	46-154	0-55	32	66	M
Ethion	8141(3550)	2	10-200	0-40	3.2	17	M
Ethoprop	8141(3550)	2	58-113	0-40	9.7	17	M
Famphur	8141(3550)	2	10-129	0-60	4.3	66	M
Fenamiphos	8141(3550)	2	40-160	0-40	20	17	M
Fensulfothion	8141(3550)	2	43-145	0-40	9.7	330	M
Fenthion	8141(3550)	2	10-128	0-60	6.8	33	M
Fonophos	8141(3550)	2	40-160	0-40	8.2	33	M
Hexazinone	8141(3550)	2	40-140	0-50	14	33	M
Isofenphos	8141(3550)	2	40-160	0-40	3.2	17	M
Malathion	8141(3550)	2	10-141	0-40	6.2	33	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC∀
Merphos	8141(3550)	2	30-147	0-40	10	33	M
Metalaxyl	8141(3550)	2	40-140	0-50	8.2	33	M
Methyl chlorpyrifos	8141(3550)	2	10-164	0-50	6.3	33	M
Metolachlor	8141(3550)	2	28-130	0-54	5.5	33	M
Metribuzin	8141(3550)	2	40-140	0-50	5.5	33	M
Mevinphos	8141(3550)	2	30-100	0-40	9.1	66	M
Molinate	8141(3550)	2	37-127	0-74	26	66	M
Monocrotophos	8141(3550)	2	40-140	0-50	130	330	M
Naled	8141(3550)	2	54-102	0-40	66	330	M
Norflurazon	8141(3550)	2	40-140	0-50	14	33	M
Parathion, ethyl (MS)	8141(3550)	2	24-151	0-79	6.0	33	M
Parathion, methyl (MS)	8141(3550)	2	36-149	0-40	8.1	17	M
Pebulate	8141(3550)	2	22-172	0-50	30	33	M
Phorate	8141(3550)	2	36-125	0-40	8.9	33	M
Prometon	8141(3550)	2	40-140	0-50	5.9	66	M
Prometryn	8141(3550)	2	40-140	0-50	31	66	M
Propazine	8141(3550)	2	40-140	0-55	24	66	M
Ronnel (MS)	8141(3550)	2	26-100	0-35	8.1	33	M
Simazine	8141(3550)	2	10-181	0-59	16	66	M
Stirophos (Tetrachlorvinphos)	8141(3550)	2	36-126	0-40	7.2	33	M
Sulfotepp (MS)	8141(3550)	2	13-171	0-65	7.7	17	M
Terbufos	8141(3550)	2	40-140	0-50	8.4	17	M
Terbutryn	8141(3550)	2	40-140	0-50	82	330	M
Terbutylazine	8141(3550)	2	40-140	0-50	58	66	M
Thionazin (MS)	8141(3550)	2	10-116	0-60	5.5	33	M
Tokuthion (Prothiofos)	8141(3550)	2	14-128	0-40	8.6	33	M
Triadimefon	8141(3550)	2	40-140	0-50	7.2	33	M
Trichloronate	8141(3550)	2	49-161	0-40	8.2	330	M
Tris-(2,3-Dibromopropyl) phosphate	8141(3550)	2	57-159	0-48	730	1000	M
Vernolate	8141(3550)	2	39-147	0-45	11	66	M
Surrogate - Triphenylphosphate	8141(3550)	2	10-137	NA	NA	NA	M

(1) Determined by NPD.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Bentazon	8151	2	68-131	0-48	11	35	M
2,4-D (MS)	8150/8151	2	19-153	0-47	3.8	8.3	M
Dalapon	8150/8151	2	10-170	0-40	35	2000	M
2,4-DB	8150/8151	2	20-160	0-40	6.4	8.3	M
Dicamba	8150/8151	2	20-160	0-40	3.8	20	M
Dichlorprop	8150/8151	2	30-170	0-40	2.3	100	M
Dinoseb	8150/8151	2	30-170	0-40	3.8	100	M
MCPA	8150/8151	2	30-170	0-40	400	2000	M
MCPP	8150/8151	2	30-170	0-40	460	2000	M
Pentachlorophenol	8151	2	10-150	0-40	0.77	17	M
Picloram	8151	2	10-150	0-40	1.6	3.3	M
2,4,5-T (MS)	8150/8151	2	14-143	0-59	0.57	8.3	M
2,4,5-TP (Silvex) (MS)	8150/8151	2	27-120	0-51	1.0	8.3	M
Surrogate - 2,4-Dichlorophenoxy butanoic acid (2,4-DB)	8150/8151	2	20-160	NA	NA	NA	M
Surrogate - 2,4-Dichlorophenyl acetic acid (DCAA)	8150/8151	2	10-189	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acetone	8240(5030)/8260(5030/5035)	2	14-183	0-40	2.3	50	M
	8260(5035ext)	2	14-183	0-40	92	2000	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Acetonitrile	8240(5030)/8260(5030/5035)	2	78-151	0-40	62	1000	M
	8260(5035ext)	2	78-151	0-40	2500	40000	M
Acrolein	8240(5030)/8260(5030/5035)	2	22-164	0-65	38	100	M
	8260(5035ext)	2	22-164	0-65	1500	4000	M
Acrylonitrile	8240(5030)/8260(5030/5035)	2	41-140	0-40	30	100	M
	8260(5035ext)	2	41-140	0-40	1200	4000	M
Benzene (MS)	8240(5030)/8260(5030/5035)	2	64-144	0-25	0.41	5.0	M
	8260(5035ext)	2	64-144	0-25	16	200	M
	CLP OLM01.9/OLM03.1	62/85	66-142	0-21	10	10	
Benzyl Chloride	8240(5030)/8260(5030/5035)	2	50-150	0-40	25	100	M
	8260(5035ext)	2	50-150	0-40	1000	4000	M
Bromobenzene	8260(5030/5035)	2	62-127	0-40	0.48	10	M
	8260(5035ext)	2	62-127	0-40	19	400	M
Bromochloromethane	8260(5030/5035)	2	56-119	0-40	0.37	5.0	M
	8260(5035ext)	2	56-119	0-40	15	200	M
Bromodichloromethane	8240(5030)/8260(5030/5035)	2	71-140	0-40	0.34	5.0	M
	8260(5035ext)	2	71-140	0-40	14	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Bromoform	8240(5030)/8260(5030/5035)	2	59-143	0-40	0.44	5.0	M
	8260(5035ext)	2	59-143	0-40	18	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Bromomethane	8240(5030)/8260(5030/5035)	2	35-181	0-65	2.0	10	M
	8260(5035ext)	2	35-181	0-65	80	400	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
2-Butanone (MEK)	8240(5030)/8260(5030/5035)	2	54-166	0-40	2.8	25	M
	8260(5035ext)	2	54-166	0-40	110	1000	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
n-Butylbenzene	8260(5030/5035)	2	66-114	0-40	0.50	5.0	M
	8260(5035ext)	2	66-114	0-40	20	200	M
sec-Butylbenzene	8260(5030/5035)	2	62-124	0-40	0.58	5.0	M
	8260(5035ext)	2	62-124	0-40	23	200	M
tert-Butylbenzene	8260(5030/5035)	2	54-130	0-40	0.28	5.0	M
	8260(5035ext)	2	54-130	0-40	34	200	M
Carbon disulfide	8240(5030)/8260(5030/5035)	2	10-160	0-65	0.29	5.0	M
	8260(5035ext)	2	10-160	0-65	12	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Carbon tetrachloride	8240(5030)/8260(5030/5035)	2	65-129	0-40	0.47	5.0	M
	8260(5035ext)	2	65-129	0-40	19	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Chlorobenzene (MS)	8240(5030)/8260(5030/5035)	2	56-152	0-25	0.58	5.0	M
	8260(5035ext)	2	56-152	0-25	23	200	M
	CLP OLM01.9/OLM03.1	62/85	60-133	0-21	10	10	
2-Chloro-1,3-butadiene (Chloroprene)	8240(5030)/8260(5030/5035)	2	28-256	0-65	1.3	5.0	M
	8260(5035ext)	2	28-256	0-65	52	200	M
Chloroethane	8240(5030)/8260(5030/5035)	2	65-129	0-40	1.3	10	M
	8260(5035ext)	2	65-129	0-40	52	400	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC∀
2-Chloroethyl vinyl ether	8240(5030)/8260(5030/5035)	2	D-286	0-65	2.9	50	M
	8260(5035ext)	2	D-206	0-65	120	2000	M
Chloroform	8240(5030)/8260(5030/5035)	2	62-117	0-40	0.26	5.0	M
	8260(5035ext)	2	62-117	0-40	10	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Chloromethane	8240(5030)/8260(5030/5035)	2	10-186	0-65	1.2	10	M
	8260(5035ext)	2	10-186	0-65	48	400	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
3-Chloropropene (Allyl chloride)	8240(5030)/8260(5030/5035)	2	50-150	0-40	1.3	5.0	M
	8260(5035ext)	2	50-150	0-40	52	200	M
2-Chlorotoluene	8260(5030/5035)	2	65-131	0-40	0.34	5.0	M
	8260(5035ext)	2	65-131	0-40	14	200	M
4-Chlorotoluene	8260(5030/5035)	2	61-134	0-40	0.49	5.0	M
	8260(5035ext)	2	61-134	0-40	20	200	M
Cyclohexanone	8240(5030)/8260 (5030/5035)	2	38-111	0-52	240	750	M
	8260**(5035ext)	2	38-111	0-52	9600	30000	M
Dibromochloromethane	8240(5030)/8260(5030/5035)	2	73-127	0-40	0.28	5.0	M
	8260(5035ext)	2	73-127	0-40	11	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,2-Dibromo-3-chloropropane (DBCP)	8240(5030)/8260(5030/5035)	2	46-136	0-40	2.8	10	M
	8260(5035ext)	2	46-136	0-40	110	400	M
1,2-Dibromoethane (EDB)	8240(5030)/8260(5030/5035)	2	74-153	0-40	0.31	5.0	M
	8260(5035ext)	2	74-153	0-40	12	200	M
Dibromomethane	8240(5030)/8260(5030/5035)	2	76-127	0-40	0.20	5.0	M
	8260(5035ext)	2	76-127	0-40	8.0	200	M
1,2-Dichlorobenzene	8260(5030/5035)	2	49-126	0-40	0.16	5.0	M
	8260(5035ext)	2	49-126	0-40	6.4	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
1,3-Dichlorobenzene	8260(5030/5035)	2	64-115	0-40	0.57	5.0	M
	8260(5035ext)	2	64-115	0-40	23	200	M
1,4-Dichlorobenzene	8260(5030/5035)	2	54-128	0-40	1.0	5.0	M
	8260(5035)	2	54-128	0-40	40	200	M
trans-1,4-Dichloro-2-butene	8260(5030/5035)	2	79-178	0-40	3.2	10	M
	8260(5035ext)	2	79-178	0-40	130	400	M
Dichlorodifluoromethane	8240(5030)/8260(5030/5035)	2	38-155	0-40	0.96	5.0	M
	8260(5035ext)	2	38-155	0-40	38	200	M
1,1-Dichloroethane	8240(5030)/8260(5030/5035)	2	64-112	0-40	0.28	5.0	M
	8260(5035ext)	2	64-112	0-40	11	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,2-Dichloroethane	8240(5030)/8260(5030/5035)	2	66-128	0-40	1.0	5.0	M
	8260(5035ext)	2	66-128	0-40	40	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
cis-1,2-Dichloroethene	8240(5030)/8260(5030/5035)	2	64-123	0-40	0.31	5.0	M
	8260(5035ext)	2	64-123	0-40	12	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
trans-1,2-Dichloroethene	8240(5030)/8260(5030/5035)	2	60-161	0-25	0.57	5.0	M
	8260(5035ext)	2	60-161	0-25	23	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,1-Dichloroethene (MS)	8260(5030/5035)	2	44-157	0-23	0.77	5.0	M
	8260(5035ext)	2	44-157	0-23	31	200	M
	CLP OLM01.9/OLM03.1	62/85	59-172	0-22	10	10	
1,2-Dichloropropane	8240(5030)/8260(5030/5035)	2	47-146	0-65	1.0	5.0	M
	8260(5035ext)	2	47-146	0-65	40	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,3-Dichloropropane	8260(5030/5035)	2	69-125	0-40	0.57	5.0	M
	8260(5035ext)	2	69-125	0-40	23	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
2,2-Dichloropropane	8260(5030/5035)	2	46-127	0-40	0.73	5.0	M
	8260(5035ext)	2	46-127	0-40	29	200	M
1,1-Dichloropropene	8260(5030/5035)	2	51-109	0-40	1.3	5.0	M
	8260(5035ext)	2	51-109	0-40	52	200	M
cis-1,3-Dichloropropene	8240(5030)/8260(5030/5035)	2	50-146	0-65	0.49	5.0	M
	8260(5035ext)	2	50-146	0-65	20	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
trans-1,3-Dichloropropene	8240(5030)/8260(5030/5035)	2	57-143	0-65	0.65	5.0	M
	8260(5035ext)	2	57-143	0-65	26	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Diethyl ether	8260(5030/5035)	2	50-150	0-40	2.5	10	M
	8260(5035ext)	2	50-150	0-40	100	400	M
Ethanol	8240(5030)/8260 (5030/5035)	2	40-160	0-40	250	1000	M
	8260(5035ext)	2	40-160	0-40	10000	40000	M
Ethyl Acetate	8260(5030/5035)	2	73-137	0-21	1.7	5.0	M
	8260(5035ext)	2	73-137	0-21	68	200	M
Ethylbenzene	8240(5030)/8260(5030/5035)	2	60-131	0-40	0.55	5.0	M
	8260(5035ext)	2	60-131	0-40	22	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Ethyl methacrylate	8240(5030)/8260(5030/5035)	2	50-150	0-40	1.6	5.0	M
	8260(5035ext)	2	50-150	0-40	64	200	M
Ethylene oxide	8260(5030/5035)	2	DL-411	0-83	900	3500	M
	8260**(5035ext)	2	DL-411	0-83	36000	140000	M
Hexachlorobutadiene	8260(5030/5035)	2	13-139	0-40	1.0	5.0	M
	8260**(5035ext)	2	13-139	0-40	40	200	M
2-Hexanone	8240(5030)/8260(5030/5035)	2	47-145	0-40	3.7	25	M
	8260(5035ext)	2	47-145	0-40	150	1000	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Iodomethane	8240(5030)/8260(5030/5035)	2	50-150	0-40	1.4	5.0	M
	8260(5035ext)	2	50-150	0-40	56	200	M
Isobutyl alcohol	8240(5030)/8260(5030/5035)	2	63-173	0-40	690	1000	M
	8260(5035ext)	2	63-173	0-40	28000	40000	M
Isopropylbenzene	8260(5030/5035)	2	21-161	0-40	0.34	5.0	M
	8260(5035ext)	2	21-161	0-40	14	200	M
p-Isopropyltoluene	8260(5030/5035)	2	38-154	0-40	0.43	5.0	M
	8260(5035ext)	2	38-154	0-40	17	200	M
Methacrylonitrile	8240(5030)/8260(5030/5035)	2	69-145	0-60	32	100	M
	8260(5035ext)	2	69-145	0-60	1300	4000	M
Methylene chloride	8240(5030)/8260(5030/5035)	2	61-149	0-65	0.63	5.0	M
	8260(5035ext)	2	61-149	0-65	25	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Methyl methacrylate	8240(5030)/8260(5030/5035)	2	50-150	0-45	2.2	5.0	M
	8260(5035ext)	2	50-150	0-45	88	200	M
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260(5030/5035)	2	54-167	0-49	3.2	25	M
	8260(5035ext)	2	54-167	0-49	130	1000	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Methyl t-butyl ether (MTBE)	8260(5030/5035)	2	40-150	0-40	3.1	50	M
	8260(5035ext)	2	40-150	0-40	120	2000	M
Naphthalene	8260(5030/5035)	2	22-135	0-40	1.5	5.0	M
	8260(5035ext)	2	22-135	0-40	60	200	M
2-Nitropropane	8260(5030/5035)	2	35-128	0-47	2.4	10	M
	8260(5035ext)	2	35-128	0-47	96	400	M
Pentachloroethane	8240(5030)/8260(5030/5035)	2	41-165	0-50	10	25	M
	8260(5035ext)	2	41-165	0-50	400	1000	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Propionitrile (ethylcyanide)	8240(5030)/8260(5030/5035)	2	73-227	0-65	37	100	M
	8260(5035ext)	2	73-227	0-65	1500	4000	M
n-Propylbenzene	8260(5030/5035)	2	63-129	0-40	0.32	5.0	M
	8260(5035ext)	2	63-129	0-40	13	200	M
Styrene	8240(5030)/8260(5030/5035)	2	56-121	0-40	0.43	5.0	M
	8260(5035ext)	2	56-121	0-40	17	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,1,1,2-Tetrachloroethane	8240(5030)/8260(5030/5035)	2	72-145	0-40	3.4	5.0	M
	8260(5035ext)	2	72-145	0-40	140	200	M
1,1,2,2-Tetrachloroethane	8240(5030)/8260(5030/5035)	2	36-157	0-40	0.80	5.0	M
	8260(5035ext)	2	36-157	0-40	32	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Tetrachloroethene	8240(5030)/8260(5030/5035)	2	61-142	0-40	0.44	5.0	M
	8260(5035ext)	2	61-142	0-40	18	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Toluene (MS)	8240(5030)/8260(5030/5035)	2	67-142	0-25	0.48	5.0	M
	8260(5035ext)	2	67-142	0-25	19	200	M
	CLP OLM01.9/OLM03.1	62/85	59-139	0-21	10	10	
1,2,3-Trichlorobenzene	8260(5030/5035)	2	10-149	0-40	1.1	5.0	M
	8260(5035ext)	2	10-149	0-40	44	200	M
1,2,4-Trichlorobenzene	8260(5030/5035)	2	29-122	0-40	0.86	5.0	M
	8260(5035ext)	2	29-122	0-40	34	200	M
1,1,1-Trichloroethane	8240(5030)/8260(5030/5035)	2	11-148	0-40	0.98	5.0	M
	8260(5035ext)	2	11-148	0-40	39	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
1,1,2-Trichloroethane	8240(5030)/8260(5030/5035)	2	66-123	0-40	0.65	5.0	M
	8260(5035ext)	2	66-123	0-40	26	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
Trichloroethene (MS)	8240(5030)/8260(5030/5035)	2	41-134	0-25	0.72	5.0	M
	8260(5035ext)	2	41-134	0-25	29	200	M
	CLP OLM01.9/OLM03.1	62/85	62-137	0-24	10	10	
Trichlorofluoromethane	8240(5030)/8260(5030/5035)	2	35-147	0-40	0.40	5.0	M
	8260(5035ext)	2	35-147	0-40	16	200	M
1,2,3-Trichloropropane	8240(5030)/8260(5030/5035)	2	77-144	0-40	1.9	5.0	M
	8260(5035ext)	2	77-144	0-40	76	200	M
1,1,2-Trichloro-1,2,2-trifluoroethane	8240(5030)/ 8260(5030/5035)	2	17-181	0-65	0.72	5.0	M
	8260(5035ext)	2	17-181	0-65	29	200	M
1,2,4-Trimethylbenzene	8260(5030/5035)	2	55-143	0-40	0.46	5.0	M
	8260(5035ext)	2	55-143	0-40	92	200	M
1,3,5-Trimethylbenzene	8260(5030/5035)	2	69-128	0-40	0.39	5.0	M
	8260(5035ext)	2	69-128	0-40	16	200	M
Vinyl acetate	8240(5030)/8260(5030/5035)	2	10-163	0-40	1.0	10	M
	8260(5035ext)	2	10-163	0-40	40	400	M
Vinyl chloride	8240(5030)/8260(5030/5035)	2	18-169	0-65	0.98	10	M
	8260(5035ext)	2	18-169	0-65	39	400	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
Xylenes (total)	8240(5030)/8260(5030/5035)	2	50-150	0-40	1.5	5.0	M
	8260(5035ext)	2	50-150	0-40	60	200	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	10	10	
o-Xylene	8260(5030/5035)	2	22-154	0-40	0.50	5.0	M
	8260(5035ext)	2	22-154	0-40	20	200	M
m+p-Xylene	8260(5030/5035)	2	62-123	0-40	1.0	5.0	M
	8260(5035ext)	2	62-123	0-40	40	200	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC^
Surrogate - Toluene-d8	8240(5030)/8260(5030/5035)	2	58-148	NA	NA	NA	M
	8260(5035ext)	2	58-148	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	84-138	NA	NA	NA	
Surrogate - p-Bromofluorobenzene	8240(5030)/8260(5030/5035)	2	70-136	NA	NA	NA	M
	8260(5035ext)	2	70-136	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	59-113	NA	NA	NA	M
Surrogate -Dibromofluoromethane	8260(5030/5035)	2	66-148	NA	NA	NA	M
	8260(5035ext)	2	66-148	NA	NA	NA	M
Surrogate - 1,2-Dichloroethane-d4	8240(5030)/8260(5030/5035)	2	38-151	NA	NA	NA	M
	8260(5035ext)	2	38-151	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	70-121	NA	NA	NA	
Surrogate - 1,2-Dichlorobenzene-d4	8260(5030/5035)	2	58-148	NA	NA	NA	M
	8260(5035ext)	2	58-148	NA	NA	NA	M

(ext) = methanol extraction; 5g to 5mL methanol; 125uL of extract analyzed.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acenaphthene (MS)	8270(3550)	2	28-102	0-25	13	330	M
	CLP OLM01.9/OLM03.1	62/85	31-137	0-19	330	330	
Acenaphthylene	8270(3550)	2	54-140	0-25	13	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Acetophenone	8270(3550)	2	10-150	0-50	51	330	M
2-Acetylaminofluorene	8270(3550)	2	25-150	0-50	38	330	M
Aldrin	8270(3550)	2	10-166	0-40	15	330	M
4-Aminobiphenyl	8270(3550)	2	10-150	0-50	62	330	M
Aniline	8270(3550)	2	10-150	0-50	35	330	M
Anthracene	8270(3550)	2	39-106	0-30	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Aramite	8270(3550)	2	40-150	0-50	18	330	M
Benzidine	8270(3550)	2	10-200	0-100	786	2700	M
Benzo(a)anthracene	8270(3550)	2	29-111	0-25	9.6	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Benzoic acid	8270(3550)	2	10-150	0-50	21	1700	M
Benzo(b)fluoranthene	8270(3550)	2	19-126	0-25	17	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Benzo(k)fluoranthene	8270(3550)	2	26-125	0-38	13	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Benzo(g,h,i)perylene	8270(3550)	2	10-121	0-50	19	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Benzo(a)pyrene	8270(3550)	2	34-116	0-29	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Benzyl alcohol	8270(3550)	2/6	10-150	0-50	12	330	M
Benzyl chloride	8270(3550)	2	10-150	0-50	82	330	M
alpha-BHC	8270(3550)	2	10-150	0-50	30	330	M
beta-BHC	8270(3550)	2	24-149	0-40	16	330	M
delta-BHC	8270(3550)	2	10-110	0-40	16	330	M
gamma-BHC	8270(3550)	2	10-150	0-50	9.9	330	M
Biphenyl (Diphenyl)	8270(3550)	2	31-150	0-57	197	660	M
Bis(2-chloroethoxy) methane	8270(3550)	2	13-108	0-50	30	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Bis(2-chloroethyl) ether	8270(3550)	2	10-130	0-50	9.6	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Bis(2-chloroisopropyl) ether	8270(3550)	2	36-166	0-50	9.9	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Bis(2-ethylhexyl) phthalate	8270(3550)	2	23-124	0-40	46	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
4-Bromophenyl phenyl ether	8270(3550)	2	53-127	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC✓
Butyl benzyl phthalate	8270(3550)	2	24-120	0-40	30	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Carbazole	8270(3550)	2	10-158	0-50	14	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Technical Chlordane	8270(3550)	2	10-150	0-50	420	1700	M
4-Chloroaniline	8270(3550)	2	10-150	0-50	17	660	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
4-Chloro-3-methylphenol (MS) (p-Chloro-m-cresol)	8270(3550)	2	25-107	0-25	10	330	M
	CLP OLM01.9/OLM03.1	62/85	26-103	0-33	330	330	
1-Chloronaphthalene	8270(3550)	2	10-150	0-50	82	330	M
2-Chloronaphthalene	8270(3550)	2	60-118	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
2-Chlorophenol (MS)	8270(3550)	2	23-114	0-25	11	330	M
	CLP OLM01.9/OLM03.1	62/85	25-102	0-50	330	330	
4-Chlorophenylphenyl ether	8270(3550)	2	20-118	0-33	10	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Chrysene	8270(3550)	2	35-130	0-27	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
2-Methyl phenol (o-Cresol)	8270(3550)	2	14-95	0-50	13	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
3- Methyl phenol (m- Cresol)	8270(3550)	2	12-102	0-50	61	330	M
4-Methyl phenol (p-Cresol)	8270(3550)	2	12-102	0-50	61	330	M
3- and 4-Methyl phenol (m- and p-Cresol)	8270(3550)	2	12-102	0-50	61	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
4,4'-DDD	8270(3550)	2	10-145	0-40	36	330	M
4,4'-DDE	8270(3550)	2	10-136	0-40	23	330	M
4,4'-DDT	8270(3550)	2	10-203	0-62	33	330	M
Diallate	8270(3550)	2	10-150	0-50	58	330	M
Dibenz(a,h)anthracene	8270(3550)	2	40-147	0-28	15	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Dibenzofuran	8270(3550)	2	10-150	0-50	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Dibenzo(a,e)pyrene	8270(3550)	2	35-109	0-42	110	330	M
Di-n-butylphthalate	8270(3550)	2	28-125	0-50	15	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
1,2-Dichlorobenzene	8270(3550)	2	10-99	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
1,3-Dichlorobenzene	8270(3550)	2	10-100	0-42	8.8	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
1,4-Dichlorobenzene (MS)	8270(3550)	2	10-125	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	28-104	0-27	330	330	
3,3'-Dichlorobenzidine	8270(3550)	2	10-189	0-100	16	660	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
2,4-Dichlorophenol	8270(3550)	2	16-104	0-40	10	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
2,6-Dichlorophenol	8270(3550)	2	10-150	0-50	13	330	M
Dieldrin	8270(3550)	2	29-136	0-40	24	330	M
Diethylphthalate	8270(3550)	2	31-113	0-40	15	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
p-(Dimethylamino)azobenzene	8270(3550)	2	10-150	0-50	42	330	M
7,12-Dimethylbenz(a)anthracene	8270(3550)	2	10-150	0-50	49	330	M
3,3'-Dimethylbenzidine	8270(3550)	2	10-200	0-100	16	1700	M
a,a-Dimethylphenethylamine	8270(3550)	2	10-150	0-50	17000	67000	M
2,4-Dimethylphenol	8270(3550)	2	10-95	0-25	10	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Dimethylphthalate	8270(3550)	2	20-116	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
m-Dinitrobenzene	8270(3550)	2	10-150	0-50	67	330	M
p-Dinitrobenzene	8270(3550)	2	49-105	0-40	400	1700	M
4,6-Dinitro-2-methylphenol	8270(3550)	2	43-135	0-93	29	1700	M
	CLP OLM01.9	62	NA	NA	800	800	
	CLP OLM03.1	85	NA	NA	830	830	
2,4-Dinitrophenol	8270(3550)	2	10-126	0-87	22	1700	M
	CLP OLM01.9	62	NA	NA	800	800	
	CLP OLM03.1	85	NA	NA	830	830	
2,4-Dinitrotoluene (MS)	8270(3550)	2	26-107	0-30	13	330	M
	CLP OLM01.9/OLM03.1	62/85	28-89	0-47	330	330	
2,6-Dinitrotoluene	8270(3550)	2	38-107	0-40	16	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270(3550)	2	10-150	0-50	120	330	M
Di-n-octylphthalate	8270(3550)	2	22-135	0-50	19	330	M
	CLP OLM01.9/OLM03.1	62/85	28-89	0-47	330	330	
1,4-Dioxane	8270(3550)	2	10-150	0-50	24	330	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Diphenylamine/ N-nitrosodiphenylamine	8270(3550)	2	40-122	0-50	98	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Diphenylamine (requires floracil cleanup to separate from N-nitosodiphenylamine)	8270(3550)	2	40-122	0-50	98	330	M
1,2-Diphenyl hydrazine	8270(3550)	2	10-150	0-50	17	330	M
Endosulfan I	8270(3550)	2	10-150	0-50	46	660	M
Endosulfan II	8270(3550)	2	10-150	0-50	79	660	M
Endosulfan sulfate	8270(3550)	2	10-107	0-50	28	660	M
Endrin	8270(3550)	2	10-150	0-50	23	660	M
Endrin aldehyde	8270(3550)	2	10-209	0-50	72	1700	M
Endrin ketone	8270/(3550)	2	10-150	0-50	420	1700	M
Ethyl carbamate	8270(3550)	2	48-100	0-20	34	330	M
Ethyl methanesulfonate	8270(3550)	2	10-150	0-50	50	330	M
Fluoranthene	8270(3550)	2	23-121	0-25	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Fluorene	8270(3550)	2	32-107	0-40	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Heptachlor	8270(3550)	2	10-192	0-40	26	660	M
Heptachlor epoxide	8270(3550)	2	26-155	0-55	36	660	M
Hexachlorobenzene	8270(3550)	2	44-105	0-40	10	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Hexachlorobutadiene	8270(3550)	2	10-112	0-40	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Hexachlorocyclopentadiene	8270(3550)	2	D-132	0-50	18	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Hexachloroethane	8270(3550)	2	16-91	0-40	13	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Hexachlorophene*	8270(3550)	2	10-200	0-80	1400	170000	M
Hexachloropropene	8270(3550)	2	10-150	0-50	50	330	M
Indeno(1,2,3-cd)pyrene	8270(3550)	2	18-157	0-83	20	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Isophorone	8270(3550)	2	17-107	0-60	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Isosafrole	8270(3550)	2	10-150	0-50	53	330	M
Kepone	8270(3550)	2	10-150	0-50	80	330	M
Methapyrilene	8270(3550)	2	10-150	0-50	17000	67000	M
3-Methylcholanthrene	8270(3550)	2	10-150	0-50	48	330	M

*Exhibits non-reproducible chromatographic behavior.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
4,4-Methylenebis(2-chloroaniline)	8270(3550)	2	40-122	0-57	4500	17000	M
Methyl methanesulfonate	8270(3550)	2	10-150	0-50	60	330	M
1-Methylnaphthalene	8270(3550)	2	10-150	0-50	8.7	330	M
2-Methylnaphthalene	8270(3550)	2	19-105	0-50	9.2	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Naphthalene	8270(3550)	2	53-125	0-25	11	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	M
1,4-naphthoquinone	8270(3550)	2	10-150	0-50	69	330	M
1-Naphthylamine	8270(3550)	2	10-150	0-50	57	330	M
2-Naphthylamine	8270(3550)	2	10-150	0-50	49	330	M
Nicotine	8270(3550)	2	10-150	0-50	820	3300	M
2-Nitroaniline	8270(3550)	2	22-110	0-50	14	1700	M
	CLP OLMO1.9	62	NA	NA	800	800	M
	CLP OLMO3.1	85	NA	NA	830	830	M
3-Nitroanline	8270(3550)	2	10-117	0-50	14	1700	M
	CLP OLMO1.9	62	NA	NA	800	800	M
	CLP OLMO3.1	85	NA	NA	830	830	M
4-Nitroaniline	8270(3550)	2	10-136	0-50	13	1700	M
	CLP OLMO1.9	62	NA	NA	NA	800	
	CLP OLMO3.1	85	NA	NA	NA	830	
Nitrobenzene	8270(3550)	2	9-104	0-40	13	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
2-Nitrophenol	8270(3550)	2	10-101	0-40	8.8	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
4-Nitrophenol(MS)	8270(3550)	2	10-117	0-45	30	1700	M
	CLP OLM01.9	62	11-114	0-50	800	800	M
	CLP OLM03.1	85	NA	NA	830	830	
4-Nitroquinoline-1-oxide	8270(3550)	2	10-150	0-50	1200	3300	M
N-Nitrosos-di-N-butylamine	8270(3550)	2	10-150	0-50	58	330	M
N-Nitrososdiethylamine	8270(3550)	2	10-150	0-50	49	330	M
N-Nitrosodimethylamine	8270(3550)	2	10-150	0-50	30	330	M
N-Nitrosodiphenylamine/ Diphenylamine	8270(3550)	2	40-122	0-50	98	330	M
	CLP OLMO1.9/OLMO3.1	62/85	NA	NA	330	330	
N-Nitrosodiphenylamine (requires floracil cleanup to separate from Diphenylamine)	8270(3550)	2	40-122	0-50	98	330	M
N-Nitrosos-di-N-propylamine (MS)	8270(3550)	2	11-117	0-35	14	330	M
	CLP OLMO1.9/OLMO3.1	62/85	41-126	0-38	330	330	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
N-Nitrosomethylethylamine	8270(3550)	2	10-150	0-50	51	330	
N-Nitrosomorpholine	8270(3550)	2	10-150	0-50	58	330	M
N-Nitrosopiperidine	8270(3550)	2	10-150	0-50	49	330	M
N-Nitrosopyrrolidine	8270(3550)	2	10-150	0-50	51	330	M
5-Nitro-o-toluidine	8270(3550)	2	10-150	0-50	46	330	M
PCB 1016	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1221	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1232	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1242	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1248	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1254	8270(3550)	2	10-150	0-50	4200	17000	M
PCB 1260	8270(3550)	2	10-150	0-50	4200	17000	M
Pentachlorobenzene	8270(3550)	2	10-150	0-50	64	330	M
Pentachloronitrobenzene	8270(3550)	2	10-150	0-50	74	330	M
Pentachlorophenol (MS)	8270(3550)	2	10-120	0-44	28	1700	M
	CLP OLM01.9	62	17-109	0-47	800	800	
	CLP OLM03.1	85	NA	NA	830	830	
Phenacetin	8270(3550)	2	10-150	0-50	72	330	M
Phenanthrene	8270(3550)	2	38-113	0-25	12	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Phenol (MS)	8270(3550)	2	17-103	0-25	19	330	M
	CLP OLM01.9/OLM03.1	62/85	26-90	0-35	330	330	
Phenyl ether (Diphenyl oxide)	8270(3550)	2	29-157	0-61	212	660	M
p-Phenylenediamine	8270(3550)	2	10-150	0-50	140	1700	M
2-Picoline	8270(3550)	2	10-150	0-50	45	330	M
Pronamide	8270(3550)	2	10-150	0-50	57	330	M
Pyrene (MS)	8270(3550)	2	18-136	0-25	11	330	M
	CLP OLM01.9/OLM03.1	62/85	35-142	0-36	330	330	
Pyridine	8270(3550)	2	10-150	0-50	34	330	M
Safrole	8270(3550)	2	10-150	0-50	15	330	M
Strychnine	8270(3550)	2	10-150	0-50	820	3300	M
1,2,4,5-Tetrachlorobenzene	8270(3550)	2	10-150	0-50	55	330	M
2,3,4,5-Tetrachlorophenol	8270(3550)	2	10-150	0-50	40	330	M
2,3,4,6-Tetrachlorophenol	8270(3550)	2	36-121	0-31	40	330	M
Tetrachlorophenols (2,3,4,5 + 2,3,4,6)	8270(3550)	2	NA	NA	NA	330	M
o-Toluidine	8270(3550)	2	10-150	0-50	29	330	M
Toxaphene	8270(3550)	2	10-150	0-50	1700	67000	M
1,2,4-Trichlorobenzene (MS)	8270(3550)	2	17-105	0-28	11	330	M
	CLP OLM01.9/OLM03.1	62/85	38-107	0-23	330	330	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
2,4,5-Trichlorophenol	8270(3550)	2	39-123	0-27	13	330	M
	CLP OLM01.9	62	NA	NA	800	800	
	CLP OLM03.1	85	NA	NA	830	830	
2,4,6-Trichlorophenol	8270(3550)	2	20-116	0-40	9.2	330	M
	CLP OLM01.9/OLM03.1	62/85	NA	NA	330	330	
Trichlorophenols (2,4,5 + 2,4,6)	8270(3550)	2	NA	NA	NA	330	
o,o,o-Triethylphosphorothioate	8270(3550)	2	10-150	0-50	70	330	M
1,3,5-Trinitrobenzene	8270(3550)	2	10-150	0-50	14	330	M
Surrogate - Nitrobenzene-d5	8270(3550)	2	12-125	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	23-120	NA	NA	NA	
Surrogate - 2-Fluorobiphenyl	8270(3550)	2	24-118	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	30-115	NA	NA	NA	
Surrogate - p-Terphenyl-d14	8270(3550)	2	18-153	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	18-137	NA	NA	NA	
Surrogate - Phenol-d5	8270(3550)	2	10-142	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	23-113	NA	NA	NA	
Surrogate - 2-Fluorophenol	8270(3550)	2	10-118	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	25-121	NA	NA	NA	
Surrogate - 2,4,6- Tribromophenol	8270(3550)	2	14-121	NA	NA	NA	M
	CLP OLM01.9/OLM03.1	62/85	19-122	NA	NA	NA	
Surrogate - 2-Chlorophenol-d4	CLP OLM01.9/OLM03.1	62/85	20-130	NA	NA	NA	
Surrogate - 1,2-Dichlorobenzene-d4	CLP OLM01.9/OLM03.1	62/85	20-130	NA	NA	NA	

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TC∀
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	8280	2	69-145	0-40	0.13	0.50	M
	8270 (Qual. Screen)	2	NA	NA	330	330	M
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes							
tetra-CDD	8280	2	69-145	0-40	0.12	0.50	M
tetra-CDF	8280	2	59-142	0-40	0.040	0.50	M
penta-CDD	8280	2	41-203	0-40	0.089	0.50	M
penta-CDF	8280	2	55-146	0-40	0.068	0.50	M
hexa-CDD	8280	2	45-174	0-53	0.13	0.50	M
hexa-CDF	8280	2	50-154	0-46	0.051	0.50	M
hepta-CDD	8280	2	20-170	0-50	0.13	1.0	M
hepta-CDF	8280	2	20-170	0-50	0.063	1.0	M
octa-CDD	8280	2	20-170	0-50	0.14	1.0	M
octa-CDF	8280	2	20-170	0-50	0.13	1.0	M
Internal Standard - 13C12-2,3,7,8-TCDD	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-2,3,7,8-TCDF	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,6,7,8-HxCDD	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,4,6,7,8-HpCDF	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-OCDD	8280	2	25-150	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
Chlordimeform (Galecron)	625(3550)	1/2	10-150	0-50	580	670	M
5-Chlordimeform	625(3550)	1/2	10-150	0-50	300	330	M
Dithiocarbamates (as Ziram)[5]	630(3540)	63/2	50-126	0-52	190	1000	M
Benomyl (as Carbendazim)	631	55/2	49-139	0-50	7.8	30	M
Aminocarb	632(3550)	13/2	50-150	0-50	2.2	50	M
Barban	632(3550)	13/2	85-128	0-25	8.3	20	M
Bromacil	632(3550)	13/2	66-120	0-25	14	40	M
Carbaryl (MS)	632(3550)	13/2	50-150	0-50	14	50	M
Carbofuran	632(3550)	13/2	23-109	0-31	23	50	M
Chlorpropham	632(3550)	13/2	50-150	0-50	11	20	M
Diuron (MS)	632(3550)	13/2	50-150	0-50	3.3	5.0	M
Fenuron	632(3550)	13/2	50-150	0-50	4.1	10	M
Fluometuron	632(3550)	13/2	50-150	0-50	5.0	10	M
Linuron	632(3550)	13/2	64-130	0-28	3.8	5.0	M
Methiocarb	632(3550)	13/2	50-150	0-50	13	50	M
Methomyl	632(3550)	13/2	50-150	0-50	28	200	M
Monuron	632(3550)	13/2	65-109	0-25	2.7	5.0	M
Neburon	632(3550)	13/2	50-150	0-50	2.9	5.0	M
Oxamyl	632(3550)	13/2	50-150	0-50	12	50	M
Propham	632(3550)	13/2	50-150	0-50	10	50	M
Propoxur	632(3550)	13/2	63-116	0-33	69	200	M
Siduron	632(3550)	13/2	50-150	0-50	15	20	M
Swep	632(3550)	13/2	50-150	0-50	4.9	20	M
Oryzalin	638(3550)	21/2	60-140	0-40	4.5	25	M

[5]The compounds determined as ziram by Method 630 include amobam, farbam, mancozeb, maneb, metham, nabam, polyram, and zineb.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acenaphthene (MS)	8310(3550)	2	11-144	0-35	14	50	M
Acenaphthylene	8310(3550)	2	10-139	0-40	5.1	20	M
Anthracene	8310(3550)	2	10-126	0-40	0.23	4.0	M
Benzo(a)anthracene	8310(3550)	2	12-135	0-40	0.27	4.0	M
Benzo(b)fluoranthene	8310(3550)	2	10-150	0-40	0.15	4.0	M
Benzo(k)fluoranthene	8310(3550)	2	10-159	0-40	0.12	4.0	M
Benzo(g,h,i)perylene	8310(3550)	2	10-120	0-40	0.68	10	M
Benzo(a)pyrene	8310(3550)	2	10-128	0-40	0.35	4.0	M
Carbazole	8310(3550)	2	10-150	0-40	5.0	20	M
Chrysene (MS)	8310(3550)	2	10-199	0-40	0.28	4.0	M
Dibenz(a,h)acridine	8310(3550)	2	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	8310(3550)	2	10-110	0-40	0.87	10	M
Fluoranthene	8310(3550)	2	56-136	0-28	0.47	10	M
Fluorene (MS)	8310(3550)	2	10-142	0-40	1.4	10	M
Indene	8310(3550)	2	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	8310(3550)	2	10-116	0-40	0.25	10	M
6-Methylchrysene	8310(3550)	2	NA	NA	NA	NA	
1-Methylnaphthalene	8310(3550)	2	10-125	0-40	6.2	20	M
2-Methylnaphthalene	8310(3550)	2	10-125	0-40	5.9	20	M
Naphthalene (MS)	8310(3550)	2	31-159	0-34	5.3	20	M
Phenanthrene	8310(3550)	2	10-155	0-40	0.50	4.0	M
Pyrene (MS)	8310(3550)	2	49-156	0-28	0.93	10	M
Thiophenol	8310(3550)	2	NA	NA	NA	NA	
Surrogate - 4-Terphenyl-d14	8310(3550)	2	28-151	NA	NA	NA	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acetaldehyde	8315	2	30-156	0-36	19	250	M
Formaldehyde	8315	2	30-170	0-47	23	100	M
Acrylamide	8316	2	27-120	0-50	220	1000	M
Aldicarb (Temik) (MS)	8318	2	44-114	0-50	0.79	10	M
Aldicarb sulfone	8318	2	58-118	0-50	1.0	10	M
Aldicarb sulfoxide	8318	2	33-143	0-50	1.0	10	M
Carbofuran (Furadan) (MS)	8318	2	53-123	0-50	1.7	10	M
Carbaryl (Sevin)	8318	2	56-126	0-50	1.6	10	M
Dioxacarb	8318	2	55-125	0-50	1.9	10	M
3-Hydroxycarbofuran	8318	2	60-120	0-50	1.6	10	M
Methiocarb (Mesurol)	8318	2	52-122	0-50	2.0	10	M
Methomyl (Lannate)	8318	2	54-114	0-50	1.7	10	M
Oxamyl (MS)	8318	2	45-161	0-50	1.8	10	M
Promecarb	8318	2	44-120	0-50	1.7	10	M
Propoxur (Baygon)	8318	2	46-116	0-50	1.5	10	M

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC~
2-Amino-4,6-dinitrotoluene	8330	2	50-150	0-30	10	250	M
4-Amino-2,6-dinitrotoluene	8330	2	58-126	0-30	54	500	M
1,3-Dinitrobenzene (MS)	8330	2	50-132	0-30	28	250	M
2,4-Dinitrotoluene (MS)	8330	2	54-120	0-30	21	250	M
2,6-Dinitrotoluene	8330	2	59-122	0-30	49	500	M
Diphenylamine	8330	2	65-140	0-30	16	100	M
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330	2	54-166	0-30	29	500	M
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)	8330	2	41-165	0-30	32	500	M
Nitrobenzene	8330	2	52-152	0-30	28	250	M
Nitroglycerin	8332	2	48-152	0-50	38	1000	M
n-Nitrosodiphenylamine	8330	2	55-121	0-30	32	100	M
2-Nitrotoluene (MS)	8330	2	52-138	0-40	53	250	M
3-Nitrotoluene	8330	2	69-137	0-30	53	250	M
4-Nitrotoluene	8330	2	54-166	0-30	100	250	M
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330	2	29-156	0-600	140	500	M
Pentaerythritol tetranitrate (PETN)	8330	2	50-150	0-30	34	1000	M
1,3,5-Trinitrobenzene	8330	2	47-123	0-30	64	250	M
2,4,6-Trinitrotoluene	8330	2	74-119	0-30	35	250	M
Surrogate - 3,4-Dinitrotoluene	8330	2	22-128	A	NA	NA	M
Acrylic Acid	SL-SOP	68	25-150	0-50	1100	5000	M
Cryomazine	SL-SOP	68	60-140	0-40	27	200	M
Ethylenethiourea	SL-SOP	68	40-120	0-40	7.6	50	M
Maleic Acid/Maleic Anhydride	SL-SOP	68	69-106	0-21	20	80	M
Nitrocellulose	SL-SOP	68	20-150	0-60	14000	50000	M
Phthalic acid/Phthalic anhydride	SL-SOP	68	30-142	0-40	5.6	100	M
Thiodiglycol	SL-SOP	68	40-128	0-50	400	1500	M

TABLE 5.2 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC~
Glyphosate	547/SL SOP	51	50-150	0-50	570	2500	M

TABLE 5.3. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Arsenic	1311/6010(3010)	2	75-125	0-20	0.026	0.20	M
Barium	1311/6010(3010)	2	75-125	0-20	0.0022	1.0	M
Cadmium	1311/6010(3010)	2	75-125	0-20	0.0032	0. 10	M
Chromium	1311/6010(3010)	2	75-125	0-20	0.0044	0.20	M
Lead	1311/6010(3010)	2	75-125	0-20	0.020	0.20	M
Mercury	1311/7470	2	80-120	0-20	0.0056	0.020	M
Selenium	1311/6010(3010)	2	75-125	0-20	0.051	0.50	M
Silver	1311/6010(3010)	2	75-125	0-20	0.0031	0.10	M

TABLE 5.3. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Endrin	1311/8080/8081 (3510/3520)	2	34-148	0-66	0.00043	0.0050	M
Lindane	1311/8080/8081 (3510/3520)	2	37-132	0-44	0.000095	0.0025	M
Methoxychlor	1311/8080/8081 (3510/3520)	2	51-137	0-40	0.0016	0.025	M
Chlordane	1311/8080/8081 (3510/3520)	2	54-140	0-30	0.0031	0.025	
Toxaphene	1311/8080/8081 (3510/3520)	2	12-130	0-30	0.028	0.25	
Heptachlor	1311/8080/8081 (3510/3520)	2	23-126	0.43	0.00013	0.0025	M
Heptachlor Epoxide	1311/8080/8081 (3510/3520)	2	49-115	0-25	0.0043	0.0025	M
Surrogate - Tetrachloro-m-xylene (TCMX)	1311/8080/8081 (3510/3520)	2	10-110	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	1311/8080/8081 (3510/3520)	2	10-134	NA	NA	NA	M

TABLE 5.3. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
2,4-D	1311/8151	2	10-180	0-65	0.010	0.025	M
2,4,5-TP (Silvex)	1311/8151	2	41-130	0-45	0.0012	0.025	M
Surrogate - DCAA	1311/8151	2	27-133	NA	NA	NA	M

TABLE 5.3. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Benzene	1311/8240/8260 (5030)	2	52-143	0-31	0.0012	0.020	M
Carbon tetrachloride	1311/8240/8260 (5030)	2	45-172	0-25	0.0020	0.020	M
Chlorobenzene	1311/8240/8260 (5030)	2	60-127	0-25	0.0016	0.020	M
1,2-Dichloroethane	1311/8240/8260 (5030)	2	53-158	0-26	0.0016	0.020	M
Chloroform	1311/8240/8260 (5030)	2	74-123	0-25	0.0021	0.020	M
1,1-Dichloroethylene	1311/8240/8260 (5030)	2	38-155	0--25	0.0028	0.020	M
Methylethyl ketone	1311/8240/8260 (5030)	2	57-120	0-40	0.0020	0.20	M
Trichloroethylene	1311/8240/8260 (5030)	2	10-213	0-40	0.0016	0.020	M
Tetrachloroethylene	1311/8240/8260 (5030)	2	52-137	0-25	0.0020	0.020	M
Vinyl chloride	1311/8240/8260 (5030)	2	36-159	0-40	0.0035	0.040	M
Surrogate - Toluene-d8	1311/8240/8260 (5030)	2	67-134	NA	NA	NA	M
Surrogate - p-Bromofluorobenzene	1311/8240/8260 (5030)	2	67-132	NA	NA	NA	M
Surrogate - Dibromofluoromethane	1311/8240/8260 (5030)	2	64-142	NA	NA	NA	M
Surrogate - 1,2-Dichloroethane-d4	1311/8240/8260 (5030)	2	70-130	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	1311/8240/8260 (5030)	2	70-130	NA	NA	NA	M

TABLE 5.3. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR TOXIC CHARACTERISTIC LEACHING PROCEDURE (TCLP)

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Nitrobenzene	1311/8270 (3510/3520)	2	26-129	0-33	0.0080	0.050	M
Hexachlorobenzene	1311/8270 (3510/3520)	2	46-121	0-25	0.0022	0.050	M
1,4-Dichlorobenzene	1311/8270 (3510/3520)	2	10-124	0-43	0-012	0.050	M
2,4-Dinitrotoluene	1311/8270 (3510/3520)	2	52-111	0-54	0.0075	0.050	M
Hexachlorobutadiene	1311/8270 (3510/3520)	2	10-138	0-28	0.0065	0.050	M
Hexachloroethane	1311/8270 (3510/3520)	2	10-101	0-55	0.0085	0.050	M
Pyridine	1311/8270 (3510/3520)	2	10-134	0-50	0.0031	0.25	M
2,4,5-Trichlorophenol	1311/8270 (3510/3520)	2	45-113	0-25	0.0095	0.050	M
2,4,6-Trichlorophenol	1311/8270 (3510/3520)	2	50-103	0-30	0.0090	0.050	M
Cresols	1311/8270 (3510/3520)	2	10-150	0-50	0.0075	0.050	M
Pentachlorophenol	1311/8270 (3510/3520)	2	19-123	0-37	0.016	0.25	M
Surrogate - Nitrobenzene-d5	1311/8270 (3510/3520)	2	10-169	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	1311/8270 (3510/3520)	2	23-130	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	1311/8270 (3510/3520)	2	27-147	NA	NA	NA	M
Surrogate - Phenol-d5	1311/8270 (3510/3520)	2	16-139	NA	NA	NA	M
Surrogate - 2-Fluorophenol	1311/8270 (3510/3520)	2	20-124	NA	NA	NA	M
Surrogate - 2,4,6-Tribromophenol	1311/8270 (3510/3520)	2	24-135	NA	NA	NA	M

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION- * (% RPD)	MDL** (ug)	RLA (ug)
Dichlorodifluoromethane	TO1/TO2	75	60-140	0-40	0.05	0.20
Chloromethane	TO1/TO2	75	60-140	0-40	0.04	0.20
Vinyl chloride	TO1/TO2	75	60-140	0-40	0.08	0.20
Bromomethane	TO1/TO2	75	60-140	0-40	0.04	0.20
Chloroethane	TO1/TO2	75	60-140	0-40	0.07	0.20
Trichlorofluoromethane	TO1/TO2	75	60-140	0-40	0.04	0.20
1,1-Dichloroethene	TO1/TO2	75	60-140	0-40	0.02	0.10
Methylene chloride (Dichloromethane)	TO1/TO2	75	60-140	0-40	0.01	0.10
Trans-1,2-Dichloroethene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1-Dichloroethane	TO1/TO2	75	60-140	0-40	0.01	0.10
2,2-Dichloropropane	TO1/TO2	75	60-140	0-40	0.02	0.10
Cis-1,2-Dichloroethene	TO1/TO2	75	60-140	0-40	0.01	0.10
Chloroform	TO1/TO2	75	60-140	0-40	0.01	0.10
Bromochloromethane	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1,1-Trichloroethane	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1-Dichloropropylene	TO1/TO2	75	60-140	0-40	0.02	0.10
Carbon tetrachloride	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2-Dichloroethane	TO1/TO2	75	60-140	0-40	0.01	0.10
Benzene	TO1/TO2	75	60-140	0-40	0.01	0.10
Trichloroethylene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2-Dichloropropane	TO1/TO2	75	60-140	0-40	0.01	0.10
Bromodichloromethane	TO1/TO2	75	60-140	0-40	0.03	0.10
Dibromomethane	TO1/TO2	75	60-140	0-40	0.02	0.10
Trans-1,3-Dichloropropene	TO1/TO2	75	60-140	0-40	0.01	0.10
Toluene	TO1/TO2	75	60-140	0-40	0.01	0.10
Cis-1,3-Dichloropropene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1,2-Trichloroethane	TO1/TO2	75	60-140	0-40	0.01	0.10
1,3-Dichloropropane	TO1/TO2	75	60-140	0-40	0.02	0.10
Tetrachloroethene	TO1/TO2	75	60-140	0-40	0.01	0.10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Dibromochloromethane	TO1/TO2	75	60-140	0-40	0.02	0.10
1,2-Dibromomethane	TO1/TO2	75	60-140	0-40	0.02	0.10
Chlorobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1,1,2-Tetrachloroethane	TO1/TO2	75	60-140	0-40	0.02	0.10
Ethylbenzene	TO1/TO2	75	60-140	0-40	0.06	0.10
m&p-Xylene	TO1/TO2	75	60-140	0-40	0.01	0.10
o-Xylene	TO1/TO2	75	60-140	0-40	0.01	0.10
Styrene	TO1/TO2	75	60-140	0-40	0.01	0.10
Isopropylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
Bromoform	TO1/TO2	75	60-140	0-40	0.01	0.10
1,1,2,2-Tetrachloroethane	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2,3-Trichloropropane	TO1/TO2	75	60-140	0-40	0.01	0.10
n-Propylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
Bromobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,3,5-Trimethylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
2-Chlorotoluene	TO1/TO2	75	60-140	0-40	0.01	0.10
4-Chlorotoluene	TO1/TO2	75	60-140	0-40	0.01	0.10
t-Butylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2,4-Trimethylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
s-Butylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
p-Isopropyltoluene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,3-Dichlorobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,4-Dichlorobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
n-Butylbenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2-Dichlorobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
1,2-Dibromo-3-chloropropane	TO1/TO2	75	60-140	0-40	0.02	0.10
1,2,4-Trichlorobenzene	TO1/TO2	75	60-140	0-40	0.01	0.10
Hexachlorobutadiene	TO1/TO2	75	60-140	0-40	0.02	0.10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Naphthalene	TO1/TO2	75	60-140	0-40	0.02	0.10
1,2,3-Trichlorobenzene	TO1/TO2	75	60-140	0-40	0.02	0.10
Acetone	TO1/TO2	75	60-140	0-40	0.21	1.0
2-Butanone (MEK)	TO1/TO2	75	60-140	0-40	0.09	1.0
Vinyl Acetate	TO1/TO2	75	60-140	0-40	0.01	0.10
4-Methyl-2-pentanone (MIBK)	TO1/TO2	75	60-140	0-40	0.16	1.0
2-Hexanone	TO1/TO2	75	60-140	0-40	0.09	1.0
Carbon disulfide	TO1/TO2	75	60-140	0-40	0.02	0.10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Aldrin	TO4/TO10	75	10-144	0-38	0.0041	0.050
alpha-BHC	TO4/TO10	75	22-101	0-40	0.0022	0.050
beta-BHC	TO4/TO10	75	12-120	0-40	0.0053	0.050
gamma-BHC (Lindane)	TO4/TO10	75	12-138	0-37	0.0019	0.050
delta-BHC	TO4/TO10	75	10-142	0-47	0.0019	0.050
technical Chlordane	TO4/TO10	75	45-119	0-40	0.061	0.50
alpha Chlordane	TO4/TO10	75	45-140	0-40	0.0028	0.050
gamma Chlordane	TO4/TO10	75	11-141	0-40	0.0026	0.050
4,4'-DDD	TO4/TO10	75	28-134	0-50	0.0060	0.10
4,4'-DDE	TO4/TO10	75	34-121	0-23	0.0069	0.10
4,4'-DDT	TO4/TO10	75	29-134	0-26	0.0074	0.10
Dieldrin	TO4/TO10	75	28-137	0-30	0.0023	0.10
Endosulfan I	TO4/TO10	75	10-141	0-40	0.0027	0.050
Endosulfan II	TO4/TO10	75	10-141	0-65	0.0037	0.10
Endosulfan sulfate	TO4/TO10	75	26-144	0-50	0.0053	0.10
Endrin	TO4/TO10	75	33-149	0-32	0.0085	0.10
Endrin aldehyde	TO4/TO10	75	10-130	0-86	0.0079	0.10
Endrin ketone	TO4/TO10	75	29-112	0-31	0.011	0.10
Heptachlor	TO4/TO10	75	17-138	0-38	0.0025	0.050
Heptachlor epoxide	TO4/TO10	75	15-142	0-40	0.0085	0.050
Methoxychlor	TO4/TO10	75	24-152	0-40	0.032	0.50
Toxaphene	TO4/TO10	75	41-126	0-50	0.55	5.0
PCB-1016	TO4/TO10	75	34-137	0-44	0.15	1.0
PCB 1221	TO4/TO10	75	15-178	0-30	0.27	1.0
PCB 1232	TO4/TO10	75	10-215	0-30	0.21	1.0
PCB-1242	TO4/TO10	75	39-150	0-30	0.25	1.0
PCB-1248	TO4/TO10	75	38-158	0-30	0.18	1.0
PCB-1254	TO4/TO10	75	66-122	0-30	0.11	1.0
PCB-1260	TO4/TO10	75	58-150	0-30	0.12	1.0
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	TO4/TO10	75	10-114	NA	NA	NA
Surrogate - Decachlorobiphenyl (DCB)	TO4/TO10	75	27-128	NA	NA	NA

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Foramaldehyde	TO5	75	43-142	0-30	3.5	50
Formaldehyde	TO11	75	43-142	0-30	3.5	50

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Phenol	TO8	75	30-130	0-50	0.50	2.0
m-Cresol (3-methylphenol)	TO8	75	30-130	0-50	0.50	2.0
p-Cresol (2-methylphenol)	TO8	75	30-130	0-50	0.50	2.0
p-Cresol (4-methylphenol)	TO8	75	30-130	0-50	0.50	2.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	TO9/8280	75/2	69-145	0-40	0.0012	0.0050
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes						
tetra-CDD	TO9/8280	75/2	69-145	0-40	0.0012	0.0050
tetra-CDF	TO9/8280	75/2	59-142	0-40	0.0013	0.0050
penta-CDD	TO9/8280	75/2	41-203	0-40	0.0017	0.0050
penta-CDF	TO9/8280	75/2	55-146	0-40	0.0016	0.0050
hexa-CDD	TO9/8280	75/2	45-174	0-53	0.0011	0.0050
hexa-CDF	TO9/8280	75/2	50-154	0-46	0.0015	0.0050
hepta-CDD	TO9/8280	75/2	20-170	0-50	0.0018	0.0010
hepta-CDF	TO9/8280	75/2	20-170	0-50	0.0013	0.010
octa-CDD	TO9/8280	75/2	20-170	0-50	0.0013	0.010
octa-CDF	TO9/8280	75/2	20-170	0-50	0.0012	0.010
Internal Standard - 13C12-2,3,7,8-TCDD	TO9/8280	75/2	25-150	NA	NA	NA
Internal Standard - 13C12-2,3,7,8-TCDF	TO9/8280	75/2	25-150	NA	NA	NA
Internal Standard - 13C12-1,2,3,6,7,8-HxCDD	TO9/8280	75/2	25-150	NA	NA	NA
Internal Standard - 13C12-1,2,3,4,6,7,8-HpCDF	TO9/8280	75/2	25-150	NA	NA	NA
Internal Standard - 13C12-OCDD	TO9/8280	75/2	25-150	NA	NA	NA

TABLE 5.4. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Acenaphthene	TO13	75	67-112	0-25	4.4	10
Acenaphthylene	TO13	75	60-102	0-25	4.1	10
Anthracene	TO13	75	89-128	0-25	3.8	10
Benzo(a)anthracene	TO13	75	73-101	0-25	2.7	10
Benzo(b)fluoranthene	TO13	75	79-111	0-25	3.0	10
Benzo(k)fluoranthene	TO13	75	83-135	0-25	4.9	10
Benzo(a)pyrene	TO13	75	74-104	0-25	2.9	10
Benzo(g,h,i)perylene	TO13	75	48-100	0-25	2.2	10
Benzyl alcohol	TO13	75	58-100	0-25	2.4	10
bis(2-Chloroethoxy)methane	TO13	75	66-100	0-25	2.5	10
bis(2-Chloroethyl)ether	TO13	75	50-100	0-25	2.2	10
(2-Chloroisopropyl)ether	TO13	75	62-100	0-25	3.3	10
bis(2-Ethylhexyl)phthalate	TO13	75	50-150	0-25	4.9	10
4-Bromophenyl phenyl ether	TO13	75	83-124	0-25	3.9	10
Butylbenzyl phthalate	TO13	75	50-150	0-25	2.8	10
4-Chloroaniline	TO13	75	62-100	0-25	2.6	20
4-Chloro-3-methyl phenol	TO13	75	78-106	0-25	2.6	10
2-chloronapthalene	TO13	75	69-100	0-25	2.8	10
2-Chlorophenol	TO13	75	53-100	0-25	2.7	10
4-Chlorophenyl phenyl ether	TO13	75	50-150	0-25	4.2	10
Chrysene	TO13	75	72-100	0-25	2.4	10
Dibenz(a,h)anthracene	TO13	75	55-100	0-25	2.4	10
Dibenzofuran	TO13	75	74-122	0-25	4.7	10
1,2-Dichlorobenzene	TO13	75	46-100	0-25	3.4	10
1,3-Dichlorobenzene	TO13	75	41-100	0-25	3.1	10
1,4-Dichlorobenzene	TO13	75	44-100	0-25	3.3	10
3,3'-Dichlorobenzidine	TO13	75	77-136	0-25	5.6	10
4-Dichlorophenol	TO13	75	69-100	0-25	2.7	10
Diethylphthalate	TO13	75	86-121	0-25	3.4	10

TABLE 5.4. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
2,4-Dimethylphenol	TO13	75	48-100	0-25	2.5	10
Dimethylphthalate	TO13	75	74-104	0-25	2.9	10
Di-n-butylphthalate	TO13	75	50-150	0-25	2.0	10
2,4-Dinitrotoluene	TO13	75	66-110	0-25	4.2	10
2,6-Dinitrotoluene	TO13	75	59-100	0-25	3.2	10
Di-n-octyl phthalate	TO13	75	50-150	0-25	5.9	10
Fluoranthene	TO13	75	88-127	0-25	3.8	10
Fluorene	TO13	75	84-137	0-25	5.1	10
Hexachlorobenzene	TO13	75	74-123	0-25	4.7	10
Hexachlorobutadiene	TO13	75	58-104	0-25	4.4	10
Hexachloroethane	TO13	75	44-100	0-25	2.5	10
Indeno(1,2,3-cd)pyrene	TO13	75	59-100	0-25	2.6	10
Isophorone	TO13	75	52-100	0-25	3.9	10
2-Methyl naphthalene	TO13	75	24-107	0-25	8.0	10
2-Methylphenol	TO13	75	59-100	0-25	3.0	10
4-Methylphenol	TO13	75	59-109	0-25	4.8	10
Naphthalene	TO13	75	30-100	0-25	6.5	10
2-Nitroaniline	TO13	75	62-100	0-25	2.5	50
3-Nitroaniline	TO13	75	75-100	0-25	2.4	50
4-Nitroaniline	TO13	75	76-100	0-25	2.0	50
Nitrobenzene	TO13	75	20-100	0-25	5.0	10
2-Nitrophenol	TO13	75	35-100	0-25	2.4	10
N-nitrosodiphenylamine	TO13	75	81-111	0-25	2.8	10
N-nitrosodi-n-propylamine	TO13	75	63-100	0-25	3.0	10
Phenanthrene	TO13	75	80-118	0-25	3.6	10
Phenol	TO13	75	74-135	0-25	5.8	10
Pyrene	TO13	75	90-128	0-25	3.7	10
1,2,4-Trichlorobenzene	TO13	75	57-100	0-25	3.8	10
2,4,5-Trichlorophenol	TO13	75	77-121	0-25	4.2	10
2,4,6-Trichlorophenol	TO13	75	65-105	0-25	3.8	10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
Dichlorodifluoromethane	TO14/TO15	75	70-130%	0-30	0.090	0.20
Chloromethane	TO14/TO15	75	70-130%	0-30	0.13	0.20
Vinyl chloride	TO14/TO15	75	70-130%	0-30	0.10	0.20
Bromomethane	TO14/TO15	75	70-130%	0-30	0.050	0.20
Chloroethane	TO14/TO15	75	70-130%	0-30	0.070	0.20
Trichlorofluoromethane	TO14/TO15	75	70-130%	0-30	0.060	0.20
1,1-Dichloroethene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Methylene chloride (Dichloromethane)	TO14/TO15	75	70-130%	0-30	0.060	0.10
Trans-1,2-Dichloroethene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,1-Dichloroethane	TO14/TO15	75	70-130%	0-30	0.050	0.10
2,2-Dichloropropane	TO14/TO15	75	70-130%	0-30	0.030	0.10
Cis-1,2-Dichloroethene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Chloroform	TO14/TO15	75	70-130%	0-30	0.050	0.10
Bromochloromethane	TO14/TO15	75	70-130%	0-30	0.060	0.10
1,1,1-Trichloroethane	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,1-Dichloropropylene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Carbon tetrachloride	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,2-Dichloroethane	TO14/TO15	75	70-130%	0-30	0.040	0.10
Benzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Trichloroethylene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,2-Dichloropropane	TO14/TO15	75	70-130%	0-30	0.040	0.10
Bromodichloromethane	TO14/TO15	75	70-130%	0-30	0.040	0.10
Dibromomethane	TO14/TO15	75	70-130%	0-30	0.040	0.10
Trans-1,3-Dichloropropene	TO14/TO15	75	70-130%	0-30	0.050	0.10
Toluene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Cis-1,3-Dichloropropene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,1,2-Trichloroethane	TO14/TO15	75	70-130%	0-30	0.050	0.10
1,3-Dichloropropane	TO14/TO15	75	70-130%	0-30	0.050	0.10
Tetrachloroethene	TO14/TO15	75	70-130%	0-30	0.050	0.10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/m³)	RLA (mg/m³)
Dibromochloromethane	TO14/TO15	75	70-130%	0-30	0.050	0.10
1,2-Dibromoethane(EDB)	TO14/TO15	75	70-130%	0-30	0.050	0.10
Chlorobenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,1,1,2-Tetrachloroethane	TO14/TO15	75	70-130%	0-30	0.040	0.10
Ethylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
m&p-Xylene	TO14/TO15	75	70-130%	0-30	0.040	0.10
o-Xylene	TO14/TO15	75	70-130%	0-30	0.050	0.10
Styrene	TO14/TO15	75	70-130%	0-30	0.050	0.10
Isopropylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Bromoform	TO14/TO15	75	70-130%	0-30	0.050	0.10
1,1,2,2-Tetrachloroethane	TO14/TO15	75	70-130%	0-30	0.050	0.10
1,2,3-Trichloropropane	TO14/TO15	75	70-130%	0-30	0.040	0.10
n-Propylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
Bromobenzene	TO14/TO15	75	70-130%	0-30	0.050	0.10
1,3,5-Trimethylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
2-Chlorotoluene	TO14/TO15	75	70-130%	0-30	0.040	0.10
4-Chlorotoluene	TO14/TO15	75	70-130%	0-30	0.050	0.10
t-Butylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,2,4-Trimethylbenzene	TO14/TO15	75	70-130%	0-30	0.050	0.10
s-Butylbenzene	TO14/TO15	75	70-130%	0-30	0.040	0.10
p-Isopropyltoluene	TO14/TO15	75	70-130%	0-30	0.040	0.10
1,3-Dichlorobenzene	TO14/TO15	75	70-130%	0-30	0.060	0.10
1,4-Dichlorobenzene	TO14/TO15	75	70-130%	0-30	0.070	0.10
n-Butylbenzene	TO14/TO15	75	70-130%	0-30	0.060	0.10
1,2-Dichlorobenzene	TO14/TO15	75	70-130%	0-30	0.060	0.10
1,2-Dibromo-3-chloropropane	TO14/TO15	75	70-130%	0-30	0.12	0.50
1,2,4-Trichlorobenzene	TO14/TO15	75	70-130%	0-30	0.21	0.50
Hexachlorobutadiene	TO14/TO15	75	70-130%	0-30	0.060	0.50

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
Naphthalene	TO14/TO15	75	70-130	0-30	0.50	0.50
1,2,3-trichlorobenzene	TO14/TO15	75	70-130	0-30	0.41	0.50
Acetone	TO14/TO15	75	70-130	0-30	0.61	1.0
2-Butanone (MEK)	TO14/TO15	75	70-130	0-30	0.18	1.0
Vinyl acetate	TO14/TO15	75	70-130	0-30	0.050	0.50
4-Methyl-2-pentanone (MIBK)	TO14/TO15	75	70-130	0-30	0.090	1.0
2-Hexanone	TO14/TO15	75	70-130	0-30	0.18	1.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
Dichlorodifluoromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.77	2.0
Chloromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	1.0	2.0
Vinyl chloride	EPA 18 (Tedlar bag)	76	60-140	0-30	0.51	2.0
Bromomethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.67	2.0
Chloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	1.0	2.0
Trichlorofluoromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.51	1.0
1,1-Dichloroethene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.44	1.0
Methylene chloride (Dichloromethane)	EPA 18 (Tedlar bag)	76	60-140	0-30	0.26	1.0
Trans-1,2-Dichloroethene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.25	1.0
1,1-Dichloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.16	1.0
2,2-Dichloropropane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.25	1.0
Cis-1,2-Dichloroethene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.24	1.0
Chloroform	EPA 18 (Tedlar bag)	76	60-140	0-30	0.14	1.0
Bromochloromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.25	1.0
1,1,1-Trichloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.26	1.0
1,1-Dichloropropylene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.20	1.0
Carbon tetrachloride	EPA 18 (Tedlar bag)	76	60-140	0-30	0.27	1.0
1,2-Dichloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.28	1.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
Benzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.13	1.0
Trichloroethylene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.15	1.0
1,2-Dichloropropane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.11	1.0
Bromodichloromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.13	1.0
Dibromomethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.14	1.0
Trans-1,3-Dichloropropene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.15	1.0
Toluene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.21	1.0
Cis-1,3-Dichloropropene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.10	1.0
1,1,2-Trichloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.15	1.0
1,3-Dichloropropane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.12	1.0
Tetrachloroethene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.28	1.0
Dibromochloromethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.21	1.0
1,2-Dibromoethane(EDB)	EPA 18 (Tedlar bag)	76	60-140	0-30	0.13	1.0
Chlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.12	1.0
Ethylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.18	1.0
m&p-Xylene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.44	1.0
o-Xylene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.27	1.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
Styrene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.20	1.0
Isopropylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.20	1.0
Bromoform	EPA 18 (Tedlar bag)	76	60-140	0-30	0.28	1.0
1,1,2,2-Tetrachloroethane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.24	1.0
1,2,3-Trichloropropane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.84	2.0
n-Propylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.19	1.0
Bromobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.17	1.0
1,3,5-Trimethylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.22	1.0
2-Chlorotoluene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.36	1.0
4-Chlorotoluene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.22	1.0
t-Butylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.20	1.0
1,2,4-Trimethylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.27	1.0
s-Butylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.23	1.0
p-Isopropyltoluene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.23	1.0
1,3-Dichlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.17	1.0
1,4-Dichlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.17	1.0
n-Butylbenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.24	1.0
1,2-Dichlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.16	1.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (mg/m^3)	RLA (mg/m^3)
1,2-Dibromo-3-chloropropane	EPA 18 (Tedlar bag)	76	60-140	0-30	0.87	2.0
1,2,4-Trichlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.21	1.0
Hexachlorobutadiene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.25	1.0
Naphthalene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.32	1.0
1,2,3-Trichlorobenzene	EPA 18 (Tedlar bag)	76	60-140	0-30	0.28	1.0
Acetone	EPA 18 (Tedlar bag)	76	60-140	0-30	0.52	2.0
2-Butanone (MEK)	EPA 18 (Tedlar bag)	76	60-140	0-30	1.5	2.0
Vinyl Acetate	EPA 18 (Tedlar bag)	76	60-140	0-30	0.59	2.0
4-Methyl-2-pentanone (MIBK)	EPA 18 (Tedlar bag)	76	60-140	0-30	0.64	2.0
2-Hexanone	EPA 18 (Tedlar bag)	76	60-140	0-30	0.94	2.0
Carbon disulfide	EPA 18 (Tedlar bag)	76	60-140	0-30	0.20	1.0
Methyl t-butyl ether (MTBE)	EPA 18 (Tedlar bag)	76	60-140	0-30	0.19	1.0
Total hydrocarbons	EPA 18 (Tedlar bag)	76	60-140	0-30	1.0	1.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	M ETHOD (prep)	REF	ACCURACY (% Rec)	PRECISION (% RPD)	MDL** (mg/m3)	RL (mg/m3)
Nitrogen(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	10000	10000
Oxygen(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	10000	10000
Carbon dioxide(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	10000	1000
Carbon monoxide(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	100	600
Methane(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	100	400
Methane (FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	1.5	5.0
Ethane(TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	150	600
Ethane (FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	1.5	5.0
Ethene (TCD)	EPA 18 (Tedlar bag)	76	75-125	0-25	150	600
Ethene (FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	1.5	5.0
Propane (FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	0.37	5.0
Butane(FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	0.84	5.0
Pentane(FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	0.95	5.0
Hexane(FID)	EPA 18 (Tedlar bag)	76	75-125	0-25	1.1	5.0

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY *(% Rec)	PRECISION *(% RPD)	MDL** (ug)	RLA (ug)
Hydrocarbons/Aaromatics						
Cyclohexane	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
Cyclohexene	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
n-Heptane	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
Methylcyclohexane	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
n-Octane	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
n-Pentane	NIOSH 1500/OSHA 07	98/99	75-125	0-25	2.5	10
Benzene	NIOSH 1500/1501 OSHA 07	98/99	75-125	0-25	2.5	10
Toluene	NIOSH 1500/1501 OSHA 07	98/99	75-125	0-25	2.5	10
Ethylbenzene	NIOSH 1501/OSHA 07	98/99	75-125	0-25	2.5	10
Xylene (total)	NIOSH 1501/OSHA 07	98/99	75-125	0-25	2.5	10
Styrene	NIOSH 1501/OSHA 09	98/99	75-125	0-25	2.5	10
Cumene	NIOSH 1501	98	75-125	0-25	2.5	10
Naphthalene	NIOSH 1501/OSHA 07	98/99	75-125	0-25	2.5	10
a-Methylstyrene	NIOSH 1501/OSHA 07	98/99	75-125	0-25	2.5	10
Vinyltoluene	NISOH 1501/OSHA 07	98/99	75-125	0-25	2.5	10
Acetone	NIOSH 1300	98	75-125	0-25	2.5	10
Methyl ethyl ketone (MEK)	NIOSH 1300	98	75-125	0-25	2.5	10
Methyl isobutyl ketone (MIBK)	NIOSH 1300	98	75-125	0-25	2.5	10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY *(% Rec)	PRECISION *(% RPD)	MDL** (ug)	RLA (ug)
Halogenated Hydrocarbons						
Benzyl chloride	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Bromoform	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Carbon tetrachloride	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Chlorobenzene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Chlorobromomethane	NIOSH 1003	98	75-125	0-25	2.5	10
Chloroform	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,2-Dichlorobenzene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,4,-Dichlorobenzene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,3-Dichlorobenzene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,1,-Dichloroethane	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,2-Dichloroethane	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
cis-1,2-Dichloroethene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
trans-1,2-Dichloroethene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Hexachloroethane	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,1,1-Trichloroethane	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
Tetrachloroethene	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,1,2-Trichloroethane	NIOSH 1003/OSHA 07	98/99	75-125	0-25	2.5	10
1,2,3-Trichloropropane	NIOSH 1003/OSHA 07	98	75-125	0-25	2.5	10
Methylene chloride	NISOH 1005	98	75-125	0-25	2.5	10
Vinyl chloride	NIOSH 1007	98	75-125	0-25	2.5	10

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Methanol (Methyl alcohol)	NIOSH 2000	98	75-125	0-25	2.5	10
Formaldehyde	NIOSH 2541	98	75-125	0-25	0.25	1.0
Biphenyl (Diphenyl) and Biphenyl oxide	NIOSH 2530	98	75-125	0-25	2.5	10
Ammonia	NIOSH 6015	98	75-125	0-25	0.15	0.60
Cyanide	NIOSH 7904	98	75-125	0-25	0.062	2.5

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Chloride	NIOSH 7903	98	75-125	0-25	2.5	10
Fluoride	NIOSH 7903	98	75-125	0-25	0.25	1.0
Nitrate	NIOSH 7903	98	75-125	0-25	0.25	1.0
Sulfate	NIOSH 7903	98	75-125	0-25	0.13	50

TABLE 5.4 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR AIR SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug)	RLA (ug)
Aluminum (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	3.2	20
Antimony (ICP)	OSHA ID-125G	99	75-125	0-20	1.9	5.0
	OSHA ID-125G - T	99	75-125	0-20	0.42	2.0
Antimony (GFAA)	OSHA ID 121	99	75-125	0-20	0.11	1.0
Arsenic (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	1.9	10
	NIOSH 7300/ OSHA ID-125G - T	98/99	75-125	0-20	0.39	1.0
Beryllium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.11	0.50
Cadmium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.31	0.50
Cadmium (GFAA)	OSHA ID-121	99	80-120	0-20	0.0090	0.10
Calcium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	2.4	50
Chromium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.44	1.0
Chromium (GFAA)	OSHA ID-121	99	80-120	0-20	0.050	1.0
Cobalt (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.41	1.0
Copper (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.78	2.5
Iron (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	3.9	5.0
Lead (ICP)	NIOSH 7300/OSHA ID-125G	98/2	75-125	0-20	1.0	5.0
Lead (GFAA)	OSHA ID-121	99	80-120	0-20	0.14	0.50
Magnesium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	1.8	50
Manganese (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.18	1.0
Mercury (CVAA)	NIOSH 6009	98	75-125	0-20	0.0020	0.0020
Molybdenum (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.23	1.0
Nickel (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	1.1	4.0

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/)	RLA (ug/)
Selenium(ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	5.4	50
	NIOSH 7300/ OSHA ID-125G-T	98/99	75-125	0-20	0.46	1.0
Selenium (GFAA)	OSHA ID-121	99	80-120	0-20	0.13	1.0
Silver (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.20	1.0
Silver (GFAA)	OSHA ID-121	99	80-120	0-20	0.016	0.10
Sodium (ICP)	NIOSH 7300	98	75-125	0-20	8.3	50
Thallium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	8.1	50
	NIOSH 7300/ OSHA ID-125G-T	98/99	75-125	0-20	0.46	2.0
Thallium (GFAA)	OSHA ID-121	99	80-120	0-20	0.14	1.0
Tin (ICP)	OSHA ID-125G	99	75-125	0-20	1.3	5.0
Titanium(ICP)	NIOSH 7300	98	70-130	0-30	0.25	1.0
Vanadium (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.23	1.0
Zinc (ICP)	NIOSH 7300/OSHA ID-125G	98/99	75-125	0-20	0.45	2.0

ICP = inductively coupled (argon) plasma atomic emission spectrophotometer
GFAA = graphite furnace atomic adsorption spectrophotometer
CVAA = cold vapor atomic adsorption spectrophotometer
-T = trace ICP

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Aluminum (ICP)	6010(3050)	2	75-125	0-20	3.2	20	M
Antimony (ICP)	6010(3050)	2	75-125	0-20	1.9	5.0	M
	6010(3050)-T	2	75-125	0-20	0.42	5.0	M
Antimony (GFAA)	7041(3050)	2	75-125	0-20	0.11	1.0	M
Arsenic (ICP)	6010(3050)	2	75-125	0-20	1.9	10	M
	6010(3050)-T	2	75-125	0-20	0.39	1.0	M
Arsenic (GFAA)	7060(3050)	2	80-120	0-20	0.27	1.0	M
Barium (ICP)	6010(3050)	2	75-125	0-20	0.42	1.0	M
Beryllium (ICP)	6010(3050)	2	75-125	0-20	0.11	0.50	M
Boron	6010(3050)	2	75-125	0-20	0.59	5.0	M
Cadmium (ICP)	6010(3050)	2	75-125	0-20	0.31	0.50	M
	6010(3050)-T	2	75-125	0-20	0.056	0.50	M
Cadmium (GFAA)	7131 (3050)	2	80-120	0-20	0.0090	0.10	M
Calcium (ICP)	6010(3050)	2	75-125	0-20	2.4	50	M
Chromium (ICP)	6010(3050)	2	75-125	0-20	0.44	1.0	M
	6010(3050)-T	2	75-125	0-20	0.18	1.0	M
Chromium (GFAA)	7191(3050)	2	80-120	0-20	0.050	1.0	M
Cobalt (ICP)	6010 (3050)	2	75-125	0-20	0.41	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.13	1.0	M
Copper (ICP)	6010 (3050)	2	75-125	0-20	0.78	2.5	M
	6010 (3050)-T	2	75-125	0-20	0.22	2.5	M
Iron (ICP)	6010 (3050)	2	75-125	0-20	3.9	5.0	M
Lead (ICP)	6010 (3050)	2	75-125	0-20	1.0	5.0	M
	6010 (3050)-T	2	75-125	0-20	0.20	5.0	M
Lead (GFAA)	7421(3050)	2	80-120	0-20	0.14	0.50	M
Magnesium (ICP)	6010 (3050)	2	75-125	0-20	1.8	50	M
Manganese (ICP)	6010(3050)	2	75-125	0-20	0.18	1.0	M
Mercury (CVAA)	7471	2	75-125	0-20	0.0020	0.020	M
Molybdenum (ICP)	6010(3050)	2	75-125	0-20	0.23	1.0	M
	6010(3050)-T	2	75-125	0-20	0.098	1.0	M
Nickel (ICP)	6010(3050)	2	75-125	0-20	1.1	4.0	M
Potassium (ICP)	6010(3050)	2	75-125	0-20	35	100	M
Selenium (ICP)	6010(3050)	2	75-125	0-20	5.4	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	1.0	M
Selenium (GFAA)	7740(3050)	2	80-120	0-20	0.13	1.0	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Silver (ICP)	6010(3050)	2	75-125	0-20	0.20	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.14	1.0	M
Silver (GFAA)	7761 (3050)	2	80-120	0-20	0.016	0.10	M
Sodium (ICP)	6010(3050)	2	75-125	0-20	8.3	50	M
Strontium	6010(3050)	2	70-130	0-30	0.84	1.0	M
Thallium (ICP)	6010(3050)	2	75-125	0-20	8.1	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	2.0	M
Thallium (GFAA)	7841 (3050)	2	80-120	0-20	0.14	1.0	M
Tin (ICP)	6010(3050)	2	75-125	0-20	1.3	5.0	M
Titanium	6010(3050)	2	70-130	0-30	0.25	1.0	M
Vanadium (ICP)	6010 (3050)	2	75-125	0-20	0.23	1.0	M
Zinc (ICP)	6010 (3050)	2	75-125	0-20	0.45	2.0	M

ICP = inductively coupled (argon) plasma atomic emission spectrophotometer
GFAA = graphite furnace atomic adsorption spectrophotometer
CVAA = cold vapor atomic adsorption spectrophotometer
-T = trace ICP

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Cyanide, total	9012(9013)	2	75-125	0-30	0.59	1.0	M
	9010	2	75-125	0-30	0.14	1.0	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Aldrin (MS)	8080(3550)/8081(3550)	97/2	10-144	0-38	0.021	1.7	M
alpha-BHC	8080(3550)/8081(3550)	97/2	22-101	0-40	0.088	1.7	M
beta-BHC	8080(3550)/8081(3550)	97/2	12-120	0-40	0.16	1.7	M
gamma-BHC (Lindane) (MS)	8080(3550)/8081(3550)	97/2	12-138	0-37	0.066	1.7	M
delta-BHC	8080(3550)/8081(3550)	97/2	10-142	0-47	0.18	1.7	M
technical Chlordane	8080(3550)/8081(3550)	97/2	45-119	0-40	1.7	17	M
alpha Chlordane	8081(3550)	97/2	45-140	0-40	0.12	1.7	M
gamma Chlordane	8081(3550)	97/2	11-141	0-40	0.078	1.7	M
4,4'-DDD	8080(3550)/8081(3550)	97/2	28-134	0-50	0.22	3.3	M
4,4'-DDE	8080(3550)/8081(3550)	97/2	34-121	0-23	0.13	3.3	M
4,4'-DDT (MS)	8080(3550)/8081(3550)	97/2	29-134	0-26	0.49	3.3	M
Dieldrin (MS)	8080(3550)/8081(3550)	97/2	28-137	0-30	0.19	3.3	M
Endosulfan I	8080(3550)/8081(3550)	97/2	10-141	0-40	0.13	1.7	M
Endosulfan II	8080(3550)/8081(3550)	97/2	10-159	0-65	0.22	3.3	M
Endosulfan sulfate	8080(3550)/8081(3550)	97/2	26-144	0-50	0.91	3.3	M
Endrin (MS)	8080(3550)/8081(3550)	97/2	33-149	0-32	0.10	3.3	M
Endrin aldehyde	8080(3550)/8081(3550)	97/2	10-130	0-86	0.22	3.3	M
Endrin ketone	8081(3550)	97/2	29-112	0-31	0.42	3.3	M
Heptachlor (MS)	8080(3550)/8081(3550)	97/2	17-138	0-38	0.12	1.7	M
Heptachlor epoxide	8080(3550)/8081(3550)	97/2	15-142	0-40	0.099	1.7	M
Methoxychlor	8080(3550)/8081(3550)	97/2	24-152	0-40	1.3	17	M
Toxaphene	8080(3550)/8081(3550)	97/2	41-126	0-50	18	170	M
PCB-1016	8080(3550)/8082(3550)	97/2	34-137	0-44	4.8	33	M
PCB 1221	8080(3550)/8082(3550)	97/2	15-178	0-30	23	67	M
PCB 1232	8080(3550)/8082(3550)	97/2	10-215	0-30	4.0	33	M
PCB-1242	8080(3550)/8082(3550)	97/2	39-150	0-30	6.0	33	M
PCB-1248	8080(3550)/8082(3550)	97/2	38-158	0-30	6.7	33	M
PCB-1254	8080(3550)/8082(3550)	97/2	66-122	0-30	2.7	33	M
PCB-1260	8080(3550)/8082(3550)	97/2	58-150	0-30	5.6	33	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080(3550)/8081(3550)/8082(3550)	97/2	10-114	NA	NA	NA	M
Surrogate- Decachlorobiphenyl (DCB)	8080(3550)/8081(3550)/8082(3550)	97/2	27-128	NA	NA	NA	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Monochlorobiphenyls	680/(3550)	97/93	30-130	0-50	0.68	10	M
Dihlorobiphenyls	680/(3550)	97/93	30-130	0-50	0.76	10	M
Trichlorobiphenyls	680/(3550)	97/93	30-130	0-50	0.68	10	M
Tetrachlorobiphenyls	680/(3550)	97/93	40-140	0-50	1.3	20	M
Pentachlorobiphenyls	680/(3550)	97/93	40-140	0-50	0.83	20	M
Hexachlorobiphenyls	680/(3550)	97/93	40-140	0-50	0.89	20	M
Heptachlorobiphenyls	680/(3550)	97/93	40-140	0-50	1.6	30	M
Octachlorobiphenyls	680/(3550)	97/93	40-140	0-50	0.95	30	M
Nonachlorobiphenyls	680/(3550)	97/93	30-130	0-50	1.9	50	M
Decachlorobiphenyl	680/(3550)	97/93	30-130	0-50	1.9	50	M
Surrogate-Decachlorobiphenyl-13C12	680/(3550)	97/93	30-130	NA	NA	NA	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC^
Acetone	8240/8260(5030/5035)	97/2	14-189	0-40	2.3	50	M
	8260(5035ext)	97/2	14-189	0-40	230	5000	M
Benzene (MS)	8240(5030)/8260(5030)	97/2	64-144	0-25	0.41	5.0	M
	8260(5035ext)	97/2	64-144	0-25	41	500	M
Bromodichloromethane	8240(5030)/8260(5030)	97/2	71-140	0-40	0.34	5.0	M
	8260(5035ext)	97/2	71-140	0-40	34	500	M
Bromoform	8240(5030)/8260(5030)	97/2	59-143	0-40	0.44	5.0	M
	8260(5035ext)	97/2	59-143	0-40	44	500	M
Bromomethane (Methyl bromide)	8240(5030)/8260(5030)	97/2	35-181	0-65	2.0	10	M
	8260(5035ext)	97/2	35-181	0-65	200	1000	M
2-Butanone (MEK)	8240(5030)/8260(5030)	97/2	54-166	0-40	2.8	25	M
	8260(5035ext)	97/2	54-166	0-40	280	2500	M
Carbon disulfide	8240(5030)/8260(5030)	97/2	10-160	0-65	0.29	5.0	M
	8260(5035ext)	97/2	10-160	0-65	29	500	M
Carbon tetrachloride	8240(5030)/8260(5030)	97/2	65-129	0-40	0.47	5.0	M
	8260(5035ext)	97/2	65-129	0-40	47	500	M
Chlorobenzene (MS)	8240(5030)/8260(5030)	97/2	56-152	0-25	0.58	5.0	M
	8260(5035ext)	97/2	56-152	0-25	58	500	M
Chloroethane	8240(5030)/8260(5030)	97/2	65-129	0-40	1.3	10	M
	8260(5035ext)	97/2	65-129	0-40	130	1000	M
Chloroform	8240(5030)/8260(5030)	97/2	62-117	0-40	0.26	5.0	M
	8260(5035ext)	97/2	62-117	0-40	26	500	M
Chloromethane	8240(5030)/8260(5030)	97/2	10-186	0-65	1.2	10	M
	8260(5035ext)	97/2	10-186	0-65	120	1000	M
Dibromochloromethane	8240(5030)/8260(5030)	97/2	73-127	0-40	0.28	5.0	M
	8260(5035ext)	97/2	73-127	0-40	28	5.0	M
1,1-Dichloroethane	8240(5030)/8260(5030)	97/2	64-112	0-40	0.28	5.0	M
	8260(5035ext)	97/2	64-112	0-40	28	500	M
1,2-Dichloroethane	8240(5030)/8260(5030)	97/2	66-128	0-40	1.0	5.0	M
	8260(5035ext)	97/2	66-128	0-40	100	500	M
cis-1,2-Dichloroethene	8240(5030)/8260(5030)	97/2	64-123	0-40	0.31	5.0	M
	8260(5035ext)	97/2	64-123	0-40	31	500	M
trans-1,2-Dichloroethene	8240(5030)/8260(5030)	97/2	60-161	0-25	0.57	5.0	M
	8260(5035ext)	97/2	60-161	0-25	57	500	M
1,1-Dichloroethene (MS)	8260(5030)	97/2	44-157	0-25	0.77	5.0	M
	8260(5035ext)	97/2	44-157	0-25	77	500	M
1,2-Dichloropropane	8240(5030)/8260(5030)	97/2	47-146	0-65	1.0	5.0	M
	8260(5035ext)	97/2	47-146	0-65	100	500	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL▲ (ug/kg)	TC▼
cis-1,3-Dichloropropene	8240(5030)/8260(5030)	97/2	50-146	0-65	0.49	5.0	M
	8260(5035ext)	97/2	50-146	0-65	49	500	M
trans-1,3-Dichloropropene	8240(5030)/8260(5030)	97/2	57-143	0-65	0.65	5.0	M
	8260(5035ext)	97/2	57-143	0-65	65	500	M
Ethylbenzene	8240(5030)/8260(5030)	97/2	60-131	0-40	0.55	5.0	M
	8260(5035ext)	97/2	60-131	0-40	55	500	M
2-Hexanone	8240(5030)/8260(5030)	97/2	47-145	0-40	3.7	25	M
	8260(5035ext)	97/2	47-145	0-40	370	2500	M
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260(5030)	97/2	54-167	0-49	3.2	25	M
	8260(5035ext)	97/2	54-167	0-49	320	2500	M
Styrene	8240(5030)/8260(5030)	97/2	56-121	0-40	0.43	5.0	M
	8260(5035ext)	97/2	56-121	0-40	43	500	M
1,1,2,2-Tetrachloroethane	8240(5030)/8260(5030)	97/2	36-157	0-40	0.80	5.0	M
	8260(5035ext)	97/2	36-157	0-40	80	500	M
Tetrachloroethene	8240(5030)/8260(5030)	97/2	61-142	0-40	0.44	5.0	M
	8260(5035ext)	97/2	61-142	0-40	44	500	M
Toluene (MS)	8240(5030)/8260(5030)	97/2	67-142	0-25	0.48	5.0	M
	8260(5035ext)	97/2	67-142	0-25	48	500	M
1,1,1-Trichloroethane	8240(5030)/8260(5030)	97/2	11-148	0-40	0.98	5.0	M
	8260(5035ext)	97/2	11-148	0-40	98	500	M
1,1,2-Trichloroethane	8240(5030)/8260(5030)	97/2	66-123	0-40	0.65	5.0	M
	8260(5035ext)	97/2	66-123	0-40	65	500	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC^
Trichloroethene (MS)	8240(5030)/8260(5030)	97/2	41-134	0-22	0.72	5.0	M
	8260(5035ext)	97/2	41-134	0-22	72	500	M
Vinyl chloride	8240(5030)/8260(5030)	97/2	18-169	0-65	0.98	10	M
	8260(5035ext)	97/2	18-169	0-65	98	1000	M
Xylenes (total)	8240(5030)/8260(5030)	97/2	50-150	0-40	1.5	5.0	M
	8260(5035ext)	97/2	50-150	0-40	150	500	M
o-Xylene	8260(5030)	97/2	22-154	0-40	0.50	5.0	M
	8260(5035ext)	97/2	22-154	0-40	50	500	M
m+p-Xylene	8260(5030)	97/2	62-123	0-40	1.0	5.0	M
	8260(5035ext)	97/2	62-123	0-40	100	500	M
Surrogate - Toluene-d8	8240(5030)/8260(5030)	97/2	58-148	NA	NA	NA	M
	8260(5035/5035ext)	97/2	58-148	NA	NA	NA	M
Surrogate - p-Bromofluorobenzene	8240(5030)/8260(5030)	97/2	70-136	NA	NA	NA	M
	8260(5035/5035ext)	97/2	70-136	NA	NA	NA	M
Surrogate -Dibromofluoromethane	8260(5030)	97/2	66-148	NA	NA	NA	M
	8260(5035/5035ext)	97/2	66-148	NA	NA	NA	M
Surrogate - 1,2-Dichloroethane-d4	8240(5030)/8260(5030)	97/2	38-151	NA	NA	NA	M
	8260(5035/5035ext)	97/2	38-151	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	8240(5030)/8260(5030)	97/2	58-148	NA	NA	NA	M
	8260(5035/5035ext)	97/2	58-148	NA	NA	NA	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCY
Acenaphthene (MS)	8270(3550)	97/2	28-102	0-25	13	330	M
Acenaphthylene	8270(3550)	97/2	54-140	0-25	13	330	M
Anthracene	8270(3550)	97/2	39-106	0-30	12	330	M
Benzo(a)anthracene	8270(3550)	97/2	29-111	0-25	9.6	330	M
Benzoic acid	8270(3550)	97/2	10-150	0-50	21	1700	M
Benzo(b)fluoranthene	8270(3550)	97/2	19-126	0-25	17	330	M
Benzo(k)fluoranthene	8270(3550)	97/2	26-125	0-38	13	330	M
Benzo(g,h,i)perylene	8270(3550)	97/2	10-121	0-50	19	330	M
Benzo(a)pyrene	8270(3550)	97/2	34-116	0-29	11	330	M
Bis(2-chloroethoxy) methane	8270(3550)	97/2	13-108	0-50	30	330	M
Bis(2-chloroethyl) ether	8270(3550)	97/2	10-130	0-50	9.6	330	M
Bis(2-chloroisopropyl) ether	8270(3550)	97/2	36-166	0-50	9.9	330	M
Bis(2-ethylhexyl) phthalate	8270(3550)	97/2	23-124	0-40	46	330	M
4-Bromophenyl phenyl ether	8270(3550)	97/2	53-127	0-40	11	330	M
Butyl benzyl phthalate	8270(3550)	97/2	24-120	0-40	30	330	M
4-Chloroaniline	8270(3550)	97/2	10-150	0-50	17	660	M
4-Chloro-3-methylphenol (MS) (p-Chloro-m-cresol)	8270(3550)	97/2	25-107	0-25	10	330	M
2-Chloronaphthalene	8270(3550)	97/2	60-118	0-40	11	330	M
2-Chlorophenol (MS)	8270(3550)	97/2	23-114	0-25	11	330	M
4-Chlorophenylphenyl ether	8270(3550)	97/2	20-118	0-33	10	330	M
Chrysene	8270(3550)	97/2	35-130	0-27	12	330	M
2-Methyl phenol (o-Cresol)	8270(3550)	97/2	14-95	0-50	13	330	M
3- Methyl phenol (m- Cresol)	8270(3550)	97/2	12-102	0-50	61	330	M
4-Methyl phenol (p-Cresol)	8270(3550)	97/2	12-102	0-50	61	330	M
3- and 4-Methyl phenol (m- and p-Cresol)	8270(3550)	97/2	12-102	0-50	61	330	M
Dibenz(a,h)anthracene	8270(3550)	97/2	40-147	0-28	15	330	M
Dibenzofuran	8270(3550)	97/2	10-150	0-50	12	330	M
Di-n-butylphthalate	8270(3550)	97/2	28-125	0-50	15	330	M
1,2-Dichlorobenzene	8270(3550)	97/2	10-99	0-40	11	330	M
1,3-Dichlorobenzene	8270(3550)	97/2	10-100	0-42	8.8	330	M
1,4-Dichlorobenzene (MS)	8270(3550)	97/2	10-125	0-40	11	330	M
3,3'-Dichlorobenzidine	8270(3550)	97/2	10-189	0-100	16	660	M
2,4-Dichlorophenol	8270(3550)	97/2	16-104	0-40	10	330	M
Diethylphthalate	8270(3550)	97/2	31-113	0-40	15	330	M
2,4-Dimethylphenol	8270(3550)	97/2	10-95	0-25	10	330	M
Dimethylphthalate	8270(3550)	97/2	20-116	0-40	11	330	M
4,6-Dinitro-2-methylphenol	8270(3550)	97/2	43-135	0-93	29	1700	M
2,4-Dinitrophenol	8270(3550)	97/2	10-126	0-87	22	1700	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
2,4-Dinitrotoluene (MS)	8270(3550)	97/2	26-107	0-30	13	330	M
2,6-Dinitrotoluene	8270(3550)	97/2	38-107	0-40	16	330	M
Di-n-octylphthalate	8270(3550)	97/2	22-135	0-50	19	330	M
Fluoranthene	8270(3550)	97/2	23-121	0-25	11	330	M
Fluorene	8270(3550)	97/2	32-107	0-40	12	330	M
Hexachlorobenzene	8270(3550)	97/2	44-105	0-40	10	330	M
Hexachlorobutadiene	8270(3550)	97/2	10-112	0-40	11	330	M
Hexachlorocyclopentadiene	8270(3550)	97/2	D-132	0-50	18	330	M
Hexachloroethane	8270(3550)	97/2	16-91	0-40	13	330	M
Indeno(1,2,3-cd)pyrene	8270(3550)	97/2	18-157	0-83	20	330	M
Isophorone	8270(3550)	97/2	17-107	0-60	12	330	M
2-Methylnaphthalene	8270(3550)	97/2	19-105	0-50	9.2	330	M
Naphthalene	8270(3550)	97/2	53-125	0-25	11	330	M
2-Nitroaniline	8270(3550)	97/2	22-110	0-50	14	1700	
3-Nitroaniline	8270(3550)	97/2	10-117	0-50	11	1700	M
4-Nitroaniline	8270(3550)	97/2	10-136	0-50	13	1700	M
Nitrobenzene	8270(3550)	97/2	9-104	0-40	13	330	M
2-Nitrophenol	8270(3550)	97/2	10-101	0-40	8.8	330	M
4-Nitrophenol (MS)	8270(3550)	97/2	10-117	0-45	30	1700	M
N-Nitrosodiphenylamine/ Diphenylamine	8270(3550)	97/2	40-122	0-50	98	330	M
N-Nitroso-di-n-propylamine MS)	8270(3550)	97/2	11-117	0-35	14	330	M
Pentachlorophenol (MS)	8270(3550)	97/2	10-120	0-44	28	1700	M
Phenanthrene	8270(3550)	97/2	38-113	0-25	12	330	M
Phenol (MS)	8270(3550)	97/2	17-103	0-25	19	330	M
Pyrene (MS)	8270(3550)	97/2	18-136	0-25	11	330	M
1,2,4-Trichlorobenzene (MS)	8270(3550)	97/2	17-105	0-28	11	330	M
2,4,5-Trichlorophenol	8270(3550)	97/2	39-123	0-27	13	330	M
2,4,6-Trichlorophenol	8270(3550)	97/2	20-116	0-40	9.2	330	M
Surrogate - Nitrobenzene-d5	8270(3550)	97/2	12-125	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	8270(3550)	97/2	24-118	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	8270(3550)	97/2	18-153	NA	NA	NA	M
Surrogate - Phenol-d5	8270(3550)	97/2	10-142	NA	NA	NA	M
Surrogate - 2-Fluorophenol	8270(3550)	97/2	10-118	NA	NA	NA	M
Surrogate - 2,4,6-Tribromophenol	8270(3550)	97/2	14-121	NA	NA	NA	M

TABLE 5.5 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC∀
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	8280	97/2	69-145	0-40	0.13	0.50	M
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes							
tetra-CDD	8280	97/2	69-145	0-40	0.12	0.50	M
tetra-CDF	8280	97/2	59-142	0-40	0.040	0.50	M
penta-CDD	8280	97/2	41-203	0-40	0.089	0.50	M
penta-CDF	8280	97/2	55-146	0-40	0.068	0.50	M
hexa-CDD	8280	97/2	45-174	0-53	0.13	0.50	M
hexa-CDF	8280	97/2	50-154	0-46	0.051	0.50	M
hepta-CDD	8280	97/2	20-170	0-50	0.13	1.0	M
hepta-CDF	8280	97/2	20-170	0-50	0.063	1.0	M
octa-CDD	8280	97/2	20-170	0-50	0.14	1.0	M
octa-CDF	8280	97/2	20-170	0-50	0.13	1.0	M
Internal Standard - 13C12-2,3,7,8-TCDD	8280	97/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-2,3,7,8-TCDF	8280	97/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,6,7,8-HxCDD	8280	97/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,4,6,7,8-HpCDF	8280	97/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-OCDD	8280	97/2	25-150	NA	NA	NA	M

TABLE 5.5. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR BIOLOGICAL TISSUES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acenaphthene (MS)	8310(3550)	97/2	11-144	0-35	14	50	M
Acenaphthylene	8310(3550)	97/2	10-139	0-40	5.1	20	M
Anthracene	8310(3550)	97/2	10-126	0-40	0.23	4.0	M
Benzo(a)anthracene	8310(3550)	97/2	12-135	0-40	0.27	4.0	M
Benzo(b)fluoranthene	8310(3550)	97/2	10-150	0-40	0.15	4.0	M
Benzo(k)fluoranthene	8310(3550)	97/2	10-159	0-40	0.12	4.0	M
Benzo(g,h,i)perylene	8310(3550)	97/2	10-120	0-40	0.68	10	M
Benzo(a)pyrene	8310(3550)	97/2	10-128	0-40	0.35	4.0	M
Carbazole	8310(3550)	97/2	10-150	0-40	5.0	20	M
Chrysene (MS)	8310(3550)	97/2	10-199	0-40	0.28	4.0	M
Dibenz(a,h)acridine	8310(3550)	97/2	NA	NA	NA	NA	
Dibenzo(a,h)anthracene	8310(3550)	97/2	10-110	0-40	0.87	10	M
Fluoranthene	8310(3550)	97/2	56-136	0-28	0.47	10	M
Fluorene (MS)	8310(3550)	97/2	10-142	0-40	1.4	10	M
Indene	8310(3550)	97/2	NA	NA	NA	NA	
Indeno(1,2,3-cd)pyrene	8310(3550)	97/2	10-116	0-40	0.25	10	M
6-Methylchrysene	8310(3550)	97/2	NA	NA	NA	NA	
1-Methylnaphthalene	8310(3550)	97/2	10-125	0-40	6.2	20	M
2-Methylnaphthalene	8310(3550)	97/2	10-125	0-40	5.9	20	M
Naphthalene (MS)	8310(3550)	97/2	31-159	0-34	5.3	20	M
Phenanthrene	8310(3550)	97/2	10-155	0-40	0.50	4.0	M
Pyrene (MS)	8310(3550)	97/2	49-156	0-28	0.93	10	M
Thiophenol	8310(3550)	97/2	NA	NA	NA	NA	
Surrogate - 4-Terphenyl-d14	8310(3550)	97/2	28-151	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RL^ (ug/wipe)	TC^
Aluminum (ICP)	6010(3050)	96/2	75-125	0-20	3.2	20	M
Antimony (ICP)	6010(3050)	96/2	75-125	0-20	1.9	5.0	M
	6010(3050)-T	96/2	75-125	0-20	0.42	2.0	M
Antimony (GFAA)	7041(3050)	96/2	75-125	0-20	0.11	1.0	M
Arsenic (ICP)	6010(3050)	96/2	75-125	0-20	1.9	10	M
	6010(3050)-T	96/2	75-125	0-20	0.39	1.0	M
Arsenic (GFAA)	7060(3050)	96/2	80-120	0-20	0.27	1.0	M
Barium (ICP)	6010(3050)	96/2	75-125	0-20	0.42	1.0	M
Beryllium (ICP)	6010(3050)	96/2	75-125	0-20	0.11	0.50	M
Boron	6010(3050)	96/2	75-125	0-20	0.59	5.0	M
Cadmium (ICP)	6010(3050)	96/2	75-125	0-20	0.31	0.50	M
	6010(3050)-T	96/2	75-125	0-20	0.056	0.50	M
Cadmium (GFAA)	7131 (3050)	96/2	80-120	0-20	0.0090	0.10	M
Calcium (ICP)	6010(3050)	96/2	75-125	0-20	2.4	50	M
Chromium (ICP)	6010(3050)	96/2	75-125	0-20	0.44	1.0	M
	6010(3050)-T	96/2	75-125	0-20	0.18	1.0	M
Chromium (GFAA)	7191(3050)	96/2	80-120	0-20	0.050	1.0	M
Cobalt (ICP)	6010 (3050)	96/2	75-125	0-20	0.41	1.0	M
	6010 (3050)-T	96/2	75-125	0-20	0.13	1.0	M
Copper (ICP)	6010 (3050)	96/2	75-125	0-20	0.78	2.5	M
	6010 (3050)-T	96/2	75-125	0-20	0.22	2.5	M
Iron (ICP)	6010 (3050)	96/2	75-125	0-20	3.9	5.0	M
Lead (ICP)	6010 (3050)	96/2	75-125	0-20	1.0	5.0	M
	6010 (3050)-T	96/2	75-125	0-20	0.20	5.0	M
Lead (GFAA)	7421(3050)	96/2	80-120	0-20	0.14	0.50	M
Magnesium (ICP)	6010 (3050)	96/2	75-125	0-20	1.8	50	M
Manganese (ICP)	6010(3050)	96/2	75-125	0-20	0.18	1.0	M
Mercury (CVAA)	7471	96/2	75-125	0-20	0.0020	0.0020	M
Molybdenum (ICP)	6010(3050)	96/2	75-125	0-20	0.23	1.0	M
	6010(3050)-T	96/2	75-125	0-20	0.098	1.0	M
Nickel (ICP)	6010(3050)	96/2	75-125	0-20	1.1	4.0	M
Potassium (ICP)	6010(3050)	96/2	75-125	0-20	35	100	M
Selenium (ICP)	6010(3050)	96/2	75-125	0-20	5.4	50	M
	6010 (3050)-T	96/2	75-125	0-20	0.46	1.0	M
Selenium (GFAA)	7740(3050)	96/2	80-120	0-20	0.13	1.0	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RLA (ug/wipe)	TCV
Silver (ICP)	6010(3050)	96/2	75-125	0-20	0.20	1.0	M
	6010 (3050)-T	96/2	75-125	0-20	0.14	1.0	M
Silver (GFAA)	7761 (3050)	96/2	80-120	0-20	0.016	0.10	M
Sodium (ICP)	6010(3050)	96/2	75-125	0-20	8.3	50	M
Strontium	6010(3050)	96/2	70-130	0-30	0.84	1.0	M
Thallium (ICP)	6010(3050)	96/2	75-125	0-20	8.1	50	M
	6010 (3050)-T	96/2	75-125	0-20	0.46	2.0	M
Thallium (GFAA)	7841 (3050)	96/2	80-120	0-20	0.14	1.0	M
Tin (ICP)	6010(3050)	96/2	75-125	0-20	1.3	5.0	M
Titanium	6010(3050)	96/2	70-130	0-30	0.25	1.0	M
Vanadium (ICP)	6010 (3050)	96/2	75-125	0-20	0.23	1.0	M
Zinc (ICP)	6010 (3050)	96/2	75-125	0-20	0.45	2.0	M

ICP = inductively coupled (argon) plasma atomic emission spectrophotometer
GFAA = graphite furnace atomic adsorption spectrophotometer
CVAA = cold vapor atomic adsorption spectrophotometer
-T = trace ICP

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL* (ug/wipe)	RLA (ug/wipe)	TCV
Aldrin (MS)	8080(3550)/8081(3550)	96/2	10-144	0-38	0.0041	0.050	M
alpha-BHC	8080(3550)/8081(3550)	96/2	22-101	0-40	0.0022	0.050	M
beta-BHC	8080(3550)/8081(3550)	96/2	12-120	0-40	0.0053	0.050	M
gamma-BHC (Lindane) (MS)	8080(3550)/8081(3550)	96/2	12-138	0-37	0.00119	0.050	M
delta-BHC	8080(3550)/8081(3550)	96/2	10-142	0-47	0.0019	0.050	M
technical Chlordane	8080(3550)/8081(3550)	96/2	45-119	0-40	0.061	0.20	M
alpha Chlordane	8081(3550)	96/2	45-140	0-40	0.0028	0.050	M
gamma Chlordane	8081(3550)	96/2	11-141	0-40	0.0026	0.050	M
4,4'-DDD	8080(3550)/8081(3550)	96/2	28-134	0-50	0.0060	0.10	M
4,4'-DDE	8080(3550)/8081(3550)	96/2	34-121	0-25	0.0069	0.10	M
4,4'-DDT (MS)	8080(3550)/8081(3550)	96/2	29-134	0-26	0.0074	0.10	M
Dieldrin (MS)	8080(3550)/8081(3550)	96/2	28-137	0-30	0.0023	0.10	M
Endosulfan I	8080(3550)/8081(3550)	96/2	10-141	0-40	0.0027	0.050	M
Endosulfan II	8080(3550)/8081(3550)	96/2	10-159	0-65	0.0037	0.10	M
Endosulfan sulfate	8080(3550)/8081(3550)	96/2	26-144	0-50	0.0053	0.10	M
Endrin (MS)	8080(3550)/8081(3550)	96/2	33-149	0-32	0.0085	0.10	M
Endrin aldehyde	8080(3550)/8081(3550)	96/2	10-130	0-86	0.0079	0.10	M
Endrin ketone	8081(3550)	96/2	29-112	0-31	0.011	0.10	M
Heptachlor (MS)	8080(3550)/8081(3550)	96/2	17-138	0-38	0.0025	0.050	M
Heptachlor epoxide	8080(3550)/8081(3550)	96/2	15-142	0-40	0.0085	0.050	M
Methoxychlor	8080(3550)/8081(3550)	96/2	24-152	0-40	0.032	0.50	M
Toxaphene	8080(3550)/8081(3550)	96/2	41-126	0-50	0.55	5.0	M
PCB-1016	8080(3550)/8082(3550)	96/2	34-137	0-44	0.15	1.0	M
PCB 1221	8080(3550)/8082(3550)	96/2	15-178	0-30	0.27	2.0	M
PCB 1232	8080(3550)/8082(3550)	96/2	10-215	0-30	0.21	1.0	M
PCB-1242	8080(3550)/8082(3550)	96/2	39-150	0-30	0.25	1.0	M
PCB-1248	8080(3550)/8082(3550)	96/2	38-158	0-30	0.18	1.0	M
PCB-1254	8080(3550)/8082(3550)	96/2	66-122	0-30	0.11	1.0	M
PCB-1260	8080(3550)/8082(3550)	96/2	58-150	0-30	0.12	1.0	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080(3550)/8081(3550)/ 8082(3550)	96/2	10-114	NA	NA	NA	M
Surrogate- Decachlorobiphenyl (DCB)	8080(3550)/8081(3550)/ 8082(3550)	96/2	27-128	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RL^ (ug/wipe)	TC~
Monochlorobiphenyls	680/(3550)	96/93	30-130	0-50	0.044	0.30	M
Dihlorobiphenyls	680/(3550)	96/93	30-130	0-50	0.035	0.30	M
Trichlorobiphenyls	680/(3550)	96/93	30-130	0-50	0.035	0.30	M
Tetrachlorobiphenyls	680/(3550)	96/93	40--140	0-50	0.053	0.60	M
Pentachlorobiphenyls	680/(3550)	96/93	40--140	0-50	0.029	0.60	M
Hexachlorobiphenyls	680/(3550)	96/93	40--140	0-50	0.037	0.60	M
Heptachlorobiphenyls	680/(3550)	96/93	40--140	0-50	0.042	0.90	M
Octachlorobiphenyls	680/(3550)	96/93	40--140	0-50	0.064	0.90	M
Nonachlorobiphenyls	680/(3550)	96/93	30-130	0-50	0.11	1.5	M
Decachlorobiphenyl	680/(3550)	96/93	30-130	0-50	0.11	1.5	M
Surrogate-Decachlorobiphenyl-13C12	680/(3550)	96/93	30-130	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/wipe)	RLA (ug/ wipe)	TCV
Acephate(1)	1657	98/72	25-140	0-50	1.2	5.0	M
Methamidophos(1)	1657	98/72	36-106	0-46	0.10	2.0	M
Alachlor	8141(3520)	96/2	46-139	0-30	0.14	1.0	M
Ametryn	8141(3520)	96/2	60-120	0-40	0.16	2.0	M
Atrazine (MS)	8141(3520)	96/2	39-130	0-30	0.13	2.0	M
Azinphos methyl	8141(3520)	96/2	48-162	0-50	0.16	1.0	M
Benoxacor	8141(3520)	96/2	10-150	0-50	4.4	10	M
Bolstar	8141(3520)	96/2	36-114	0-40	0.26	1.0	M
Butachlor	8141(3520)	96/2	50-150	0-40	0.35	1.0	M
Carbophenothion	8141(3520)	96/2	69-122	0-40	0.23	1.0	M
Chlordimeform (Galecron)	8141(3520)	96/2	10-150	0-50	3.8	10	M
-Chloroaminotoluene	8141(3520)	96/2	10-150	0-50	3.4	10	M
Chlorpyrifos	8141(3520)	96/2	49-109	0-40	0.17	1.0	M
Chlorpyrifos methyl	8141(3520)	96/2	53-136	0-40	0.17	1.0	M
Coumaphos	8141(3520)	96/2	61-139	0-40	0.19	1.0	M
Demeton-o	8141(3520)	96/2	10-117	0-40	1.1	2.5	M
Demeton-s	8141(3520)	96/2	37-121	0-40	0.35	2.5	M
Demeton-o+s	8141(3520)	96/2	10-117	0-40	1.1	2.5	M
Diazinon (MS)	8141(3520)	96/2	40-137	0-40	0.17	1.0	M
Dichlofenthion	8141(3520)	96/2	38-118	0-40	0.11	1.0	M
Dichlorvos	8141(3520)	96/2	11-158	0-40	0.28	2.0	M
Dimethoate	8141(3520)	96/2	14-101	0-40	0.11	2.0	M
Dioxathion	8141(3520)	96/2	26-127	0-40	1.5	10	M
Disulfoton	8141(3520)	96/2	42-112	0-66	0.17	2.0	M
EPN	8141(3520)	96/2	48-124	0-40	0.19	1.0	M
Ethion	8141(3520)	96/2	62-175	0-40	0.12	0.50	M
Ethoprop	8141(3520)	96/2	42-123	0-40	0.27	0.50	M
Famphur	8141(3520)	96/2	13-128	0-60	0.25	2.0	M
Fenamiphos	8141	96/2	40-160	0-40	0.59	2.0	M
Fensulfothion	8141(3520)	96/2	31-163	0-40	0.27	5.0	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/wipe)	RLA (ug/ wipe)	TCV
Fenthion	8141(3520)	96/2	41-115	0-60	0.23	1.0	M
Isofenphos	8141	96/2	40-160	0-40	0.060	0.50	M
Malathion	8141(3520)	96/2	10-140	0-40	0.071	1.0	M
Merphos	8141(3520)	96/2	32-138	0-40	0.22	1.0	M
Metolachlor	8141(3520)	96/2	53-133	0-40	0.11	1.0	M
Metrabuzin	8141(3520)	96/2	50-150	0-40	0.11	1.0	M
Mevinphos	8141(3520)	96/2	24-166	0-40	0.23	2.0	M
Monocrotophos	8141(3520)	96/2	43-126	0-50	2.9	10	M
Naled	8141(3520)	96/2	10-119	0-40	0.14	5.0	M
Parathion, ethyl (MS)	8141(3520)	96/2	28-155	0-34	0.083	1.0	M
Parathion, methyl (MS)	8141(3520)	96/2	38-149	0-32	0.19	0.50	M
Phorate	8141(3520)	96/2	28-119	0-40	0.30	1.0	M
Prometon	8141(3520)	96/2	55-124	0-40	0.11	2.0	M
Prometryn	8141(3520)	96/2	36-155	0-40	0.23	2.0	M
Propazine	8141(3520)	96/2	51-127	0-30	0.25	2.0	M
Ronnel (MS)	8141(3520)	96/2	30-98	0-35	0.26	1.0	M
Simazine	8141(3520)	96/2	39-149	0-50	0.19	2.0	M
Stirophos (Tetrachlorvinphos)	8141(3520)	96/2	48-125	0-40	0.39	1.0	M
Sulfotepp	8141(3520)	96/2	40-157	0-40	0.17	0.50	M
Terbufos	8141(3520)	96/2	40-160	0-40	0.16	1.0	M
Terbutylazine	8141(3520)	96/2	60-130	0-40	0.33	2.0	M
Terbutryn	8141(3520)	96/2	53-113	0-40	0.066	2.0	M
Thionazin (MS)	8141(3520)	96/2	12-139	0-60	0.21	1.0	M
Tokuthion (Prothiofos)	8141(3520)	96/2	45-114	0-40	0.22	1.0	M
Trichloronate	8141(3520)	96/2	16-123	0-40	0.12	1.0	M
Surrogate - Triphenylphosphate	8141	96/2	16-164	NA	NA	NA	M

(1) Determined by NPD

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RLA (ug/wipe)	TCV
Acetone	8240/8260(5030/5035)	96/2	14-189	0-40	1.7	5.0	M
Benzene (MS)	8240(5030)/8260(5030)	96/2	64-144	0-25	0.17	0.50	M
Bromodichloromethane	8240(5030)/8260(5030)	96/2	71-140	0-40	0.17	0.50	M
Bromoform	8240(5030)/8260(5030)	96/2	59-143	0-40	0.19	0.50	M
Bromomethane	8240(5030)/8260(5030)	96/2	35-181	0-65	0.31	1.0	M
2-Butanone (MEK)	8240(5030)/8260(5030)	96/2	54-166	0-40	2.6	2.5	M
Carbon disulfide	8240(5030)/8260(5030)	96/2	10-160	0-65	0.090	0.50	M
Carbon tetrachloride	8240(5030)/8260(5030)	96/2	65-129	0-40	0.25	0.50	M
Chlorobenzene (MS)	8240(5030)/8260(5030)	96/2	56-152	0-25	0.18	0.50	M
Chloroethane	8240(5030)/8260(5030)	96/2	65-129	0-40	0.65	1.0	M
Chloroform	8240(5030)/8260(5030)	96/2	62-117	0-40	0.20	0.50	M
Chloromethane	8240(5030)/8260(5030)	96/2	10-186	0-65	0.24	1.0	M
Dibromochloromethane	8240(5030)/8260(5030)	96/2	73-127	0-40	0.17	0.50	M
1,1-Dichloroethane	8240(5030)/8260(5030)	96/2	64-112	0-40	0.21	0.50	M
1,2-Dichloroethane	8240(5030)/8260(5030)	96/2	66-128	0-40	0.20	0.50	M
cis-1,2-Dichloroethene	8240(5030)/8260(5030)	96/2	64-123	0-40	0.25	0.50	M
trans-1,2-Dichloroethene	8240(5030)/8260(5030)	96/2	60-161	0-25	0.32	0.50	M
1,1-Dichloroethene (MS)	8260(5030)	96/2	44-157	0-23	0.30	0.50	M
1,2-Dichloropropane	8240(5030)/8260(5030)	96/2	47-146	0-65	0.21	0.50	M
cis-1,3-Dichloropropene	8240(5030)/8260(5030)	96/2	50-146	0-65	0.18	0.50	M
trans-1,3-Dichloropropene	8240(5030)/8260(5030)	96/2	57-143	0-65	0.18	0.50	M
Ethylbenzene	8240(5030)/8260(5030)	96/2	60-131	0-40	0.18	0.50	M
2-Hexanone	8240(5030)/8260(5030)	96/2	47-145	0-40	2.2	2.5	M
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260(5030)	96/2	54-167	0-49	1.8	2.5	M
Styrene	8240(5030)/8260(5030)	96/2	56-121	0-40	0.20	0.50	M
1,1,2,2-Tetrachloroethane	8240(5030)/8260(5030)	96/2	36-157	0-40	0.26	0.50	M
Tetrachloroethene	8240(5030)/8260(5030)	96/2	61-142	0-40	0.23	0.50	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RLA (ug/wipe)	TCV
Toluene (MS)	8240(5030)/8260(5030)	96/2	67-142	0-25	0.16	0.50	M
1,1,1-Trichloroethane	8240(5030)/8260(5030)	96/2	11-148	0-40	0.16	0.50	M
1,1,2-Trichloroethane	8240(5030)/8260(5030)	96/2	66-123	0-40	0.20	0.50	M
Trichloroethene (MS)	8240(5030)/8260(5030)	96/2	41-134	0-22	0.20	0.50	M
Vinyl chloride	8240(5030)/8260(5030)	96/2	18-169	0-65	0.44	1.0	M
Xylenes (total)	8240(5030)/8260(5030)	96/2	50-150	0-40	0.37	0.50	M
o-Xylene	8260(5030)	96/2	22-154	0-40	0.20	0.50	M
m+p-Xylene	8260(5030)	96/2	62-123	0-40	0.23	0.50	M
Surrogate - Toluene-d8	8240(5030)/8260(5030)	96/2	58-148	NA	NA	NA	M
Surrogate - p-Bromofluorobenzene	8240(5030)/8260(5030)	96/2	70-136	NA	NA	NA	M
Surrogate -Dibromofluoromethane	8260(5030)	96/2	66-148	NA	NA	NA	M
Surrogate - 1,2-Dichloroethane-d4	8240(5030)/8260(5030)	96/2	38-151	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	8240(5030)/8260(5030)	96/2	58-148	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RLA (ug/ wipe)	TCV
Acenaphthene (MS)	8270(3550)	96/2	28-102	0-25	0.71	10	M
Acenaphthylene	8270(3550)	96/2	54-140	0-25	1.8	10	M
Anthracene	8270(3550)	96/2	39-106	0-30	0.42	10	M
Benzo(a)anthracene	8270(3550)	96/2	29-111	0-25	0.59	10	M
Benzoic acid	8270(3550)	96/2	10-150	0-50	7.4	50	M
Benzo(b)fluoranthene	8270(3550)	96/2	19-126	0-25	0.64	10	M
Benzo(k)fluoranthene	8270(3550)	96/2	26-125	0-38	0.085	10	M
Benzo(g,h,i)perylene	8270(3550)	96/2	10-121	0-50	0.92	10	M
Benzo(a)pyrene	8270(3550)	96/2	34-116	0-29	0.58	10	M
Bis(2-chloroethoxy) methane	8270(3550)	96/2	13-108	0-50	1.7	10	M
Bis(2-chloroethyl) ether	8270(3550)	96/2	10-130	0-50	1.3	10	M
Bis(2-chloroisopropyl) ether	8270(3550)	96/2	36-166	0-50	1.3	10	M
Bis(2-ethylhexyl) phthalate	8270(3550)	96/2	23-124	0-40	0.61	10	M
4-Bromophenyl phenyl ether	8270(3550)	96/2	53-127	0-40	2.0	10	M
Butyl benzyl phthalate	8270(3550)	96/2	24-120	0-40	2.2	10	M
4-Chloroaniline	8270(3550)	96/2	10-150	0-50	1.4	20	M
4-Chloro-3-methylphenol (MS) (p-Chloro-m-cresol)	8270(3550)	96/2	25-107	0-25	0.82	10	M
2-Chloronaphthalene	8270(3550)	96/2	60-118	0-40	1.8	10	M
2-Chlorophenol (MS)	8270(3550)	96/2	23-114	0-25	1.4	10	M
4-Chlorophenylphenyl ether	8270(3550)	96/2	20-118	0-33	2.1	10	M
Chrysene	8270(3550)	96/2	35-130	0-27	0.46	10	M
2-Methyl phenol (o-Cresol)	8270(3550)	96/2	14-95	0-50	1.5	10	M
3- Methyl phenol (m- Cresol)	8270(3550)	96/2	12-102	0-50	1.5	10	M
4-Methyl phenol (p-Cresol)	8270(3550)	96/2	12-102	0-50	1.5	10	M
3- and 4-Methyl phenol (m- and p-Cresol)	8270(3550)	96/2	12-102	0-50	1.5	10	M
Dibenz(a,h)anthracene	8270(3550)	96/2	40-147	0-28	0.83	10	M
Dibenzofuran	8270(3550)	96/2	10-150	0-50	2.3	10	M
Di-n-butylphthalate	8270(3550)	96/2	28-125	0-50	0.65	10	M
1,2-Dichlorobenzene	8270(3550)	96/2	10-99	0-40	1.5	10	M
1,3-Dichlorobenzene	8270(3550)	96/2	10-100	0-42	1.3	10	M
1,4-Dichlorobenzene (MS)	8270(3550)	96/2	10-125	0-40	2.3	10	M
3,3'-Dichlorobenzidine	8270(3550)	96/2	10-189	0-100	8.0	20	M
2,4-Dichlorophenol	8270(3550)	96/2	16-104	0-40	1.6	10	M
Diethylphthalate	8270(3550)	96/2	31-113	0-40	0.86	10	M
2,4-Dimethylphenol	8270(3550)	96/2	10-95	0-25	2.1	10	M
Dimethylphthalate	8270(3550)	96/2	20-116	0-40	2.1	10	M
4,6-Dinitro-2-methylphenol	8270(3550)	96/2	43-135	0-93	3.9	50	M
2,4-Dinitrophenol	8270(3550)	96/2	10-126	0-87	2.8	50	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/wipe)	RL^ (ug/ wipe)	TC^
2,4-Dinitrotoluene (MS)	8270(3550)	96/2	26-107	0-30	1.5	10	M
2,6-Dinitrotoluene	8270(3550)	96/2	38-107	0-40	2.1	10	M
Di-n-octylphthalate	8270(3550)	96/2	22-135	0-50	0.63	10	M
Fluoranthene	8270(3550)	96/2	23-121	0-25	0.51	10	M
Fluorene	8270(3550)	96/2	32-107	0-40	0.60	10	M
Hexachlorobenzene	8270(3550)	96/2	44-105	0-40	0.44	10	M
Hexachlorobutadiene	8270(3550)	96/2	10-112	0-40	1.3	10	M
Hexachlorocyclopentadiene	8270(3550)	96/2	D-132	0-50	4.7	10	M
Hexachloroethane	8270(3550)	96/2	16-91	0-40	1.7	10	M
Indeno(1,2,3-cd)pyrene	8270(3550)	96/2	18-157	0-83	0.77	10	M
Isophorone	8270(3550)	96/2	17-107	0-60	1.9	10	M
2-Methylnaphthalene	8270(3550)	96/2	19-105	0-50	1.7	10	M
Naphthalene	8270(3550)	96/2	53-125	0-25	0.47	10	M
Naphthalene	8270(3550)	96/2	53-125	0-25	0.47	10	M
2-Nitroaniline	8270(3550)	96/2	22-110	0-50	2.2	50	M
3-Nitroaniline	8270(3550)	96/2	10-117	0-50	1.9	50	M
4-Nitroaniline	8270(3550)	96/2	10-136	0-50	2.0	50	M
Nitrobenzene	8270(3550)	96/2	9-104	0-40	1.6	10	M
2-Nitrophenol	8270(3550)	96/2	10-101	0-40	2.5	10	M
4-Nitrophenol (MS)	8270(3550)	96/2	10-117	0-45	2.4	50	M
N-Nitrosodiphenylamine/ Diphenylamine	8270(3550)	96/2	40-122	0-50	2.6	10	M
N-Nitroso-di-n-propylamine MS)	8270(3550)	96/2	11-117	0-35	1.4	10	M
Pentachlorophenol (MS)	8270(3550)	96/2	10-120	0-44	3.2	10	M
Phenanthrene	8270(3550)	96/2	38-113	0-25	0.92	10	M
Phenol (MS)	8270(3550)	96/2	17-103	0-25	1.0	10	M
Pyrene (MS)	8270(3550)	96/2	18-136	0-25	0.89	10	M
1,2,4-Trichlorobenzene (MS)	8270(3550)	96/2	17-105	0-28	1.4	10	M
2,4,5-Trichlorophenol	8270(3550)	96/2	39-123	0-27	1.9	10	M
2,4,6-Trichlorophenol	8270(3550)	96/2	20-116	0-40	1.8	10	M
Surrogate - Nitrobenzene-d5	8270(3550)	96/2	12-125	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	8270(3550)	96/2	24-118	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	8270(3550)	96/2	18-153	NA	NA	NA	M
Surrogate - Phenol-d5	8270(3550)	96/2	10-142	NA	NA	NA	M
Surrogate - 2-Fluorophenol	8270(3550)	96/2	10-118	NA	NA	NA	M
Surrogate - 2,4,6-Tribromophenol	8270(3550)	96/2	14-121	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/wipe)	RL^ (ug/ wipe)	TC~
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	8280	96/2	69-145	0-40	0.0012	0.0050	M
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes							
tetra-CDD	8280	96/2	69-145	0-40	0.0012	0.0050	M
tetra-CDF	8280	96/2	59-142	0-40	0.0013	0.0050	M
penta-CDD	8280	96/2	41-203	0-40	0.0017	0.0050	M
penta-CDF	8280	96/2	55-146	0-40	0.0016	0.0050	M
hexa-CDD	8280	96/2	45-174	0-53	0.0011	0.0050	M
hexa-CDF	8280	96/2	50-154	0-46	0.0015	0.0050	M
hepta-CDD	8280	96/2	20-170	0-50	0.0018	0.0010	M
hepta-CDF	8280	96/2	20-170	0-50	0.0013	0.010	M
octa-CDD	8280	96/2	20-170	0-50	0.0013	0.010	M
octa-CDF	8280	96/2	20-170	0-50	0.0012	0.010	M
Internal Standard - 13C12-2,3,7,8-TCDD	8280	96/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-2,3,7,8-TCDF	8280	96/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,6,7,8-HxCDD	8280	96/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,4,6,7,8-HpCDF	8280	96/2	25-150	NA	NA	NA	M
Internal Standard - 13C12-OCDD	8280	96/2	25-150	NA	NA	NA	M

TABLE 5.6 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WIPE SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/wipe)	RL^ (ug/wipe)	TC^
Acenaphthene (MS)	8310(3550)	96/2	11-144	0-35	0.38	1.0	M
Acenaphthylene	8310(3550)	96/2	10-139	0-40	0.17	1.0	M
Anthracene	8310(3550)	96/2	10-126	0-40	0.0060	0.20	M
Benzo(a)anthracene	8310(3550)	96/2	12-135	0-40	0.013	0.20	M
Benzo(b)fluoranthene	8310(3550)	96/2	10-150	0-40	0.0046	0.20	M
Benzo(k)fluoranthene	8310(3550)	96/2	10-159	0-40	0.0056	0.20	M
Benzo(g,h,i)perylene	8310(3550)	96/2	10-120	0-40	0.0035	0.50	M
Benzo(a)pyrene	8310(3550)	96/2	10-128	0-40	0.062	0.20	M
Carbazole	8310(3550)	96/2	10-150	0-40	0.25	1.0	M
Chrysene (MS)	8310(3550)	96/2	10-199	0-40	0.012	0.20	M
Dibenzo(a,h)anthracene	8310(3550)	96/2	10-110	0-40	0.043	0.50	M
Fluoranthene	8310(3550)	96/2	56-136	0-28	0.014	0.50	M
Fluorene (MS)	8310(3550)	96/2	10-142	0-40	0.080	0.50	M
Indeno(1,2,3-cd)pyrene	8310(3550)	96/2	10-116	0-40	0.019	0.50	M
1-Methylnaphthalene	8310(3550)	96/2	10-125	0-40	0.15	1.0	M
2-Methylnaphthalene	8310(3550)	96/2	10-125	0-40	0.16	1.0	M
Naphthalene (MS)	8310(3550)	96/2	31-159	0-34	0.15	1.0	M
Phenanthrene	8310(3550)	96/2	10-155	0-40	0.015	0.20	M
Pyrene (MS)	8310(3550)	96/2	49-156	0-28	0.035	0.50	M
Surrogate - 4-Terphenyl-d14	8310(3550)	96/2	28-151	NA	NA	NA	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Aluminum (ICP)	6010(3050)	2	75-125	0-20	3.2	20	M
	6010(3051)	2	75-125	0-20	1.9	20	M
Antimony (ICP)	6010(3050)	2	75-125	0-20	1.9	5.0	M
	6010(3050)-T	2	75-125	0-20	0.42	5.0	M
	6010(3051)	2	75-125	0-20	1.6	5.0	M
	6010(3051)-T	2	75-125	0-20	0.42	5.0	M
Arsenic (ICP)	6010(3050)	2	75-125	0-20	1.9	10	M
	6010(3050)-T	2	75-125	0-20	0.39	1.0	M
	6010(3051)	2	75-125	0-20	2.1	10	M
	6010(3051)-T	2	75-125	0-20	0.35	1.0	M
Arsenic (GFAA)	7060(3050)	2	80-120	0-20	0.27	1.0	M
	7060(3051)	2	80-120	0-20	0.12	1.0	M
Barium (ICP)	6010(3050)	2	75-125	0-20	0.42	1.0	M
	6010(3051)	2	75-125	0-20	0.19	1.0	M
Beryllium (ICP)	6010(3050)	2	75-125	0-20	0.11	0.50	M
	6010(3051)	2	75-125	0-20	0.023	0.50	M
Cadmium (ICP)	6010(3050)	2	75-125	0-20	0.28	0.50	M
	6010(3050)-T	2	75-125	0-20	0.056	0.50	M
	6010(3051)	2	75-125	0-20	0.29	0.50	M
	6010(3051)-T	2	75-125	0-20	0.058	0.50	M
Cadmium (GFAA)	7131 (3050)	2	80-120	0-20	0.0090	0.10	M
	7131 (3051)	2	80-120	0-20	0.0016	0.10	M
Calcium (ICP)	6010(3050)	2	75-125	0-20	2.4	50	M
	6010(3051)	2	75-125	0-20	2.8	50	M
Chromium (ICP)	6010(3050)	2	75-125	0-20	0.44	1.0	M
	6010(3051)	2	75-125	0-20	0.50	1.0	M
Cobalt (ICP)	6010 (3050)	2	75-125	0-20	0.41	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.13	1.0	M
	6010(3051)	2	75-125	0-20	0.26	1.0	M
	6010(3051)-T	2	75-125	0-20	0.14	1.0	M
Copper (ICP)	6010 (3050)	2	75-125	0-20	0.78	2.5	M
	6010 (3050)-T	2	75-125	0-20	0.22	2.5	M
	6010(3051)	2	75-125	0-20	0.31	2.5	M
	6010(3051)-T	2	75-125	0-20	0.22	2.5	M
Iron (ICP)	6010 (3050)	2	75-125	0-20	0.88	5.0	M
	6010(3051)	2	75-125	0-20	0.96	5.0	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Lead (ICP)	6010 (3050)	2	75-125	0-20	1.0	5.0	M
	6010 (3050)-T	2	75-125	0-20	0.20	5.0	M
	6010(3051)	2	75-125	0-20	2.0	5.0	M
	6010 (3051)-T	2	75-125	0-20	0.16	5.0	M
Lead (GFAA)	7421(3050)	2	80-120	0-20	0.14	0.50	M
	7421 (3051)	2	80-120	0-20	0.16	0.50	M
Magnesium (ICP)	6010 (3050)	2	75-125	0-20	1.7	50	M
	6010(3051)	2	75-125	0-20	2.0	50	M
Manganese (ICP)	6010(3050)	2	75-125	0-20	0.18	1.0	M
	6010 (3051)	2	75-125	0-20	0.093	1.0	M
Mercury (CVAA)	7471 (3050/3051)	2	75-125	0-20	0.0020	0.020	M
Molybdenum (ICP)	6010(3050)	2	75-125	0-20	0.23	1.0	M
	6010(3050)-T	2	75-125	0-20	0.098	1.0	M
	6010(3051)	2	75-125	0-20	0.12	1.0	M
	6010(3051)-T	2	75-125	0-20	0.098	1.0	M
Nickel (ICP)	6010(3050)	2	75-125	0-20	1.1	4.0	M
	6010 (3051)	2	75-125	0-20	0.65	4.0	M
Potassium (ICP)	6010(3050)	2	75-125	0-20	35	100	M
	6010(3051)	2	75-125	0-20	70	100	M
Selenium (ICP)	6010(3050)	2	75-125	0-20	5.4	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	1.0	M
	6010(3051)	2	75-125	0-20	5.0	50	M
	6010(3051)-T	2	75-125	0-20	0.46	1.0	M
Selenium (GFAA)	7740(3050)	2	80-120	0-20	0.13	1.0	M
	7740 (3051)	2	80-120	0-20	0.38	1.0	M
Silver (ICP)	6010(3050)	2	75-125	0-20	0.20	1.0	M
	6010 (3050)-T	2	75-125	0-20	0.14	1.0	M
	6010(3051)	2	75-125	0-20	0.13	1.0	M
	6010(3051)-T	2	75-125	0-20	1.14	1.0	M
Silver (GFAA)	7761 (3050)	2	80-120	0-20	0.016	0.10	M
	7761 (3051)	2	80-120	0-20	0.037	0.10	M
Sodium (ICP)	6010(3050)	2	75-125	0-20	8.3	50	M
	6010(3051)	2	75-125	0-20	4.0	50	M
Strontium	6010(3050)	2	70-130	0-30	0.84	1.0	M
	6010(3051)	2	75-125	0-20	0.62	1.0	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (mg/kg)	RLA (mg/kg)	TCV
Thallium (ICP)	6010(3050)	2	75-125	0-20	8.1	50	M
	6010 (3050)-T	2	75-125	0-20	0.46	2.0	M
	6010(3051)	2	75-125	0-20	8.7	50	M
	6010(3051)-T	2	75-125	0-20	0.46	2.0	M
Thallium (GFAA)	7841 (3050)	2	80-120	0-20	0.14	1.0	M
	7841 (3051)	2	80-120	0-20	0.13	1.0	M
Tin (ICP)	6010(3050)	2	75-125	0-20	1.3	5.0	M
	6010(3051)	2	75-125	0-20	1.5	5.0	M
Titanium	6010(3050)	2	75-125	0-20	0.25	1.0	M
	6010(3051))	2	75-125	0-20	0.25	1.0	M
Vanadium (ICP)	6010(3050)	2	75-125	0-20	0.23	1.0	M
	6010(3015)	2	75-125	0-20	0.32	1.0	M
Zinc (ICP)	6010(3050)	2	75-125	0-20	0.45	2.0	M
	6010(3051)	2	75-125	0-20	0.38	2.0	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTE AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/kg)	RL▲ (mg/kg)	TC▼
Cyanide, reactive	7.3.3.2	2	NA	0-50	NA	10mg HCN/ Kg Waste	
Cyanide, total	9012(9013)	2	75-125	0-30	0.59	1.0	M
	9010(9013)	2	75-125	0-30	0.14	1.0	M
pH	9041	2	63-158	0-40	NA	NA	

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC∀
Aldrin (MS)	8080(3580)/8081(3580)	2	10-168	0-38	0.63	50	M
alpha-BHC	8080(3580)/8081(3580)	2	37-134	0-40	2.6	50	M
beta-BHC	8080(3580)/8081(3580)	2	17-147	0-40	4.8	50	M
gamma-BHC (Lindane) (MS)	8080(3580)/8081(3580)	2	10-173	0-37	2.0	50	M
delta-BHC	8080(3580)/8081(3580)	2	19-140	0-47	5.4	50	M
technical Chlordane	8080(3580)/8081(3580)	2	45-119	0-40	51	500	M
alpha Chlordane	8080(3580)/8081(3580)	2	45-140	0-40	3.6	50	M
gamma Chlordane	8080(3580)/8081(3580)	2	45-140	0-40	2.3	50	M
4,4'-DDD	8080(3580)/8081(3580)	2	31-140	0-50	6.6	100	M
4,4'-DDE	8080(3580)/8081(3580)	2	30-145	0-25	3.9	100	M
4,4'-DDT (MS)	8080(3580)/8081(3580)	2	10-181	0-26	15	100	M
Dieldrin (MS)	8080(3580)/8081(3580)	2	10-176	0-30	5.7	100	M
Endosulfan I	8080(3580)/8081(3580)	2	45-153	0-40	3.9	50	M
Endosulfan II	8080(3580)/8081(3580)	2	10-202	0-65	6.6	100	M
Endosulfan sulfate	8080(3580)/8081(3580)	2	26-144	0-50	27	100	M
Endrin (MS)	8080(3580)/8081(3580)	2	10-180	0-32	3.0	100	M
Endrin aldehyde	8080(3580)/8081(3580)	2	10-150	0-86	6.6	100	M
Endrin ketone	8080(3580)/8081(3580)	2	40-100	0-31	13	100	M
Heptachlor (MS)	8080(3580)/8081(3580)	2	10-162	0-38	3.6	50	M
Heptachlor epoxide	8080(3580)/8081(3580)	2	37-142	0-40	3.0	50	M
Methoxychlor	8080(3580)/8081(3580)	2	34-166	0-40	39	500	M
Toxaphene	8080(3580)/8081(3580)	2	41-126	0-50	540	5000	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
PCB-1016	8080(3580)/8082(3580)	2	52-152	0-44	140	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB 1221	8080(3580)/8082(3580)	2	15-178	0-30	690	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB 1232	8080(3580)/8082(3580)	2	10-215	0-30	120	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB-1242	8080(3580)/8082(3580)	2	39-150	0-30	180	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB-1248	8080(3580)/8082(3580)	2	38-158	0-30	200	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB-1254	8080(3580)/8082(3580)	2	66-122	0-30	81	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
PCB-1260	8080(3580)/8082(3580)	2	58-150	0-30	170	1000	M
	EPA-600/4-81-045	61	50-130	0-50	1200	5000	M
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080(3580)/8081(3580)/8082(3580)	2	10-114	NA	NA	NA	M
Surrogate - Decachlorobiphenyl (DCB)	8080(3580)/8081(3580)/8082(3580)	2	27-128	NA	NA	NA	M

Waste dilution extraction : 1g of sample ot a final volume of 10mL with appropriate solvent.

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC~
Polychlorinated biphenyl classes							
Monochlorobiphenyls	680(3580)	93/2	30-130	0-50	20	300	M
Dichlorobiphenyls	680(3580)	93/2	30-130	0-50	23	300	M
Trichlorobiphenyls	680(3580)	93/2	30-130	0-50	20	300	M
Tetrachlorobiphenyls	680(3580)	93/2	40-140	0-50	39	600	M
Pentachlorobiphenyls	680(3580)	93/2	40-140	0-50	25	600	M
Hexachlorobiphenyls	680(3580)	93/2	40-140	0-50	27	600	M
Heptachlorobiphenyls	680(3580)	93/2	40-140	0-50	48	900	M
Octachlorobiphenyls	680(3580)	93/2	40-140	0-50	29	900	M
Nonochlorobiphenyls	680(3580)	93/2	30-130	0-50	57	1500	M
Decachlorobiphenyl	680(3580)	93/2	30-130	0-50	57	1500	M
Surrogate - $^{13}C_{12}$-Decachlorobiphenyl	680(3580)	93/2	30-130	NA	NA	NA	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acetone	8240(5030ext)/8260(5035ext)	2	14-189	00-40	1200	25000	M
Benzene (MS)	8240(5030ext)/8260(5035ext)	2	64-144	0-25	210	2500	M
Bromodichloromethane	8240(5030ext)/8260(5035ext)	2	71-140	0-40	170	2500	M
Bromoform	8240(5030ext)/8260(5035ext)	2	59-143	0-40	430	2500	M
Bromomethane (Methyl bromide)	8240(5030ext)/8260(5035ext)	2	35-181	0-65	1000	5000	M
2-Butanone (MEK)	8240(5030ext)/8260(5035ext)	2	54-166	0-40	1400	12500	M
Carbon disulfide	8240(5030ext)/8260(5035ext)	2	10-160	0-65	150	2500	M
Carbon tetrachloride	8240(5030ext)/8260(5035ext)	2	65-129	0-40	240	2500	M
Chlorobenzene (MS)	8240(5030ext)/8260(5035ext)	2	56-152	0-25	290	2500	M
Chloroethane	8240(5030ext)/8260(5035ext)	2	65-129	0-40	650	5000	M
Chloroform	8240(5030ext)/8260(5035ext)	2	62-117	0-40	130	2500	M
Chloromethane	8240(5030ext)/8260(5035ext)	2	10-186	0-65	600	5000	M
Dibromochloromethane	8240(5030ext)/8260(5035ext)	2	73-127	0-40	140	2500	M
1,1-Dichloroethane	8240(5030ext)/8260(5035ext)	2	64-112	0-40	140	2500	M
1,2-Dichloroethane	8240(5030ext)/8260(5035ext)	2	66-128	0-40	500	2500	M
cis-1,2-Dichloroethene	8240(5030ext)/8260(5035ext)	2	64-123	0-40	160	2500	M
trans-1,2-Dichloroethene	8240(5030ext)/8260(5035ext)	2	60-161	0-25	290	2500	M
1,1-Dichloroethene (MS)	8240(5030ext)/8260(5035ext)	2	44-157	0-25	390	2500	M
1,2-Dichloropropane	8240(5030ext)/8260(5035ext)	2	47-146	0-65	500	2500	M
cis-1,3-Dichloropropene	8240(5030ext)/8260(5035ext)	2	51-109	0-65	250	2500	M
trans-1,3-Dichloropropene	8240(5030ext)/8260(5035ext)	2	57-143	0-65	330	2500	M
Ethylbenzene	8240(5030ext)/8260(5035ext)	2	60-131	0-40	280	2500	M
2-Hexanone	8240(5030ext)/8260(5035ext)	2	47-145	0-40	1900	12500	M
Methylene chloride	8240(5030ext)/8260(5035ext)	2	61-149	0-65	330	2500	M
4-Methyl-2-pentanone (MIBK)	8240(5030ext)/8260(5035ext)	2	64-167	0-49	1600	12500	M
Styrene	8240(5030ext)/8260(5035ext)	2	56-121	0-40	2220	2500	M
1,1,2,2-Tetrachloroethane	8240(5030ext)/8260(5035ext)	2	36-157	0-40	400	2500	M
Tetrachloroethene	8240(5030ext)/8260(5035ext)	2	61-142	0-40	220	2500	M
Toluene (MS)	8240(5030ext)/8260(5035ext)	2	67-142	0-25	240	2500	M
1,1,1-Trichloroethane	8240(5030ext)/8260(5035ext)	2	11-148	0-40	490	2500	M
1,1,2-Trichloroethane	8240(5030ext)/8260(5035ext)	2	66-123	0-40	330	2500	M
Trichloroethene (MS)	8240(5030ext)/8260(5035ext)	2	41-134	0-25	360	2500	M
Vinyl chloride	8240(5030ext)/8260(5035ext)	2	18-169	0-65	490	5000	M
Xylenes (total)	8240(5030ext)/8260(5035ext)	2	50-150	0-40	750	2500	M
o-Xylene	8240(5030ext)/8260(5035ext)	2	22-154	0-40	250	2500	M
m+p-Xylene	8240(5030ext)/8260(5035ext)	2	62-123	0-40	500	2500	M
Surrogate - Toluene-d8	8240(5030ext)/8260(5035ext)	2	58-148	NA	NA	NA	M
Surrogate - p-Bromofluorobenzene	8240(5030ext)/8260(5035ext)	2	70-136	NA	NA	NA	M
Surrogate -Dibromofluoromethane	8240(5030ext)/8260(5035ext)	2	66-148	NA	NA	NA	M
Surrogate - 1,2-Dichlorobenzene-d4	8240(5030ext)/8260(5035ext)	2	70-130	NA	NA	NA	M

ext= 1g of waste to 10mL methanol; analyze 0.10mL of extract (equivalent to 0.010g of sample)

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
Acenaphthene (MS)	8270(3580)	2	28-102	0-25	3900	100000	M
Acenaphthylene	8270(3580)	2	54-140	0-25	3900	100000	M
Anthracene	8270(3580)	2	48-130	0-30	3600	100000	M
Benzo(a)anthracene	8270(3580)	2	42-143	0-25	2900	100000	M
Benzoic acid	8270(3580)	2	10-150	0-50	6300	500000	M
Benzo(b)fluoranthene	8270(3580)	2	49-123	0-25	5100	100000	M
Benzo(k)fluoranthene	8270(3580)	2	24-137	0-38	3900	100000	M
Benzo(g,h,i)perylene	8270(3580)	2	10-219	0-50	5700	100000	M
Benzo(a)pyrene	8270(3580)	2	44-141	0-29	3300	100000	M
Bis(2-chloroethoxy) methane	8270(3580)	2	33-184	0-50	9000	100000	M
Bis(2-chloroethyl) ether	8270(3580)	2	12-158	0-50	2900	100000	M
Bis(2-chloroisopropyl) ether	8270(3580)	2	36-166	0-50	3000	100000	M
Bis(2-ethylhexyl) phthalate	8270(3580)	2	10-158	0-40	14000	100000	M
4-Bromophenyl phenyl ether	8270(3580)	2	53-127	0-40	3300	100000	M
Butyl benzyl phthalate	8270(3580)	2	10-152	0-40	9000	100000	M
Carbazole	8270(3580)	2	10-150	0-50	4200	100000	M
4-Chloroaniline	8270(3580)	2	10-150	0-50	5100	200000	M
4-Chloro-3-methylphenol (MS) (p-Chloro-m-cresol)	8270(3580)	2	31-123	0-25	3000	100000	M
2-Chloronaphthalene	8270(3580)	2	60-118	0-40	3300	100000	M
2-Chlorophenol (MS)	8270(3580)	2	29-108	0-25	3300	100000	M
4-Chlorophenylphenyl ether	8270(3580)	2	25-158	0-33	3000	100000	M
Chrysene	8270(3580)	2	40-148	0-27	3600	100000	M
2-Methyl phenol (o-Cresol)	8270(3580)	2	10-150	0-50	3900	100000	M
3-Methyl phenol (m-Cresol)	8270(3580)	2	10-150	0-50	18000	100000	M
4-Methyl phenol (p-Cresol)	8270(3580)	2	10-150	0-50	18000	100000	M
Dibenz(a,h)anthracene	8270(3580)	2	40-147	0-28	4500	100000	M
Dibenzofuran	8270(3580)	2	10-150	0-50	3600	100000	M
Di-n-butylphthalate	8270(3580)	2	10-118	0-50	4500	100000	M
1,2-Dichlorobenzene	8270(3580)	2	32-129	0-40	3300	100000	M
1,3-Dichlorobenzene	8270(3580)	2	10-172	0-42	2600	100000	M
1,4-Dichlorobenzene (MS)	8270(3580)	2	20-114	0-40	3300	100000	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY* (% Rec)	PRECISION* (% RPD)	MDL** (ug/kg)	RLA (ug/kg)	TCV
3,3'-Dichlorobenzidine	8270(3580)	2	10-262	0-100	4800	200000	M
2,4-Dichlorophenol	8270(3580)	2	39-135	0-40	3000	100000	M
Diethylphthalate	8270(3580)	2	10-114	0-40	4500	100000	M
2,4-Dimethylphenol	8270(3580)	2	15-151	0-25	3000	100000	M
Dimethylphthalate	8270(3580)	2	10-112	0-40	3300	100000	M
4,6-Dinitro-2-methylphenol	8270(3580)	2	10-181	0-93	8700	500000	M
2,4-Dinitrophenol	8270(3580)	2	10-167	0-87	6600	500000	M
2,4-Dinitrotoluene (MS)	8270(3580)	2	25-128	0-30	3900	100000	M
2,6-Dinitrotoluene	8270(3580)	2	50-158	0-40	4800	100000	M
Diphenylamine/ N-nitrosodiphenylamine	8270(3580)	2	10-150	0-50	29000	100000	M
Fluoranthene	8270(3580)	2	54-135	0-21	3300	100000	M
Fluorene	8270(3580)	2	59-121	0-40	3600	100000	M
Hexachlorobenzene	8270(3580)	2	10-152	0-40	3000	100000	M
Hexachlorobutadiene	8270(3580)	2	24-116	0-40	3300	100000	M
Hexachlorocyclopentadiene	8270(3580)	2	10-150	0-50	5400	100000	M
Hexachloroethane	8270(3580)	2	40-113	0-40	3900	100000	M
Indeno(1,2,3-cd)pyrene	8270(3580)	2	18-157	0-83	6000	100000	M
Isophorone	8270(3580)	2	21-196	0-60	3600	100000	M
2-Methylnaphthalene	8270(3580)	2	10-150	0-50	2800	100000	M
Naphthalene	8270(3580)	2	53-125	0-25	3300	100000	M

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES, AND METHOD DETCTIN LIMIITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (prep)	REF	ACCURACY* (%Rec)	PRECISION * (%RPD)	MDL** (ug/kg)	RLA (ug/kg	TCV
2-Nitroaniline	8270(3580)	2	10-150	0-50	4200	500000	
3-Nitroaniline	8270(3580)	2	10-150	0-50	3300	500000	M
4-Nitroaniline	8270(3580)	2	10-150	0-50	3900	500000	M
Nitrobenzene	8270(3580)	2	35-180	0-40	3900	100000	M
2-Nitrophenol	8270(3580)	2	29-182	0-40	2400	100000	M
4-Nitrophenol (MS)	8270(3580)	2	10-125	0-45	9000	500000	M
N-Nitroso-di-n-propylamine (MS)	8270(3580)	2	27-140	0-35	4200	100000	M
Pentachlorophenol (MS)	8270(3580)	2	10-111	0-44	8400	500000	M
Phenanthrene	8270(3580)	2	56-129	0-25	3600	100000	M
Phenol (MS)	8270(3580)	2	26-108	0-25	5700	100000	M
Pyrene (MS)	8270(3580)	2	24-155	0-25	3300	100000	M
1,2,4-Trichlorobenzene (MS)	8270(3580)	2	23-124	0-28	3300	100000	M
2,4,5-Trichlorophenol	8270(3580)	2	39-123	0-27	3900	100000	M
2,4,6-Trichlorophenol	8270(3580)	2	37-144	0-40	2800	100000	M
Surrogate - Nitrobenzene-d5	8270(3580)	2	21-98	NA	NA	NA	M
Surrogate - 2-Fluorobiphenyl	8270(3580)	2	29-99	NA	NA	NA	M
Surrogate - p-Terphenyl-d14	8270(3580)	2	22-136	NA	NA	NA	M
Surrogate - Phenol-d5	8270(3580)	2	28-105	NA	NA	NA	M
Surrogate - 2-Fluorophenol	8270(3580)	2	18-107	NA	NA	NA	M
Surrogate - 2,4,6 -Tribromophenol	8270(3580)	2	12-122	NA	NA	NA	M

Waste dilution extraction : 1g of sample ot a final volume of 10mL with appropriate solvent.

TABLE 5.7 LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WASTES AND OILY SAMPLES

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (ug/kg)	RL^ (ug/kg)	TC~
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	8280	2	69-145	0-40	1.3	50	M
	8270 (Qual. Screen)	2	NA	NA	330	330	M
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes							
tetra-CDD	8280	2	69-145	0-40	1.2	50	M
tetra-CDF	8280	2	59-142	0-40	0.40	50	M
penta-CDD	8280	2	41-203	0-40	0.89	50	M
penta-CDF	8280	2	55-146	0-40	0.68	50	M
hexa-CDD	8280	2	45-174	0-53	1.3	50	M
hexa-CDF	8280	2	50-154	0-46	0.51	50	M
hepta-CDD	8280	2	20-170	0-50	1.3	100	M
hepta-CDF	8280	2	20-170	0-50	0.63	100	M
octa-CDD	8280	2	20-170	0-50	1.4	100	M
octa-CDF	8280	2	20-170	0-50	1.3	100	M
Internal Standard - 13C12-2,3,7,8-TCDD	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-2,3,7,8-TCDF	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,6,7,8-HxCDD	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-1,2,3,4,6,7,8-HpCDF	8280	2	25-150	NA	NA	NA	M
Internal Standard - 13C12-OCDD	8280	2	25-150	NA	NA	NA	M

TABLE 5.8 FIELD ANALYTICAL METHODS, QA OBJECTIVES AND METHOD DETECTION LIMITS (MDL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REF	ACCURACY * (% Rec)	PRECISION * (% RPD)	MDL** (mg/L)	RLA (mg/L)	TCV
Chlorine, residual	4500-Cl F	4	NA	0-40	NA	0.05	
	330.5/4500-Cl-G (Hach8021)	3/4	NA	0-40	NA	0.05	
Hydrogen ion (pH)	150.1/9040	3/2	85-115	0-15	NA	NA	M
Oxygen (dissolved)	360.1	3	NA	0-30	NA	0.20	
Salinity	2520B	4	NA	NA	NA	100	
Specific conductance	120.1/9050	3/2	90-110	0-10	0.26 µS/cm	1.0 µS/cm	M
Temperature	170.1	3	NA	0-10	NA	NA	
Turbidity	180.1/2130B	3/4	60-140	0-30	0.008 NTU	0.10 NTU	M
Water level	EPA	12	NA	0-5	NA	0.01 ft	
Sulfite	4500-SO_3^{2-}B	4	75-125	0-30	NA	1.0	M
	377.1	3	75-125	0-30	NA	1.0	M

REFERENCES AND NOTES FOR TABLES 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8

* Accuracy data are presented as recoveries for spikes or surrogates. For routine analysis of organics, percent recoveries are evaluated only on the subset spike compound lists specified by the methods. The routine matrix and laboratory control spike compounds are designated by an (MS) following the parameter name. Precision data are presented as relative percent difference (% RPD) and are advisory; i.e., not used for laboratory control. Since reportable levels (above detection limit) for most of the organic parameters may not be detected in all environmental samples, precision is usually based on duplicate spike data and evaluated according to method requirements.

Accuracy and precision control limits are primarily derived from in-house laboratory data. Some accuracy and precision limits have been rounded to the nearest "5". In some cases, method limits may be used in lieu of in-house limits because in-house limits are broader than the method limits or are too broad to be usable. These cases include all metals methods, certain of the 500-series methods, method 8015 DAI, and all 600 series methods.

** Method Detection Limit

A Routine Reporting Limit (also referred to as quntitation limt or pratical quantitation limit(PQL).)

∀ Target Concentration

QA target concentration is the spike level used to develop the accuracy and precision data contained in the tables. All target data in Table 5.1 - 5.8 have been developed from medium level concentration spikes, and designated with an "M." Medium spike levels are levels between 21 and 80% of the calibration curve or at the level which is specified in the method.

NA Not Applicable

-T (Trace ICP) No modification of method 200.7/6010 has been made to achieve the lower detection limit. This detection limit is achievable due to the configuration of the torch, which is horizontal rather than vertical, thus, increasing the light path and sensitivity.

SIM Selected ion monitoring. Savannah Laboratories has verified that the analytes listed can be determined using this procedure.

∀∀ Employs the use of the low level salting out method as described in SW-8330, Section 2.2.

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6.0 SAMPLING PROCEDURES

When Savannah Laboratories is contracted to provide sampling services, a field crew is assigned to each project. Each crew is composed of experienced field sampling technicians and a highly qualified field sampling manager, who is trained in EPA protocols for groundwater and other environmental sampling. On numerous past projects, these managers have had their field sampling techniques critiqued by Florida DEP personnel, Georgia EPD personnel, Alabama ADEM, South Carolina DHEC, and EPA Region IV field coordinators. The field sampling crews at Savannah Laboratories are responsible for collection, handling, field screening, documentation, and packaging and shipment of samples to the lab in accordance with client requests..

The crew adheres to the sampling protocol defined by the appropriate regulatory agency or the requirements defined in the project sampling plan (QAPjP). In some cases, sampling procedures may be modified to comply with client's project requirements.

6.1 Sampling Capabilities

Savannah Laboratories has the capability for sampling groundwater, surface water, wastewater, soils, sediments/sludges, drinking water, and tissues for the following analyte classes:

Analyte Class	Sample Source
Volatile Organics (VOAs)	Drinking water, groundwater, surface water, wastewater, soils, sediments, fish, shellfish, plant and animal tissues, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Extractable Organics	Drinking water, groundwater, surface water, wastewater, soils, sediments, fish, shellfish, plant and animal tissues, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Metals	Drinking water, groundwater, surface water, wastewater, soils, sediments, fish, shellfish, plant and animal tissues, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Radionuclides	Drinking water, groundwater, surface water, wastewater, soils, and sediments
Microbiology	Drinking water, groundwater, surface water, wastewater, soils, sediments and tissues
Cyanide/Sulfide	Drinking water, groundwater, surface water, wastewater, soils, sediments, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Inorganic Anions(1)	Drinking water, groundwater, surface water, wastewater, soils, sediments, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Organics: TOC, COD, BOD, Total Recoverable Petroleum Hydrocarbons, Oil & Grease, Phenolics, MBAS	Drinking water, groundwater, surface water, wastewater, soils, sediments, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.
Physical Properties: Color, Specific Conductance, Hardness, Odor, pH, Residues, Temperature, Turbidity	Drinking water, groundwater, surface water, wastewater, soils, sediments, liquid hazardous wastes, sludges, solid and hazardous wastes, and domestic waste sludges.

Footnotes:

(1) Nitrogen, Phosphorus Series; Bromide, Chloride, Chlorine, Iodide, Sulfate, Sulfite, Acidity, Alkalinity, DO, IC Parameters

6.2 Sampling Equipment

The following is a list of equipment and the sample preservation reagents employed by Savannah Laboratories' field samping crews.

Routinely Used Equipment	Use
Ice chests, Styrofoam or insulated plastic	Sample container and sample transport
Sampling vehicles	Sample container and sample transport
Field thermometer	Field measurement of temperature
Field pH meter	Field measurement of pH
Field conductivity meter	Field measurement of conductivity
Electronic water level indicator	Well volume calculation
Stainless steel tape measure	Well volume calculation
Nylon, monofilament, or polypropylene line	Well volume calculation
Sheet plastic	Contamination control
Aluminum foil	Contamination control
Plastic or metal buckets	Collection of purge water or cleaning wastes
Cleaning brushes	Equipment decontamination
Liquinox detergent in original container	Equipment decontamination
Analyte-free water contained in contaminant-free glass or plastic bottles	Equipment decontamination
Isopropyl alcohol (nanograde) contained in contaminant-free glass bottles or Teflon squeeze bottles	Equipment decontamination
10% Nitric acid (metals grade) contained in contaminant-free glass bottles	Equipment decontamination (except for stainless steel equipment)
Glass or plastic bottles and dispensers	Equipment decontamination
Glass or plastic jugs	Transport of cleaning wastes
Field carrier (covered, divided tray or box)	Transport of preservation reagents
Narrow range pH paper	Field-check of sample preservation
Disposable pipettes glass (organic) and plastic (inorganic)	Addition of preservation reagents
Standard buffer solutions (pH 4, 7, and 10)	Calibration of field pH meter
Standard KCl solution (100, 500, 1000, 1413, 12880 micro ohms/cm)	Calibration check of field conductivity and salinity meter
Disposable unpowdered latex gloves	Contamination control
Ice	Sample preservation
Sealing Tape	Sealing sample containers (except VOA vials)
Shipping labels and forms	Shipping samples
Sample container labels	Labeling samples
Bubble pack	Packing samples
Clothing and goggles	Sampling safety
Notebooks	Documentation
Waterproof pens, markers	Documentation, labeling
Custody seals	Monitor for tampering
Custody forms	Document custody
Camera	Document site

Routinely Used Equipment	Use
Calculator	Calculations
Site maps	Determine locations
SOPs	Reference procedures
MSDS Sheet on all chemicals	Safety emergency
Turbidity meter with 0.75, 10 and 100 NTU Standards	Field measurement of turbidity
Chlorine test kit with pocket colorimeter	Field determination of chlorine
Sulfite test kit with calibrated burets	Field determination of sulfite
Paper towels	General use

Preservation Reagents	Grade
HCl, 1:1	Metals grade, pre-assayed
HNO_3, 1:1	Metals grade, pre-assayed
H_2SO_4, 1:1	Metals grade, pre-assayed
NaOH	ACS reagent grade
$Na_2S_2O_3$, 10%; 0.008%	ACS reagent grade
$Zn(C_2H_3O_2)_2$, 2 N	ACS reagent grade
Ascorbic acid, neat; 0.06%	ACS reagent grade
Chloroacetic acid	ACS reagent grade

6.3 Container Preservation Techniques

Tables 6.1 and 6.2 list the preservation techniques, types of containers, and recommended holding times for analytical parameters.

TABLE 6.1

CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Bacterial Tests:			
Coliform, total in drinking water	120-mL P or Whirl-Paks	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	30 hours
Coliform, fecal and total	120-mL P or Whirl-Paks	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	6 hours
Fecal coliform in sludge	120-mL P or Whirl-Paks	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	24 hours
Fecal streptococci	120-mL P or Whirl-Paks	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	6 hours
Inorganic Tests:			
Acidity	250-mL P	Cool, 4°C	14 days
Alkalinity	250-mL P	Cool, 4°C	14 days
Ammonia	100-mL P	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Biochemical oxygen demand (including carbonaceous)	1-L P	Cool, 4°C	48 hours
Bromide	100-mL P	None required	28 days
Chemical oxygen demand	100-mL P	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Chloride	100-mL P	None required	28 days
Chlorine, total residual	250-mL	None required	Analyze immediately
Color	250-mL P	Cool, 4°C	48 hours
Cyanide, total and amenable to chlorination	1-L P	Cool, 4°C, NaOH to pH > 12, 0.6 g ascorbic acid	14 days[6]
Fluoride	100-mL P	None required	28 days
Hardness	250-mL P	HNO_3 to pH < 2, H_2SO_4 to pH < 2	6 months
Hydrogen ion (pH)	100-mL P	None required	Analyze immediately
Iron, Ferrous	250-mL P	HCl (2ml per 100mL)	Analyze immediately[16]
Kjeldahl and organic nitrogen	250-mL P	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Chromium VI	250-mL P	Cool, 4°C	24 hours
Mercury[7]	130-mL G	HNO_3 to pH < 2	28 days
Metals[7], except chromium VI and mercury	250-mL P or 500-mL P (ICP or AA)	HNO_3 to pH < 2	6 months
Metals, Cu and Pb in drinking water	1-L P	HNO_3 to pH < 2	6 months
Nitrate	100-mL P	Cool, 4°C	48 hours
Nitrate-nitrite	100-mL P	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Nitrite	100-mL P	Cool, 4°C	48 hours
Organic carbon - EPA 415.1 (Combustion or oxidation)	125-mL amber G	Cool, 4°C, HCl to pH < 2	28 days
Orthophosphate	100-mL P	Filter immediately, cool, 4°C	48 hours

TABLE 6.1

CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Oxygen, dissolved (electrode)	G bottle & top	None required	Analyze immediately
Oxygen, dissolved (Winkler)	G bottle & top	Fix on site and store in dark	8 hours
Phenolics, Total Recoverable	1-L amber	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Phosphorus, total	250-mL P	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Residue, total	500-mL P	Cool, 4°C	7 days
Residue, filterable (TDS)	250-mL P	Cool, 4°C	7 days
Residue, nonfilterable (TSS)	500-mL P	Cool, 4°C	7 days
Residue, settleable	500-mL P	Cool, 4°C	48 hours
Residue, volatile (VSS)	500-mL P	Cool, 4°C	7 days
Silica	250-mL P	Cool, 4°C	28 days
Specific Conductance	100-mL P	Cool, 4°C	28 days
Sulfate	100-mL P	Cool, 4°C	28 days
Sulfide	250-mL P	Cool, 4°C, zinc acetate	7 days
Sulfite	100-mL P	None required	Analyze immediately
Surfactants	250-mL P	Cool, 4°C	48 hours
Temperature	100-mL P	None required	Analyze immediately
Turbidity	250-mL P	Cool, 4°C	48 hours
Organic Tests:[8,9]			
Purgeable halocarbons	3 X 40-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] or 0.06% ascorbic acid[5]	14 days
Purgeable aromatic hydrocarbons	3 X 40-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] or 0.06% ascorbic acid[5],HCl to pH < 2[10]	14 days (7 days if unpreserved)
Acrolein and acrylonitrile	3 X 40-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], adjust pH to 4-5[10] or 0.06% ascorbic acid[5]	14 days (3 days if the pH is not adjusted)
Phenols[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days
Benzidines[11,12]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days[14]
Phthalate esters[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
Nitrosamines[11,14]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days

TABLE 6.1

CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Pesticides[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, pH 5-9[15]	Extraction-7 days Analysis-40 days
PCBs[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
Nitroaromatics and isophorone[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark	Extraction-7 days Analysis-40 days
Polynuclear aromatic hydrocarbons[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days
Haloethers[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days
Microextractables	2 X 40-mL G Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	14 days
Endothall	1-L amber G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-14 days
Chlorinated hydrocarbons[11]	2 X 1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
TCDD[11] (8280)	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-30 days Analysis-45 days of collection
TCDD[11] (613)	2 X 1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days of collection
Total organic halogens	500-mL amber G, Teflon-lined cap	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Absorbable organic halides (AOX)	500-mL amber G, Teflon-lined cap	Cool, 4°C, HNO_3 to pH <2	6 months
Total petroleum hydrocarbons	500-mL G, Teflon-lined cap	Cool, 4°C, HCl to < 2	28 days
Phenols, total recoverable	1-L G	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Oil and grease	2 X 500-mL G	Cool, 4°C, H_2SO_4 or HCl to pH < 2	28 days
N-Methylcarbamoyloximes and N-Methylcarbamates	125-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], monochloroacetic acid to pH < 3	Analysis - 28 days if pH adjusted
Glyphosate	125-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], store in dark	Analysis - 14 days, 18 months if frozen
Diquat and Paraquat	500-mL high density foil wrapped PCB, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], NaOH or H_2SO_4 to pH < 2, store in dark	Extraction - 7 days Analysis - 21 days

TABLE 6.1

CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Benomyl and Carbendazim	1-L amber G, Teflon-lined cap	Cool, 4°C	Extraction - 7 days Analysis - 40 days
Carbamate and Urea Pesticides	1-L amber G, Teflon-lined cap	Cool, 4°C	Extraction - 7 days Analysis - 40 days
Oryzalin	1-L amber G, Teflon-lined cap	Cool, 4°C NaOH or H_2SO_4 to pH 6-8	Extraction - 7 days Analysis - 40 days
Carbonyl Compounds	2 X 125-mL amber G, Teflon-lined cap	Cool, 4°C	Derivatization and extraction - 3 days Analysis - 3 days
N-Methylcarbamates	2 X 125-mL amber G, Teflon-lined cap	Cool, 4°C, monochloroacetic acid to pH 4-5, store in dark	Extraction - 7 days Analysis - 40 days
Nitroaromatics and Nitroamines	1-L amber G, Teflon-lined cap	Cool, 4°C, store in dark	Extraction - 7 days Analysis - 40 days
Asulam	125-mL G, Teflon-lined septum	Cool, 4°C	21 days
Ethylenethiourea	125-mL G, Teflon-lined septum	Cool, 4°C, store in dark	Extraction - 7 days Analysis - 21 days
Thiodiglycol	125-mL G, Teflon-lined septum	Cool, 4°C	Extraction - 7 days Analysis - 40 days
Acrylamide (8316)	40-mL G, Teflon-lined septum	Cool, 4°C, dark	Extraction - 7 days Analysis - 40 days
Acrylic Acid	40-mL G, Teflon-lined septum	Cool, 4°C, dark	Extraction - 7 days Analysis - 40 days
Maleic Acid/Maleic anhydride	40-mL G, Teflon-lined septum	Cool, 4°C, dark	Extraction - 7 days Analysis - 40 days
Phthalic Acid/Phthalic Anhydride	40-mL G, Teflon-lined septum	Cool, 4°C, dark	Extraction - 7 days Analysis - 30 days
Nitrocellulose	1-L amber G	Cool, 4°C, dark	Filtration - 7 days Analysis - 40 days
Resorcinol	40-mL G, Teflon-lined septum	Cool, 4°C, dark	Extraction - 7 days Analysis - 40 days
Radiological Tests:			
Alpha, Beta	1-L P	HNO_3 to pH < 2	6 Months
Radium - 226, -228	4-L P	HNO_3 to pH < 2	6 Months
Tritium	1-L P	None Required	6 Months

1. Polyethylene (P) or Glass (G). In cases where more than one inorganic parameter with the sample preservative is required, a single sample container of sufficient size for all analyses is usually preferred. Such grouping of parameters will be indicated when bottles are provided for client sampling.

2. Sample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, samples may be preserved by maintaining at 4° C until compositing and sample splitting are completed.
3. When any sample is to be shipped by common carrier or sent through the United States mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before preparation and/or analysis. Project-specific data quality objectives determine if results on samples for which holding times have been exceeded are considered unuseable.
5. Sodium thiosulfate or ascorbic acid may be used only if residual chlorine is present. The dechlorination agent and hydrochloric acid must not be combined in pre-preserved vials.
6. Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.
7. Samples should be filtered immediately on-site before adding preservative for dissolved metals.
8. Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.
9. Sample receiving no pH adjustments must be analyzed within seven days of sampling.
10. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.
11. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4° C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in Footnote 5 (re: the requirement for thiosulfate reduction of residual chlorine), and Footnotes 12 and 13 (re: the analysis of benzidine).
12. If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.
13. Extracts may be stored up to seven days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.
14. For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 within 24 hours of sampling.
15. The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.
16. Ferrous iron should be analyzed for at the sampling site. When this is not possible, 2 samples should be collected, 1-250mL sample preserved with HCl and 1-250mL sample unpreserved.

TABLE 6.2

CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR SOIL OR SEDIMENT SAMPLES

PARAMETER	SAMPLE CONTAINER	SAMPLE PRESERVATION	RECOMMENDED HOLDING TIMES
Acrylamide	100-mL G, Teflon-lined Lid	Cool to 4°C, dark	Extraction - 14 days Analysis - 40 days
Alpha, beta	100-mL P	None Required	6 Months
Benomyl and carbendazim	100-mL G, Teflon-lined Lid	Cool to 4°C	Extraction - 14 days Analysis - 40 days
Carbamate and Urea Pesticides	100-mL G, Teflon-lined Lid	Cool to 4°C	Extraction - 14 days Analysis - 40 days
Carbonyl Compounds	100-mL G, Teflon-lined Lid	Cool to 4°C	Derivatization and extraction - 3 days Analysis - 3 days
Cyanide	250-mL P	Cool to 4°C	14 days
Cyromazine	100-mL G, Teflon-lined Lid	Cool to 4°C, dark	Extraction - 14 days Analysis - 40 days
Ethylenethiourea	100-mL G, Teflon-lined Lid	Cool to 4°C, dark	Extraction - 14 days Analysis - 40 days
Mercury	250-mL P	Cool to 4°C	28 days
Metals (except Mercury)	500-mL P	Cool to 4°C	6 months
Nitrocellulose	500-mL amber G	Cool to 4°C, dark	Preparation - 40 days Analysis - 24 hours
Nutrients/TOC	250-mL P	Cool to 4°C	28 days
Oil & grease, Total petroleum hydrocarbons	250-mL G	Cool to 4°C	28 days
Oryzalin	100-mL G, Teflon-lined Lid	Cool to 4°C	Extraction - 14 days Analysis - 40 days
Phthalic acid/Phthalic anydride	100-mL G, Teflon-lined Lid	Cool to 4°C, dark	Extraction - 14 days Analysis - 40 days
Semivolatile organics	500-mL G, Teflon-lined Lid	Cool to 4°C, dark	Extraction-14 days Analysis-within 40 days of extraction
Sulfide	250-mL P	Cool to 4°C	7 days
Thiodigycol	100-ml G, Teflon-lined Lid	Cool to 4°C, dark	Extraction - 14 days Analysis - 40 days
Volatile organics	125-mL amber G, Teflon-lined Lid	Cool to 4°C, dark	14 days

TABLE 6.3

APPROVED WATER AND WASTEWATER PROCEDURES, CONTAINERS, PRESERVATION AND HOLDING TIMES FOR PARAMETERS NOT FOUND IN 40 CFR 136

Parameter	Method	Reference[1]	Container[2]	Preservation[3]	Maximum Holding Times[4]
Bromate	Ion Chromatography	EPA-SOP (300.0)[5]	P, G	Cool, 4 C	28 days
Carbon dioxide	Titration	4500-CO2-C	P, G	Cool, 4 C	Analyze immediately
Carbon dioxide	Calculation	4500-CO2-D	P, G	Cool, 4 C	14 days
Chlorophyll	Spectrophotometric	SM 10200H	P, G[6]	30 d in dark	30 days
Corrosivity	Calculated ($CaCO_3$ Stability, Langlier Index)	SM 2330 ASTM 0513-82	P, G	Cool, 4 C	7 days[7]
Odor	Human Panel	SM 2150	G only	Cool, 4 C	6 hours
ReDOX Potential	Electrometric	D1498-76	P, G	Cool, 4 C	Analyze immedaitely
Salinity	Electrometric[8]	SM 2520B	G, wax seal	Analyze immediately or use wax seal	6 months
Transparency	Irradiometric[9]	17-3.021 FAC	—	—	Analyze in-situ
Organic Pesticides	GC and HPLC	EPA (600-Series)[10]	"	"	"

1. SM XXX = procedures from "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WEF, 18th Edition, 1995.
2. P = plastic, G = glass
3. When specified, sample preservation should be performed immediately upon sample collection.
4. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
5. "Determination of Inorganic Disinfection By-Products by Ion Chromatography, Method 300.0" by John D. Pfaff and Carol A. Brockoff, U.S. EPA, Cincinnati, Ohio.
6. Collect sample in opaque bottles and process under reduced light. Samples on filters taken from water having pH 7 or higher may be placed in airtight plastic bags and stored frozen for up to three weeks. Samples from acidic water must be processed promptly to prevent chlorophyll degradation.
7. Temperature and pH must be measured on site at the time of sample collection. Seven days is the maximum time for laboratory analysis of total alkalinity, calcium ion and total dissolved solids.
8. The electrometric analytical method is employed for field analysis. The argentometric method is suited for laboratory use. Samples collected for laboratory analysis, when properly sealed with paraffin waxed stopper, may be held indefinitely. The maximum holding time of 30 days is recommended as a practical regulatory limit.
9. Transparency in surface waters is defined as a compensation point for photosynthetic activity, i.e., the depth at which one percent of the light intensity entering at the water surface remains unabsorbed. The DER rule 17-3 FAC requires that the light intensities at the surface and subsurface be measured simultaneously by irradiance meters such as the Kahlsico Underwater Irradiometer, Model No. 268 WA 310, or an equivalent device having a comparable spectral response.
10. Other pesticides listed in approved EPA methods (608.1, 608.2, 614, 614.1, 615, 617, 618, 619, 622, 622.1, 627, 629, 631, 632, 632.1, 633, 643, 644 and 645) which are not included in Table 1D of 40 CFR Part 136 (July 1989).
11. Container, preservation and holding time as specified in each individual method shall be followed.

6.4 Analyte-Free Water

Analyte-free water used in cleaning and field QC samples is defined as water from any source which exhibits no interferences or analytes of interest above the applicable MDLs.

Analyte-free water may be obtained from the following sources, but is not limited to these sources.

Laboratory deionized: most inorganics

Laboratory deionized with Milli-Q-type polishing: all analytes

Sterilized laboratory deionized: microbiology

Deep well water: any analysis for which acceptability is demonstrated. This water may be purged with nitrogen for VOA determination.

Purchased distilled: any analysis for which acceptability is demonstrated

Analyte-free water is used as the final rinse in field or lab cleaning procedures, and for trip blanks, field blanks, equipment blanks, and laboratory blanks.

Documentation of analyte-free water sources is maintained via results of trip blanks, equipment blanks, laboratory blanks, control blanks, and container blanks.

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7.0 SAMPLE CUSTODY

7.1 Sample Custody Objectives

The primary objective of SL's sample chain-of-custody procedures is to provide accurate, verified, and traceable records of sample possession and handling from sample container shipment through laboratory receipt and sample disposition.

Evidence of documentation of sample collection, shipment, laboratory receipt and custody is accomplished utilizing a chain-of-custody record (Figure 7.1). A sample is considered in custody if it is:

- in actual possession of the sampler or transferee
- in view after being in physical possession of the sampler or transferee
- sealed so that sample integrity will be maintained while in possession of the sampler or transferee
- in a secured area, restricted to authorized personnel.

7.1.1 Custody Record Maintenance

Field and laboratory records, including copies of the chain-of-custody forms and associated field documentation, are maintained in a secure area with other associated project records. All field and laboratory data are recorded in bound notebooks and entries are made in waterproof ink. Field and laboratory data entry errors are deleted with a one-line strike through the error. Correction tape or other substances designed to obliterate documentation are strictly prohibited in the laboratory or custody areas. The correction is initialed and dated by the sampling or analytical staff member making the change. Field and laboratory information is documented on prepared forms. All forms for recording field and laboratory data include spaces for date and initials which must be completed by the data recorder. Field and laboratory documentation not recorded on prepared forms is also dated and initialed.

7.2 Sample Custody Procedures

All samples are recieved by the custody technician using custody procedures detailed in SL SOP CU01: *Receipt, Log Number Assignment, and Distribution of Field Samples.*

7.3 Laboratory and Field Custody Procedures

The following procedures apply to the custody activities observed by Savannah Laboratories during sample or legal custody procedures.

7.3.1 Selection and Preparation of Sample Containers Supplied to a Client or Sampling Team

Sample containers provided by SL are constructed from EPA-designated materials, contain EPA-prescribed preservatives and are affixed with an SL identification label (Figure 7.2). In order to monitor container temperature, a 100-mL plastic container labeled "Container Temperature- For Laboratory Use Only" is prefilled with tap water and supplied with each sample shipment to monitor sample temperature upon receipt.

Precleaned sample containers are purchased by Savannah Laboratories. Containers from each lot are precertified in-house prior to use. The lot number is affixed to each container for purposes of traceability.

Serial Number 51229

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

☐ 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
☐ 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-0504
☐ 414 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (954) 421-7400 Fax: (954) 421-2584
☐ 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
☐ 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
☐ 1100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

PROJECT REFERENCE	PROJECT NO.	P.O. NUMBER
PROJECT LOC. (State)	SAMPLER(s) NAME	PHONE / FAX
CLIENT NAME	CLIENT PROJECT MANAGER	
CLIENT ADDRESS (CITY, STATE, ZIP)		

MATRIX TYPE: AQUEOUS (WATER) / SOLID OR SEMI-SOLID / AIR / NONAQUEOUS LIQUID (specify)

REQUIRED ANALYSES — PAGE ___ OF ___

☐ STANDARD REPORT DELIVERY

☐ EXPEDITED REPORT DELIVERY (surcharge)

Date Due: _____

SAMPLE DATE	SAMPLE TIME	SL NO.	SAMPLE IDENTIFICATION	AQUEOUS (WATER)	SOLID OR SEMI-SOLID	AIR	NONAQUEOUS LIQUID (specify)	NUMBER OF CONTAINERS SUBMITTED										REMARKS

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
EMPTY CONTAINERS								
RECEIVED BY: (SIGNATURE)	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**	**RECEIVED BY: (SIGNATURE)**	**DATE**	**TIME**
EMPTY CONTAINERS								

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
			☐ YES ☐ NO			

FIGURE 7.1

FIGURE 7.2

Client _____

Sample ID _____

Location _____

Analysis _____

Preservative _____

Collection Date/Time _____

Collected By _____

7.3.2 Chain of Custody Documentation, Traceability, and Sample Integrity

Formal chain-of-custody procedures are initiated by a *custody technician* who is responsible for organization and relinquishment of sample containers to the client or field personnel.

All field information must be properly recorded on the chain-of-custody form. Proper completion of the form is the responsibility of the *field sampling manager or client* and is requested prior to relinquishment of the samples. If the site location is different from the client address, the site location is recorded in the "Project Name" space on the chain-of-custody form, or on the right hand side of the form if additional space is required. The sample identities assigned in the field are recorded in the "Sample Identification" column. Common carriers may identify themselves by signing the "Relinquished By" space on the chain-of-custody form.

For samples transported from the field to the laboratory by common carrier, chain of custody is maintained. Completed custody forms must accompany each sealed cooler, and are placed in a plastic bag and taped to the inside lid of the cooler. At the client's request, coolers are sealed in the field with the SL Custody Seal (Figure 7.3) or custody tape by the field sampling team to ensure that tampering will be immediately evident. A unique identification number is recorded on the seal and accompanying chain-of-custody form with waterproof ink.

The *custody technician* is responsible for the inspection of shipping containers upon laboratory receipt for overall integrity and to ensure that the contents have not been altered or tampered with during transit. If tampering is apparent, the sample receipt custodian immediately contacts the assigned *project manager* who is responsible for client notification. Any problem or abnormality detected is documented on an Anomaly Report (Figure 7.4), which is completed by the sample custody technician. Any corrective action required by the client is also documented.

If shipping containers arrive intact, they are immediately opened by the custody technician in the receiving area, and the chain-of-custody form and temperature container removed for inspection. Container temperature upon receipt is documented in a bound sample registry (Figure 7.5), or if requested by the client, documented on the chain-of-custody form.

7.3.3 Field Custody

When sample collection is performed by Savannah Laboratories, the SL field sampling manager is responsible for ensuring that chain-of-custody procedures for all sampling events are properly documented. The custody forms and login procedures follow the protocol outlined in Section 7.3.

Prior to field sampling, it is preferable to place waterproof sample labels on each sample container and complete each sample label with as much information as possible in waterproof ink. Field sampling technicians are responsible for ensuring that labels are completed. Each sample is identified in the field by a unique alphanumeric designation on the label.

All information included on each container label must be included on all field-generated records including: permanent field notebook, individual well log, groundwater elevation form, and chain-of-custody form. This field documentation demonstrates traceability of the containers and samples and links all ancillary records to specific sampling events.

FIGURE 7.3

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

OFFICIAL SAMPLE SEAL

SAMPLE ID

SIGNATURE

SEAL NO. DATE TIME

SEAL BROKEN BY

DATE

FIGURE 7.4

ANOMALY REPORT			
Date: _____	Log #: _____	Sample ID: _____	Client: _____
Dept: ___EX ___GE ___LC ___ME ___RA ___CU ___SG ___SM ___VG ___VM ___AI		Analysis: _____	Reported by: _____

Anomaly:

☐ Sample matrix is different than indicated by log-in.

Logged in as	*Best described as*
Water	*Water*
Soil	*Non-aqueous liquid*
Oil	*Soil*
	Sludge
	Oil
	Product
	Other _____

☐ Sample was received with inadequate preservation, and was preserved upon receipt.

☐ Sample received in an incompatible sample container. ___ *glass* ___ *plastic* ___ *other* _____

☐ MS/MSD failed while the LCS/LCSD passed criteria, for a drinking water parameter. Method indicates data flagging.

☐ Target analyte(s) detected in drinking water sample. (Describe below)

☐ Sample exhibits gross non-homogeneity. (Describe below)

☐ Insufficient sample received for analysis.

☐ Data flag may be needed. Discuss with DM/LM before reporting.

Other _____

Custody: *ALWAYS ATTACH A COPY OF COC WITH HIGHLIGHTED DEFICIENCY

☐ Sample description discrepancy between COC & Container
☐ Sample container breakage
☐ Cooler temp >6°C or frozen
☐ Sample received not listed on COC
☐ Custody seals broken
☐ Incomplete COC
☐ Sample container partially filled
☐ Improperly preserved sample

Comments:	Client Notified: ☐Yes ☐No Contact:
	Date:
	Resolution:

Route to:
Division PM:

Other Div. PM: SL_____ ML_____ NL_____ FL_____ TL_____ BL_____

FIGURE 7.5

SL SAMPLE REGISTRY

SL LOG NO.	TIME RECEIVED	DATE RECEIVED	DELIVERED BY	CLIENT ID	AQUEOUS												NONAQUEOUS								ADDITIONAL SAMPLE INFORMATION	CONTAINER TEMP.	NOTIFY CLIENT	LOGIN COMPUTER	DATE REPORTED
					L n/m plastic	L n/m amber glass w/TFE	500 mL n/m plastic	500 mL n/m amber glass	250 mL n/m plastic	250 mL n/m nalgene	125 mL n/m amber glass w/-TE	100 mL n/m plastic	40 mL vial w/TFE			L w/m glass	L w/m plastic	500 mL w/m glass	500 mL w/m plastic	250 mL w/m plastic	125 mL n/m amber glass w/-TE	100 mL w/m glass	250 mL n/m glass					

Each sample is packed to ensure against leakage or breakage and to maintain individual sample integrity. All glass containers are secured individually with bubble wrap. All VOA sample vials are wrapped twice in bubble wrap and each set is sealed in a separate plastic bag. An attempt should be made by the field sampling team to precool samples to 4° C prior to packing the sample coolers for shipment. Cooler temperature is maintained at 4° C in transit by adding sufficient quantities of ice dispersed throughout the cooler. Additional information regarding sampling can be found in Section 6.0 and the appropriate SL SOPs.

When applicable to the site, the following information is documented by the field technicians in the bound field notebook. This field documentation is reviewed, approved and initialed by the field sampling manager prior to client submission.

Site location
Date/time of sampling
Sample identification (including specific location)
Sample sequence number
Site conditions
Weather conditions
Description of QC samples collected
Names of personnel/visitors
Sampling/purging equipment used
Field analysis data
Field decontamination techniques
Well casing composition and diameter
Drilling/boring method
Drilling well type/name
Water table and well depth
Purge volume calculations
Volume of water purged
Date/time of purging
Analytical data to monitor stabilization of well
Use of fuel powered units
Plumbing/tap material construction
Purging flow rate
Purging time
Flow rate at sample collection
Depth samples taken
Beginning/ending time for composite sampling
Depth soil samples taken
Soil sampling technique used
Type/description of drums
Phases sampled in drums

More complete information is provided regarding sampling procedures and documentation in Section 6.

7.3.4 Sample Documentation, Identification, and Login

A sequential laboratory identification number is assigned by division to the project and recorded on the chain-of-custody form, on each sample container submitted with the project and in the bound Sample Registry. Accurate and complete sample documentation must be provided on the chain-of-custody form in order to log samples into the sample registry. The sample registry includes all information necessary to maintain chain of custody including laboratory ID, client (field) ID, and initials of the custody technician. Ancillary information such as sample collection date and requested analyses is transferred directly from the chain-of-custody form into the LIMS, and appears on the client project-specific acknowledgement.

Once the chain of custody is verified, the project identified by this unique number is logged into the computerized LIMS (Figure 12.1) to transfer the desired work order request to the laboratory. The custody technician checks each sample against the chain-of-custody form for discrepancies between information on the sample label and information provided on the chain-of-custody form. The custody technician also inspects all samples for leakage or obvious seal tampering (if provided). All samples are unpacked in a well-ventilated sample receipt area. Face shields are available to each sample receipt staff member for use with any hazardous samples. Samples received in plastic containers which appear to be accumulating or evolving gas are treated cautiously and inspected under a chemical hood because they may contain toxic fumes or be of an explosive nature.

A space labeled "custody intact" provided on the chain-of-custody form is used to describe the sample condition upon receipt. A "Y" indicates no custody problem was identified and a "N" indicates samples or container integrity was compromised and client notification and corrective action is required. At client request, a "Cooler Receipt Form" (Figure 7.6) can be completed to document custodial concerns at sample login.

Discrepancies noted by the custody staff are transmitted to the project and sample manager and are resolved with the client prior to laboratory work assignment. Discrepancies are documented on the Anomaly Report. The project manager and the custody department staff should attempt to resolve custody discrepancies expeditiously to avoid holding time compromises. After a decision concerning a sample has been made, the project manager or sample manager makes an initialed note on the original custody form which states person notified, time, date, and resolution, if applicable. This information is also documented on the Anomaly Report. A faxed or hard copy of custodial resolutions or project order alterations should be secured from the client prior to work initiation. Copies of this documentation are mailed to the client and maintained in the client file.

7.3.5 Sample Preservation

After addition of the project sequential identification number, the samples are distributed to the appropriate laboratory section sample storage areas. Color-code dots and unique sample bottle types correspond to specific analyses and are stored at designated sample storage areas throughout the laboratory sections. Bound sample storage temperature logs are maintained for all sample storage refrigerators to assure proper temperature maintenance throughout the analytical process.

The color code scheme for the various preservatives used in SL's sample containers is described in the Sample Container Request Form which is submitted to the client along with the sample containers. This two-sided form is shown in Figures 7.7 and 7.8.

FIGURE 7.6

COOLER RECEIPT FORM	
Client:	Project:
SL Log #:	Date Received:
SL Cooler Receipt Custodian (Signature):	

Use other side of this form to note details concerning custodial discrepancies

		YES	NO
1	Did a shipping slip (air bill, etc.) accompany the cooler shipment?		
2	Were custody seals affixed to the outside of cooler? If YES, enter the following: Seal Identification (if provided):		
3	Were custody seals unbroken and intact at the date and time of arrival?		
4	Were custody papers completed properly (ink, signed, etc.)?		
5	Chain of custody associated with cooler receipt form.		
6	Was wet ice/blue ice used? (Circle which media)		
7	Cooler temperature upon receipt:		
8	Describe type of packing in cooler (vermiculite, bubble pack, etc.).		
9	Were sampling containers supplied by SL or client? (Circle which one)		
10	Did all bottles arrive intact and were labels in good condition?		
11	Did all bottle labels agree with custody papers?		
12	Were bubbles present in VOA samples?		
13	Was the project manager notified of any custody discrepancies or excursions?		
14	Was a custody excursion form completed and a copy provided to the project manager? If so, complete No. 15.		
15	Who was contacted? By whom: Date:		

FIGURE 7.7

Shipping Address: _____

Date of Shipment:

Method of Shipment: _____

Project Reference: _____

Phone No: _____

Project Site Location: _____

Account No: _____

SAMPLE CONTAINER REQUEST FORM

AQUEOUS													NONAQUEOUS						
																			PRESERVATIVES
L n/m plastic	L n/m glass w/TFE	500 mL m/m plastic	500 mL m/m amber plastic	500 mL m/m amber glass	250 mL m/m plastic	250 mL m/m nalgene	250 mL m/m amber glass	125 mL m/m amber glass w/TFE	100 mL m/m plastic	40 mL vial w/TFE			100 mL w/m glass	125 mL m/m amber glass w/TFE	250 mL w/m glass	250 mL w/m plastic	500 mL w/m plastic	500 mL w/m glass	Lab Pk Prep. by: _____ Lab Pk Checked by: _____ Quantity of Lab Pks. Shipped: _____ Proj Mgr: _____ Coordinator: _____ Comments: _____
																			NO. OF CONTAINERS SHIPPED
																			NO. OF CONTAINERS/SAMPLE
																			SET(S) OF TRIP BLANKS
																			SET(S) OF FIELD BLANKS
																			SET(S) OF EQUIPMENT BLANKS
																			ANALYSIS

It is the shipper's responsibility to ensure samples are maintained at the appropriate temperature during transit.

PRESERVATION COLOR CODE KEY

RED(R)	CAUTION! STRONG OXIDIZER! CONTAINS NITRIC ACID. Avoid skin and eye contact. If contact is made, FLUSH IMMEDIATELY with water.
GREEN(G)	CAUTION! CONTAINS SULFURIC ACID. Avoid skin and eye contact. If contact is made, FLUSH IMMEDIATELY with water.
BLUE(B)	CAUTION! STRONG CAUSTIC! CONTAINS SODIUM HYDROXIDE. Avoid skin and eye contact. If contact is made, FLUSH IMMEDIATELY with water.
ORANGE(O)	No preservatives added.
TAN(T)	Contains Zinc Acetate. Avoid skin and eye contact. If contact is made, FLUSH IMMEDIATELY with water.
YELLOW(Y)	Contains Sodium Thiosulfate. Sterilized container.
LT.BLUE(LB)	CAUTION! CONTAINS HYDROCHLORIC ACID. Avoid skin and eye contact. If contact is made, FLUSH IMMEDIATELY with water.

DO NOT inhale vapors that may be caused from a chemical reaction between the preservative and sample. Collect sample in a well-ventilated area or use appropriate breathing apparatus. NEVER RINSE sample containers. If skin contact with preservatives occurs, flush exposed areas

FIGURE 7.8

GENERAL SAMPLING INSTRUCTIONS

DO NOT PRE-RINSE CONTAINERS. These containers have been specially prepared for specific analyses (See Preservation Color Code Key). Fill container to within 1" of capacity unless otherwise indicated, cap tightly, label and ice. Some requests require multiple containers to perform all analyses. (See Sample Request Form on reverse side.)

LITER PLASTIC

Orange n/m:	Physical Properties, Miscellaneous General (BOD)
Red n/m:	Radiological (Rad 226, Rad 228, alpha and beta)
Orange w/m: (Nonaqueous)	Metals and Miscellaneous Inorganics, General, Physical Properties.

LITER AMBER GLASS

Orange n/m:	Extractable Organics (BNAs, Pesticides/PCBs, Herbicides), Dioxins/Dibenzofurans
Orange w/m: (Nonaqueous)	All Organics (excluding Volatiles), Inorganics, Physical Properties, General

500 ML PLASTIC

Blue n/m:	Cyanide
Orange m/m:	Physical Properties, Miscellaneous, General
Red m/m:	Metals with Mercury
Orange w/m: (Nonaqueous)	Inorganics, Physical Properties

500 ML GLASS W/TFE

Lt. Blue m/m:	Petroleum Hydrocarbons
Green m/m:	Oil and Grease
Green m/m (amber)	TOX. Fill to capacity.
Orange w/m: (Nonaqueous)	All Organics (excluding Volatiles), Inorganics, Physical Properties, General

250 ML PLASTIC

Orange w/m: (Nonaqueous)	Inorganics, Physical Properties, General (single parameter)
Orange m/m:	Physical Properties, Inorganics (nutrients), Hexavalent Chromium
Red m/m:	Metals without Mercury
Green m/m:	Nitrogen series, Phosphorus
Tan m/m:	Sulfide

250 ML NALGENE

Yellow m/m:	Bacteriological (Coliform, Standard Plate Count) Sterile container - do not touch cap or container interior. Remove faucet strainer and flush line prior to sample collection.

125 ML AMBER GLASS W/TFE

Lt. Blue m/m:	TOC. Fill to capacity.
Green n/m:	Total Recoverable Phenolics
Orange m/m: (Nonaqueous)	Volatiles. Fill to capacity - no headspace.

100 ML PLASTIC

Orange m/m:	Physical Properties. Inorganics (single parameter)
Green m/m:	Nutrients, COD (single parameter)

100 ML GLASS

Orange w/m: (Nonaqueous)	Organics, Inorganics, Physical Properties, General (single parameter)

40 ML GLASS VIAL W/TFE

Lt. Blue n/m:	Volatiles (Aromatics and/or Halogenated constituents). Fill vials until slightly overflowing with minimum aeration. Place septa W/TFE liner facing sample and seal with NO headspace.
Orange n/m:	EDB, Volatile Halocarbons. Fill as referenced above.
Yellow n/m:	Trihalomethanes (THM). Fill as referenced above.

250 ML GLASS

Orange w/m: (Nonaqueous)	Physical Properties, Inorganics (single parameter)

Container Closure Key (n/m = narrow mouth, m/m = medium mouth, w/m = widemouth)

CONTAINER SHIPPING INSTRUCTIONS

After sample collection, please check all custody forms and sample containers for discrepancies. Sign the custody form and seal in the enclosed plastic bag. To avoid container leakage during transit, additional plastic bags have been included in the shipment to contain ice for sample preservation. Please place these ice bags between the samples and secure the lab pack for shipment. Return lab packs to Savannah Laboratories & Environmental Services, Inc., 5102 LaRoche Avenue, Savannah, GA 31404. If you have any questions concerning containers shipped or acceptable field substitution, please contact your project manager or sample coordinator for assistance at (912) 354-7858 or FAX (912) 352-0165.

When preservation is required, sample containers used by the SL field sampling team contain premeasured portions of preservatives. Preservatives are obtained prior to each sampling event from parent stocks assayed and maintained by the laboratory. The effectiveness of pH adjustment by addition of acid or base to the samples is checked after sampling by pouring a small amount of the preserved samples into a small specimen cup and testing with narrow range pH paper. Because of the risk of compromising sample integrity, VOA samples cannot be checked in the field.

All samples received by Savannah Laboratories are checked for proper pH adjustment by the appropriate preparation or analytical department as soon after receipt as possible. The pH of each sample is checked, documented, and adjusted, if necessary. To avoid compromising sample integrity, volatile samples are checked for proper pH adjustment only at the time of screening or analysis. The pH of volatile samples is not adjusted.

7.3.6 Sample Security, Accessibility, Distribution, and Tracking

Only authorized personnel are permitted within the laboratory areas where samples are stored. Sample storage areas are designed to segregate volatile and nonvolatile samples. Standards and extracts are also departmentally controlled and stored separately.

After sample registry login and verification, samples are relinquished from the receiving area to the appropriate sample analysis storage area. Those samples not requiring preparation are relinquished immediately to the sample analysis storage area. Using LIMS-generated sample preparation worksheets for guidance, samples are extracted, digested, or distilled as appropriate. An example sample preparation log (Fluoride Extraction Log) is shown in Figure 7.9. The extracts, digestates, or distillates are then transferred and relinquished to the appropriate analysis section, where analysis is performed. An example analysis log (Fluoride Analysis) is shown in Figure 7.10. An example of a department-specific tracking form is shown in Figure 7.11 (BNA Extract Custody).

For projects where in-laboratory custody records are required by the client, the project manager and custody department will coordinate the documentation of these records.

Sample holding times are tracked via the LIMS. Sample collection dates are routinely entered into the LIMS with all sample logins. This information allows holding times specific to each departmental analysis to be tracked by department managers, supervisors, chemists, and analysts through the use of daily status sheets, reference sheets, and preparation worksheets. Date analyzed is recorded via instrument outputs or analysis forms/logs when applicable as an integral part of the raw data. For projects in which reporting the analysis or preparation date is appropriate, the dates are entered into the LIMS.

7.3.7 Sample Disposition Documentation

Upon completion of analytical work, sample custody of unused sample portions, extracts, or digests is relinquished to a central secured storage area. Here the samples, digests, or extracts await disposal, which is performed with the assistance of the LIMS. The LIMS stores clients' specific disposal instructions, compiles results from the analyses of composited samples, prepares sample disposal lists, invoices for disposal and sample return costs, and provides a disposal record for all excess samples.

FIGURE 7.9

FLUORIDE EXTRACTION LOG

Batch No.: _____ Analyst: _____

Spike Level: _____ Date: _____

Final Volume: _____

	SL Log #	Sample Description	Wet Weight
	Method Blank		
	LCS 1		
	LCS 2		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

FIGURE 7.10

FLUORIDE
Method 340.2

CALIBRATION CURVE		
mg/L	Log (mg/L)	mV
0.1	-1	
0.3	-0.522	
1	0	
2	0.301	
3	0.477	
10	1	
20	1.30	

Date:
Analyst:
Batch #:
Correlation Coefficient:
QC Check (Source/True Value) :
Accuracy Range:
Spike Level:
Rev/Date:

#	SL Log No.	Sample Description	Sample Dilution	Volume or Wet Weight	Sample Potential (mV)	Result (mg/L)	Percent Solids	Result (mg/kg dw)	% REC	% RPD

FIGURE 7.11

SEMIVOLATILE EXTRACT CUSTODY LOG

QE #	Total # of Extracts	Box ID	Analysis Required	Date Complete (Final Proj Chk)	Date Relinquished from Extraction Department		Date Received		Instrument Group	Date Disposed
					Int	Date	Int	Date		

7.3.8 InterdivisionalCustody

The laboratory director at each location monitors the sample load and turnaround time through LIMS-generated reports. If it appears that analysis demand will exceed capacity, samples may be transferred (provided client contracts or arrangements, project QA plans or certification limitations do not prohibit sample transfer) to another SL division to ensure that holding times and turnaround commitments are met.

If samples are transferred to another division laboratory, full custody is maintained. Special LIMS determination codes specific to each laboratory location are utilized to enable the project manager and laboratory director to track sample progress and maintain chain of custody. Copies of the original chain-of-custody form (executed for interdivisional sample submittal), computerized LIMS work order acknowledgements, and extract or digest preparation logs pertinent to the project order accompany the samples or sample preparations. Computerized LIMS order information reports accompany shipped samples after sample log-in. The accompanying documentation also includes dates of sample preparation and requested analyses. For projects where reporting the preparation or analysis dates/times is appropriate or required, the dates/times are entered into the LIMS so that it appears on the final report.

7.4 Verification of Hard Copy Records

Data worksheets, data approval forms, and final reports are routinely printed for verification and signatures. Hard copies of final reports, field data, chain-of-custody forms, and any ancillary documentation pertinent to the project will be stored in a secured storage area and placed chronologically within alphabetically arranged client files.

7.5 Facility Security

All Savannah Laboratories' facilities operate under a security policy. Under this policy, all external doors are either visually monitored by SL staff or kept locked. Visitors are required to sign in, and wear a visitor's badge during their visit. They are accompanied at all times by an SL staff member when in the laboratory. Lockable refrigerators and storage cabinets are available for samples requiring this level of security.

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8.0 ANALYTICAL PROCEDURES

The ultimate responsibility for analytical method selection lies with the client or regulatory agencies. Whenever possible, laboratory and field analysis of all samples are conducted by EPA-approved methodology or guidance. Interpretation of ambiguous or conflicting method requirements is accomplished by consulting with regulatory agencies and EPA Laboratory/QA personnel. When EPA approved methods do not exist or project protocols require alternative methods or modifications of EPA methods (i.e., to acheive lower reporting limits), methods are modified based on scientific logic and regulatory alternative method guidance.

Tables 5.1 and 5.2 list Savannah Laboratories' routine laboratory parameters with their respective method numbers. Table 5.3 lists the parameters for TCLP samples. Tables 5.4 through 5.7 list parameters for air, biological tissue, wipes, and oily samples with their respective method numbers, and Table 5.8 lists field parameters.

For Gas Chromatographic (GC) methods, which have long lists of targets, have peaks that co-elute, or are subject to matrix interferences (i.e., methods 8021, 604/8040, 606/8060, 607/8070, 609/8090, 610/8100, 612/8120), SL recommends the guidance in SW846, which states that GC-Mass Spec (GC/MS) methods are preferred, provided project reporting detection limits are met and costs are not appreciably different. This practice will usually result in fewer false positive detects and more accurate results (usually lower due to the ability by GC/MS to separate unresolved peaks or eliminate matrix interferences).

A detailed SOP has been prepared for each routine analytical method. Any modifications to the approved methodology are described in the SOPs. Copies of the SOPs are issued under document control procedures to each staff member involved with the procedure. A master copy of each SOP is maintained in each laboratory's QA Department.

For those cases where no specific soil or sediment method exists, water methods are adapted and verfied. These adaptations are described in Section 8.2. The modifications are also described in the appropriate SOP.

8.1 Laboratory Glassware

8.1.1 Volumetric Glassware

Savannah Laboratories employs appropriate glassware for all preparatory and analytical operations. For critical measurements, such as standards preparation, Class A volumetric glassware is used, when practical. Exceptions include the use of volumetric syringes for volatiles standards preparation and polypropylene volumetric flasks for metals standards.

8.1.2 Glassware Cleaning Procedures

Laboratory glassware washing procedures are adapted from SW-846, *40 CFR Part 136, Standard Methods*, and EPA 600/4-79-019, and are as follows:

Extractable Organics

Prior to use, the glassware is rinsed with the solvent used in the extraction procedure. This is to remove any contaminants that may have adhered to the glassware during storage. The glassware is washed with hot water and a non-phosphate detergent. The glassware is scrubbed vigorously with a brush to remove all artifacts and rinsed three (3) times with tap water. The glassware is allowed to air dry whenever possible and stored inverted or with cap openings covered with aluminum foil or glass stoppers to exclude dust and other contaminants. Whenever possible, precleaned, certified, disposable glassware is utilized for extraction and extract storage.

Volatile Organics

The glassware is washed with tap water and nonphosphate detergent, rinsed thoroughly with organic free water, and oven dried at 110°- 120°C for at least two hours. Class A volumetric glassware is air dried. Glassware is usually stored in the oven until use. Caps and septa are washed in the same manner, but caps are air dried. Highly contaminated glassware is allowed to soak in Nochromix solution overnight, then washed as above.

General Chemistry, Microbiology, Nutrients, Demands

The glassware is washed with hot tap water and nonphosphate detergent, rinsed thoroughly with tap and deionized water, air dried, and stored inverted or foil placed over cap openings. Bacteriological laboratory glassware and collection bottles are autoclaved as described in analytical procedures or purchasesd presterilized (disposable). COD digestion tubes and caps are cleaned with brushing and tap water (no soap)and rinsed thoroughly with deionized water. Tubes for TKN and total phosphorus sample digestions are washed with hot water and phosphate-free detergent, and rinsed with tap water, Nochromix, and deionized water. Whenever possible, precleaned, certified disposable glassware is utilized.

Metals/Radionuclides

The glassware, plastic, and Teflon items are washed in hot tap water and phosphate-free detergent. They are then rinsed with tap water, 1:1 nitric acid, tap water, and deionized water. For highly contaminated samples, it is recommended that Teflon beakers used for sample digestion are further decontaminated by adding 20 mL nitric acid and 12 mL hydrochloric acid, covered with a watch glass, and digested on a hot plate for two hours. Following this treatment, they are rinsed with 10% nitric acid and deionized water and allowed to air dry. Whenever possible, precleaned, certified disposable glassware is utilized for digestion and digestate storage.

8.2 Soil Sample Preparation Notes

In the absence of an approved soil method, water methods are adapted for soil matrices. The following soil preparation procedures are applied to parameters in Table 5.2.

1. Fluoride (extractable): Method 340.2/300.0

Approximately 5 g of sample is weighed out exactly and placed in a screw-cap plastic bottle. One hundred mL of DI water is added to the sample, the bottle is capped, placed in a rotating extractor, and rotated for 2 hours. Upon removal, the sample is allowed to settle, the supernatant decanted, and the extract is analyzed as a liquid sample.

2. Gross Alpha and Gross Beta Particle Activity: Method 9310

Soil is ground to a fine powder with mortar and pestle, and 50 to 100 mg soil is weighed onto a tared planchet. Sample is distributed evenly over planchet surface, fixed with clear acrylic solution, dried, and counted.

3. Chloride (extractable): Method 9251/9252/4500-ClC/300.0

Approximately 5 g of sample is weighed out exactly and placed in a screw-cap plastic bottle. One hundred mL of DI water is added to the sample, the bottle is capped, placed in a rotating extractor, and rotated for 2 hours. Upon removal, the sample is allowed to settle and the supernatant is decanted. The extract is analyzed as a liquid sample.

4. Sulfate (extractable): Method 9036/9038/375.3/300.0

Approximately 5 g of sample is weighed out exactly and placed in a 100-mL screw-cap plastic bottle. One hundred mL of DI water is added to the sample, the bottle is capped, placed in a rotating extractor, and rotated for 2 hours. Upon removal, the extract is filtered using a syringe filter with a 0.20-um pore size filter and analyzed as a liquid sample.

5. Orthophosphate (extractable): Method 365.1/300.0

Approximately 5 g of sample is weighed out exactly and placed in a screw-cap plastic bottle. One hundred mL of DI water is added to the sample, the bottle is capped and placed in a rotating extractor, and rotated for 2 hours. Upon removal, the sample is allowed to settle and the supernatant is decanted. The extract is analyzed as a liquid sample.

6. Benomyl in Soil: Method 631

Ten grams of sample are extracted and hydrolyzed in 2:1 methylene chloride:acidified methanol. The extract is cleaned by passing through a 5 gram alumina solid phase extraction cartridge. The cleaned extract is then concentrated, filtered, and analyzed as a liquid sample.

7. Acrylamide in Soil: Method 8316

Samples are prepared by adding 10 ml of HPLC grade H_2O to 2.0 grams of sample in a 20 mL scintillation vial and sonicating for one hour. The leachate is then passed through a C18 solid phase extraction cartridge. The extract is filtered and analyzed as a liquid.

8.3 Validated Compounds and Modifications of Referenced Analytical Methods

Except for the instances described below, parameters in Tables 5.1 and 5.2 have been determined by the methods referenced with no significant modification to those methods, other than the use of additional standards for parameters not included in the referenced method lists.

Asulam

Water samples are prepared by adjusting the pH to 3, saturating with NaCl and extracting with 1:1 acetonitrile:ethyl acetate. The extract is injected into the HPLC system following concentration. The HPLC system consists of an isocratic pump and a UV detector.

Thiodiglycol

Water samples are prepared by passing them through a solid phase cartridge. Soil samples are extracted by sonication with calcium chloride solution and then processed through the same cleanup as the water samples. The samples are injected into the HPLC system which consists of an isocratic pump and a UV detector.

Ethylenethiourea

Water samples are analyzed by passing them through a solid phase cartridge. Soil samples are extracted by sonication with water, then processed through the same cleanup as water samples. The samples are injected into the HPLC system which consists of an isocratic pump and a UV detector.

Nitrocellulose

Water samples are filtered through an inorganic membrane filter to isolate the nitrocellulose fibers which are suspended in the sample. The filter is then washed with methanol to remove any sources of organic nitrogen compounds while the nitrocellulose fibers remain on the filter. The fibers are dissolved in acetone, followed by evaporation of the acetone and subsequent hydrolysis of the residue in the presence of sodium hydroxide. Following neutralization, the sample is analyzed for nitrate and nitrite by a cadmium reduction spectrophotometric method or ion chromatography. The mass of nitrogen (as nitrate-nitrite) is used to calculate the concentration of nitrocellulose.

Soil samples are treated with a methanol rinse to remove any interfering sources of nitrogen. Acetone is then added to the soil to dissolve the nitrocellulose fibers. Following the addition of acetone, the sample is sonicated for about 10 hours. Centrifugation is then employed to separate the acetone from the soil residue. The soil residue is then treated and analyzed using the technique described above for water samples.

Phthalic acid/Phthalic anhydride and Maleic acid/Maleic anhydride

Soil samples are extracted by tumbling with reagent water. Soil sample extracts and water samples are adjusted to neutral pH and then cleaned by passing through C8 and amino solid phase extraction cartridges connected in series. Analysis is by HPLC with UV detection. All results are reported as the acid form.

Cryomazine

Cryomazine is extracted from soil samples by sonication with HPLC extraction fluid, consisting of hexanesulfonic acid, triethylamine, ammonium hydroxide, and phosphoric acid. Extract cleanup is accomplished using a C18 solid phase extraction cartridge, followed by HPLC with UV detection analysis.

Resorcinol

Water samples are acidified with phosphoric acid, then passed through a C18 solid phase extraction cartridge and filtered. Analysis is by HPLC using UV detection.

Arsenic in Water by Method 7060 (3020)

Water samples are prepared using the procedures described in Section 7 of Method 3020. Arsenic is then determined using the analytical procedures described in Method 7060.

Selenium in Water by Method 7740 (3020)

Water samples are prepared using the procedures in Section 7 of Method 3020. Selenium is then determined using the analytical procedures described in Method 7740.

8.4 Reagent Storage and Documentation

Reagents are stored with consideration for safety and maximum shelf life. Storage conditions and documentation maintenance status for various classes of reagents are given in Table 8.1, as well as discussed below.

All acids, except those poured up in small marked containers which are for immediate use, are stored in the original containers in acid storage cabinets.

All bases, except those poured up in small containers for immediate use and those that are standardized for specific purposes, are stored in the original containers within designated areas or storage cabinets.

All flammable solvents, except those poured up for immediate use, are stored in original containers in approved vented flammable storage cabinets which are located indoors.

Dry reagents are stored in designated cabinets in cool, dry areas. Reactive chemicals, cyanides and sulfides are labeled and isolated from other chemicals.

All acids used for metal sample digestions and all solvents used for semivolatile sample extraction are tested prior to initial use. Specific acceptable chemical lots are reserved and stored by the vendor(s) and are requisitioned and received as needed by the laboratory. Lot numbers used for digestions or extractions are recorded in bound notebooks in the appropriate departments.

Reagent blanks are analyzed with each sample batch for all methods, validating the purity of all reagents. All reagent containers are dated when received, and dated and initialed when opened (except high use items consumed in less than one week). Documentation is maintained to provide traceability of the reagents used with the analysis of any batch to specific reagent lot numbers.

8.5 Waste Disposal

Savannah Laboratories' divisions operate as either conditionally exempt small quantity generators or small quantity generators of hazardous waste.

All waste disposal is carried out in accordance to Savannah Laboratories' Waste Disposal SOP (CA70). This document includes procedures for identification, storage, personnel training, tracking forms, report forms, safety, as well as details of the disposal. Hazardous waste disposal procedures are given in Table 8.2 and discussed below.

Hazardous wastes must:

- be stored in non-leaking containers in good condition with close-fitting lids and kept closed when wastes are not being added or removed.
- be accurately labeled with waterproof labels. Labels must specify the words "Hazardous Waste", the composition and physical state of the waste, the hazardous properties of the waste (e.g., flammable, reactive, etc.), and the name and address of the generator.
- be clearly labeled on each container with the date that the period of accumulation began. The date must also be documented on the Hazardous Waste Tracking Log Form.
- be handled in containers and in a way that minimizes the possibility of spills and escape of wastes into the environment.
- be stored in an area which is regularly inspected for deteriorating or leaking containers.

All waste must be segregated for temporary accumulation and storage as well as for disposal. Care must be taken to combine waste materials into categories or waste streams based upon their compatibility.

The following three types of waste are stored in 55-gallon drums.

1. Halogenated solvents such as methylene chloride (closed cap metal drum)
2. Nonhalogenated flammable solvents (closed cap metal drum)
3. Heavy metals or other aqueous wastes except cyanide (poly drum)

All other wastes should be stored in the original container or 4-liter glass bottles and disposed of via lab pak. (Packed by disposal company in 55-gallon open top drums.)

8.6 Sample Disposal

Sample disposal is carried out in accordance with Savannah Laboratories' Waste Disposal SOP (CA70). This document includes procedures for identification, storage, personnel training, tracking forms, report forms, safety, as well as details of the disposal

After analysis completion, unused sample portions, extracts, or digests are transferred to a central secured storage area to await disposal. Unless a client requests the project manager to save unused samples, digests, or extracts, disposal from the central storage occurs as soon as holding times have expired or three weeks after results submission.

Requests for extended sample, digest or extract storage must be provided by the client to the SL project manager in writing (or contract form) prior to sample receipt and extended storage may result in additional fees to be negotiated by the SL project manager prior to sample receipt. SL is not responsible for evaporation or other deterioration of samples, extracts, or digests during extended storage periods.

Samples which are requested to be returned to the client may be picked up at the laboratory by the client, shipped by courier (at the client's expense for packaged shipping) or returned by any other legal means that is arranged by the client. Clients requesting the return of samples should provide detailed shipping instructions.

If a client by contract requires that samples be disposed of by a hazardous waste contractor, the client's name and EPA ID number are used on the manifest and the client is billed for all disposal related costs.

Other excess sample portions will be composited according to matrix (solids, oils or aqueous) by the laboratory. The composited soils, sediments and other solid samples are subsampled and analyzed for hazardous waste characterization: ignitability, reactivity, (releasable cyanide and sulfide), corrosivity (pH), toxicity (TCLP by SW-846 Method 1311) and PCBs. If the pooled subsample is hazardous by any of the hazardous waste characteristics or contains greater than 50 ppm PCBs, the composited excess sample is disposed of by a hazardous waste contractor. If the pooled subsample is not deemed hazardous per these tests, the composited excess material is disposed of in an industrial/municipal landfill/or incinerator.

If the analyses performed on the composite aqueous samples meets the public sewer system discharge criteria as outlined in 40 CFR Part 261.3 (a)(2)(iv)(E), the samples are neutralized and discharged into the public sewer system. The tests performed on the samples must demonstrate that the levels of contaminants present do not exceed the hazardous characteristics as stated in 40 CFR Part 262, Subpart C, or applicable regulations.

TABLE 8.1

REAGENT STORAGE

Chemical	Method of Storage	Documentation
Acids	Original containers in acid storage cabinets	Yes
Bases	Original containers in designated storage cabinets	Yes
Nonflammable Organic Solvents	Original containers in designated storage cabinets	Yes
Flammable Solvents	Original containers in vented flammable storage cabinets	Yes
Dry Reagents	Original containers in designated cool, dry storage cabinets	Yes
Reactive Chemicals	Original containers in isolated cool, dry storage cabinets	Yes

TABLE 8.2

WASTE DISPOSAL PROCEDURES

Waste Type	Associated Analytical and Sample Prep Methods	Storage Procedures	Disposal Procedures
Halogenated Solvents Methylene Chloride	Pesticides, Herbicides, BNA, GPC, etc.	Store in glass bottles, then in drums.**	Reclaimed by HW contractor
Freon	Oil & Grease, Petroleum Hydrocarbons	Store in glass bottles	Reclaimed by laboratory
Mixed Solvents (Flammable & nonhalogenated)	VOC Standards, Herbicides, Pesticides	Store in carboys, then in drums	Disposal by HW contractor
All neat standards	All analyses	Store in original bottles of glass/ plastic bottles, then lab pak	Disposal by HW contractor (Packed by also)
Heavy Metals Solutions	Metals, COD, Chloride	Store in carboys, then in drums	Disposal by HW contractor
Acid Solutions	Metals, General Inorganics, Extractions	Store in carboys or add to neutralizing chambers	Neutralize; sanitary sewer
Alkaline Solutions	General Inorganics, Extractions	Store in carboys	Neutralize, sanitary sewer
All samples containing Organics or Inorganics exceeding hazardous waste standards*	All analytical groups	Store in original bottles or jars in sample custody storage area	Return to client, or disposal by HW contractor

* Hazardous Waste Characteristics (D001 - D017) (40 CFR Part 261), HCN > 250 mg/kg, H_2S > 500 mg/kg, TCLP Toxicity Characteristics (*Federal Register*, 55FR 11798), March 29, 1990, or contains greater than 50 ppm PCBs.

** Bottles are kept in each lab and are periodically moved by the Waste Coordinator to hazardous waste storage area.

9.0 CALIBRATION PROCEDURES AND FREQUENCY

9.1 Laboratory Equipment

Savannah Laboratories is equipped with state-of-the-art instrumentation to provide quality analytical data to clients. A list of the instrumentation maintained by Savannah Laboratories for the determination of the parameters contained in Tables 5.1 - 5.8 is found in Table 9.1. A list of all field instrumentation maintained by the laboratory is contained in Table 9.2.

9.2 Standard Receipt and Traceability

Standards are purchased from commercial sources in stock solutions or mixes designed for the specific methods or as neat analytes. Certificates of analysis are shipped with each standard material by the vendor. When possible, standards are certified to meet or exceed the criteria established by the US EPA or are traceable to NIST standards.

Standard traceability logbooks are maintained by all sections of the laboratory to track the receipt, preparation, and disposition of all standard materials. A lot number is assigned to each standard material and the lot number is documented in the standard traceability logbook along with date of preparation, initials of analyst, concentration, expiration date (if applicable), and solvent (if applicable). If required, a standard preparation narrative is also provided in this logbook to document the preparation steps for each stock standard.

9.3 Standard Sources and Preparation

Savannah Laboratories maintains an inventory of standard materials necessary to calibrate and verify all analytical systems. Table 9.3 presents standard sources and preparation protocols for various sections of the laboratory. Field instruments requiring calibration standards (conductivity meters and pH meters) use the same sources as laboratory instrumentation. Table 9.4 lists titrants used by the laboratory and information regarding their standardization.

9.4 Laboratory Instrument Calibration

The calibration procedures for the various analytical methods are summarized below. Detailed procedures are provided in the individual SOPs for each method. All CLP protocols are followed as written in the statement of work(SOW).

9.4.1 Metals

Metals are analyzed by three protocols: 200-series (primarily for drinking water and for NPDES compliance); 6000 and 7000-series (primarily for RCRA testing); and CLP protocols (primarily for hazardous waste site monitoring). It should be noted that EPA has promulgated two versions of EPA method 200.7; one for drinking water and the other for NPDES compliance testing.

ICP (Inductively Coupled Plasma-Atomic Emission)

The inductively coupled plasma atomic emission spectrophotometer is standardized daily with a single concentration standard solution containing the metals of interest and a calibration blank. Multi-point calibrations with a minimum of three standards and a calibration blank encompassing the concentration range of interest are analyzed annually and are on file for each ICP. The calibration curve demonstrates the linearity of each metal over the standardization range. An initial calibration verification (ICV) standard is analyzed after standardization and must meet acceptance criteria. Continuing calibration verification (CCV) standards are analyzed after every 10 samples and at the end of the sequence and must meet the acceptance criteria. A calibration blank (ICB or CCB) is analyzed immediately after the verification standards and must meet the acceptance criteria.

ICP (Inductively coupled plasma-atomic emission)

Calibration Check	6010	200.7 (NPDES)	200.7 (Drinking Water)
Standardization	1 point + cal blank	1 point + cal blank	1 point + cal blank
Re-analysis of Standards	+/-5% of true value	+/-5% of true value	+/-5% of true value
Initial Calibration Verification (ICV)	+/-10% of true value	+/-5% of true value	+/-5% of true value
Initial Calibration Blank(ICB)	<Reporting limit	<Reporting limit	<Reporting limit
RL Standard	Detected; +/-50% of true value	Detected; +/-50% of true value	Detected; +/-50% of true value
Interference Check Solutions A and AB	+/-20% of true value	+/-20% of true value	+/-20% of true value
Continuing Calibration Verification (CCV)	+/-10% of true value	+/-5% of true value	+/-10% of true value
Continuing Calibration Blank (CCB)	<Reporting limit	<Reporting limit	<Reporting limit

All sample results must be bracketed by acceptable calibration standards.

AA (Atomic absorption)

Atomic absorption spectrophotometers are calibrated daily with the specified number of calibration standards, including a calibration blank. The correlation coefficient of the regression curve must be greater than or equal to 0.995. An initial calibration verification (ICV) standard is analyzed immediately upon calibration and must meet acceptance criteria. Continuing calibration verification (CCV) standards are analyzed after every 10 samples and at the end of the sequence and must meet the acceptance criteria. A calibration blank (ICB or CCB) is analyzed immediately after the verification standards and must meet the acceptance criteria.

GFAA (Graphite furnace atomic absorption)

Calibration Check	7000-series	200-series	200.9
Minimum number of calibration points*	4	4	4
Initial Calibration Verification (ICV)	+/-10% of true value	+/-10% of true value	+/-5% of true value
Initial Calibration Blank(ICB)	<Reporting limit	<Reporting limit	<Reporting limit
Continuing Calibration Verification (CCV)	+/-20% of true value	+/-10% of true value	+/-10% of true value
Continuing Calibration Blank (CCB)	<Reporting limit	<Reporting limit	<Reporting limit

All sample results must be bracketed by acceptable calibration standards.
*contains RL standard

FLAA (Flame atomic absorption)

Calibration Check	7000-series	200-series
Minimum number of calibration points*	4	4
Initial Calibration Verification (ICV)	+/-10% of true value	+/-10% of true value
Initial Calibration Blank(ICB)	<Reporting limit	<Reporting limit
Continuing Calibration Verification (CCV)	+/-20% of true value	+/-10% of true value
Continuing Calibration Blank (CCB)	<Reporting limit	<Reporting limit

All sample results must be bracketed by acceptable calibration standards.
*contains RL standard

CVAA (Cold vapor atomic absorption-Mercury)

Calibration Check	7000-series	200-series
Minimum number of calibration points*	6	4
Initial Calibration Verification (ICV)	+/-10% of true value	+/-5% of true value
Initial Calibration Blank(ICB)	<Reporting limit	<Reporting limit
Continuing Calibration Verification (CCV)	+/-20% of true value	+/-10% of true value
Continuing Calibration Blank (CCB)	<Reporting limit	<Reporting limit

All sample results must be bracketed by acceptable calibration standards.
*contains RL standard

9.4.2 General Chemistry

Autoanalyzer

The autoanalyzer is calibrated with a minimum of five calibration standards at least every six months (some procedures/instruments may require daily calibration). The correlation coefficient of the curve must be ≥0.995 using a regression fit. Calibration verification standards are analyzed immediately upon calibration, after every 10 samples, and at the end of each run, when required by the method. Sample analyses must be bracketed by calibration verification standards that meet control criteria. The calibration curve is verified each day that analyses are performed by the analysis of a standard at the midpoint of the calibration curve and by the analysis of a standard at the reporting limit of the target analyte(s). The standard at the midpoint must be ±10% of the true value of the standard and the standard at the reporting limit must be detected.

Ion Chromatography (IC)

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target analytes with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. Either linear regression or quadratic curve fitting is used, depending on the analyte. The regression correlation coefficient must be ≥0.99 for any analyte to be used for quantitation. Calibration verification standards are analyzed immediately upon calibration, after every 10 samples, and at the end of each run. For method 300.0, sample analyses must be bracketed by calibration verification standards that meet the acceptance criteria.

Ultraviolet-Visible (UV-VIS) Spectrophotometer

The spectrophotometer is calibrated with a minimum of five standards at least every six months (some procedures/instruments may require daily calibration). The correlation coefficient of the curve must be ≥0.995 using a regression fit. Data must be bracketed by calibration verification standards that meet control criteria. The calibration curve is verified each day that analyses are performed by the analysis of a standard at the midpoint of the calibration curve and by the analysis of a standard at the reporting limit of the target analyte(s). The standard at the midpoint must be ±10% of the true value of the standard and the standard at the reporting limit must be detected.

Infrared (IR) Spectrophotometer

The infrared spectrophotometer is calibrated with a minimum of five standards at least every six months (some procedures/instruments may require daily calibration). The correlation coefficient of the curve

must be ≥0.995 using a regression fit. Data must be bracketed by calibration verification standards that meet control criteria. The calibration curve is verified each day that analyses are performed by the analysis of a standard at the midpoint of the calibration curve and by the analysis of a standard at the reporting limit of the target analyte(s). The standard at the midpoint must be ±10% of the true value of the standard and the standard at the reporting limit must be detected.

Turbidimeter

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. Gelex solid standards are calibrated against formazin standards initially and then quarterly. The instrument is calibrated daily with one Gelex standard for each range of interest. A mid-range calibration verification standard is analyzed for every 10 samples and must meet control criteria in order for bracketed data to be acceptable.

Conductivity Meter

The cell constant of each meter is determined at a minimum annually by the analysis of five KCl standards. To verify the cell constant, a verification standard is analyzed at the beginning of each working day, using a KCl standard in the expected range of the samples. For meters not having automatic temperature compensation, all samples are analyzed at 25° C ± 2° C.

pH Meter

The pH meter is calibrated daily with two standard buffers at pH 7.0 and either 4.0 or 10.0, and checked with a third buffer at 10.0 or 4.0, which must indicate ± 0.10 pH units of its given value. A calibration verification standard is analyzed immediately upon calibration and after every 10 samples. Acceptable calibration verification standards must bracket the sample analyses. Manual or automatic temperature compensation is performed, depending on the meter. Additional checks of the pH meter must be performed with buffers other than 4 or 10 if samples are outside the pH range of 4-10.

Total Organic Carbon (TOC)

The instrument is calibrated according to the manufacturer's recommendations, with a minimum of a single point calibration daily. A calibration verification standard is analyzed immediately upon calibration, after 10 samples, and at the end of each run. Sample analyses must be bracketed by acceptable calibration verification standards.

Ion Selective Electrode (ISE)

Ion selective electrodes are calibrated with a minimum of five standards every six months. The calibration curve is established by linear regression applied to the log of the standard concentration versus potential, and must result in a correlation coefficient of $\geq$0.995. The calibration curve is verified each day by the analysis of two standards at mid-low and mid-high levels of the calibration curve. These standards must be $\pm$10% of the true value of the standard.

Total Organic Halogens(TOX) /Absorbable Organic Halides(AOX)

Although the TOX/AOX instrument provides an "absolute" measurement of halogen, a six point calibration curve (five point and a calibration blank) is analyzed annually to confirm the accuracy of the instrument readout.. The coefficient of variation (percent relative deviation) must be less than or equal to 20% to confirm the validity of the calibration curve. The TOX/AOX calibration is verified by periodic analysis of a precision and recovery (PAR) standard, a mid-level calibration check standard.

Bomb Calorimeter

The energy equivalent of the bomb calorimeter is determined quarterly by bombing six standard benzoic acid tablets. A control standard is analyzed for every batch of samples, and must meet control criteria in order for data to be acceptable.

Dissolved Oxygen(DO) Meter

DO meters are calibrated prior to use either by Winkler titration or the air calibration technique.

Temperature

All laboratory and field thermometers are calibrated annually by comparison with a NIST-certified thermometer. Field meters with automated temperature compensation are checked before use with a calibrated thermometer.

9.4.3 Gas Chromatography (GC)

Volatiles by GC (VG)

Volatile organic compounds (VOC) are analyzed by three GC protocols: 500-series (primarily for drinking water); 600-series (primarily for NPDES compliance); and 8000-series (primarily for RCRA testing). These analyses are generally performed using internal standard calibration and quantitation; therefore absolute retention time window determination is not required and 8000 series samples do not have be bracketed by acceptable CCV standards. The internal standard retention time and response can be used to judged the retention time stability and system response.

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target compounds with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. After the initial calibration standards are injected, a calibration curve is constructed using either internal standard or external standard methodology. The analyst inspects the curves before proceeding with sample analysis. The correlation coefficient - or coefficient of determination of the calibration curve must be greater than or equal to 0.99. An alternative to quantitation from a calibration curve is quantitation from an average response factor. If the %RSD of the calibration curve is less than or equal to the acceptance criteria, the average response factor can be used for quantitation. A midpoint calibration verification standard must be analyzed at the frequency specified in the method as a check on the validity of the initial calibration. If the percent difference or percent drift is within the acceptance criteria, the curve is acceptable for quantitation of samples.

Volatiles by GC			
Calibration Check	500-series	600-series	8000-series
Initial calibration -minimum calibration standards	3*	3	5
%RSD criteria	≤20%	≤10%	≤20% (with exceptions noted below)
CCV criteria (%difference or %drift)	+/- 20%	+/-15%	+/-15% (with exceptions noted below)

* An alternate single point calibration can be performed if the standard response is within 20% of the sample response.

8000-series ICAL exception if the %RSD criteria is used to evaluate the calibration curve:
If one or more compounds fail the %RSD criteria, the calibration curve can be used for quantitation if the average %RSD of ALL of the compounds in the calibration standard is less than or equal to 20% and the user of the data is notified of the compounds that fail.

8000-series CCAL exception for %drift or %difference criteria:
If one or more compounds fail the %drift or %difference criteria, the calibration curve can be used for quantitation if the average %drift or %difference of ALL of the compounds in the calibration standard is less than or equal to 15% and the user of the data is notified of the compounds that fail.

NOTE: 2-Chloroethyl vinyl ether exhibits erratic chromatographic behavior which impacts the ability of SL to analyze consistently for this compound within the method requirements or RL. If the requirements or RL cannot be met for 2-Chloroethyl vinyl ether, the appropriate flag should accompany the data for this compound in the report.

Semivolatiles by GC (SG)

Semivolatile organic compounds (SVOC) are analyzed by four GC protocols: 500-series (primarily for drinking water); 600-series (primarily for NPDES compliance); 8000-series (primarily for RCRA testing); and the CLP protocols (for hazardous waste site monitoring). These analyses are generally performed using external standard calibration and quantitation; therefore, absolute retention time window determination and bracketing of the samples by acceptable CCV are required for 8000-series methods. However, internal standard calibration and quantitation may be used and would negate the requirement to calculate absolute retention time windows and bracket the samples with acceptable CCV. The internal standard retention time and response can be used to judged the retention time stability and system response.

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target compounds with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. After the initial calibration standards are injected, a calibration curve is constructed using either internal standard or external standard methodology. The analyst inspects the curves before proceeding with sample analysis. The correlation coefficient or coefficient of determination of the calibration curve must be greater than or equal to 0.99. An alternative to quantitation from a calibration curve is quantitation from an average response factor. If the %RSD of the calibration curve is less than or equal to the acceptance criteria, the average response factor can be used for quantitation. A midpoint calibration verification standard must be analyzed at the frequency specified in the method as a check on the validity of the initial calibration. If the percent difference or percent drift is within the acceptance criteria, the curve is acceptable for quantitation of samples.

Semivolatiles by GC			
Calibration Check	500-series	600-series	8000-series
Initial calibration -minimum calibration standards	3*	3	5
%RSD criteria	≤20%	≤10%	≤20% (with exceptions noted below)
CCV criteria (%difference or %drift)	+/- 20%	+/-15%	+/-15% (with exceptions noted below)

* An alternate single point calibration can be performed if the standard response is within 20% of the sample response.

8000-series ICAL exception if the %RSD criteria is used to evaluate the calibration curve:
If one or more compounds fail the %RSD criteria, the calibration curve can be used for quantitation if the average %RSD of ALL of the compounds in the calibration standard is less than or equal to 20% and the user of the data is notified of the compounds that fail.

8000-series CCAL exception for %drift or %difference criteria:
If one or more compounds fail the %drift or %difference criteria, the calibration curve can be used for quantitation if the average %drift or %difference of ALL of the compounds in the calibration standard is less than or equal to 15% and the user of the data is notified of the compounds that fail.

If the CCV standard analyzed after the samples fails to meet the acceptance criteria and the response of the mid point standard is *above* the criteria (that is the response of the analytical system has increased), samples which have no target compounds detected above the RL may be reported as <RL, since the compounds would have been detected if present. (SW-846 Method 8000B).

9.4.4 Gas Chromatography/Mass Spectrometry (GC/MS)

Volatiles by GC/MS (VM)

Volatile organic compounds (VOC) are analyzed by three GC protocols: 500-series (primarily for drinking water); 600-series (primarily for NPDES compliance); 8000-series (primarily for RCRA testing); and the CLP protocols (for hazard waste site monitoring).

Hardware tuning is performed on each GC/MS prior to calibration as specified in the applicable EPA methods. Ion abundance acceptance criteria for VOC tuning with BFB are given below. Mass calibration is performed as an integral part of tuning.

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION BROMOFLUOROBENZENE (BFB) FOR 524.2	
m/e	Ion Abundance Criteria
50	15-40% of mass 95
75	30-80% of mass 95
95	Base peak, 100% relative abundance
96	5-9% of mass 95
173	< 2% of mass 174
174	> 50% of mass 95
175	5-9% of mass 174
176	> 95% but < 101% of mass 174
177	5-9% of mass 176

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION BROMOFLUOROBENZENE (BFB) FOR 624/8260	
m/e	Ion Abundance Criteria
50	15.0 – 40.0% of mass 95
75	30.0 – 60.0% of mass 95
95	Base peak, 100% relative abundance
96	5.0 - 9.0% of mass 95
173	Less than 2.0% of mass 174
174	Greater than 50.0% of mass 95
175	5.0 - 9.0% of mass 174
176	Greater than 95.0 %, but less than 101.0% of mass 174
177	5.0 - 9.0% of mass 176

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target compounds with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. After the initial calibration standards are injected, a calibration curve is constructed using internal standard methodology. The analyst inspects the curves before proceeding with sample analysis. The correlation coefficient or coefficient of determination of the calibration curve must be greater than or equal to 0.99. An alternative to quantitation from a calibration curve is quantitation from an average response factor. If the %RSD of the calibration curve is less than or equal to the acceptance criteria, the average response factor can be used for quantitation. A midpoint

calibration verification standard must be analyzed at the frequency required by the method as a check on the validity of the initial calibration. If the percent difference or percent drift is within the acceptance criteria, the curve is acceptable for quantitation of samples.

The tune check and calibration check must be performed in the following intervals:

624 – every working day.
8240/8260/CLP – every 12 hours.
524.2 – every 8 hours.

Volatiles by GC/MS		
Method	**Initial Calibration Check Criteria**	**Continuing Calibration Check Criteria**
624	All targets <35% RSD, or alternatively, construct calibration curve	QC Check Sample (20 ug/L)meets limits specified in method-Table 5, Range for Q
8260	CCC <30% RSD; if %RSD ≤15%, the average RF can be used for quantitation: if the %RSD >15%, a calibration curve must be constructed and used for quantitation. The correlation coefficient or coefficient of determination for the curve must be greater than or equal to 0.99	CCC <20% difference or drift from initial calibration
8260	SPCC (minimum RF) Chloromethane 1,1-Dichloroethane Bromoform Chlorobenzene 1,1,2,2-Tetrachloroethane	 0.10 0.10 >0.10 0.30 0.30 (0.10 for 25mL purge) (1)
524.2	All targets <20% RSD, or alternatively, generate linear, 2nd or 3rd order calibration curve(2)	All targets <30% difference from initial calibration, or alternatively, using analyst judgment, all targets must fall on the initial calibration curve

(1) The purging efficiency of 1,1,2,2-Tetrachloroethane relative to the internal standard is such that the SPCC criteria cannot be met consistently for a 25mL purge. The response factor is generally in the 0.1 to 0.3 range. The alternate criteria is adopted from the EPA CLP Low Level Statement of Work, a protocol very similar in scope and application to SW-846 Method 8260.
(2) An alternate single point calibration can be performed if the standard response is within 20% of the sample response.

NOTE: 2-Chloroethyl vinyl ether exhibits erratic chromatographic behavior which impacts the ability of SL to consistently analyze for this compound within the method requirements or RL. If the requirements or RL cannot be met for 2-Chloroethyl vinyl ether, the appropriate flag should accompany the data for this compound in the report.

Semivolatile GC/MS (SM)

Semivolatile organic compounds (SVOC) are analyzed by four GC protocols: 500-series (primarily for drinking water); 600-series (primarily for NPDES compliance); 8000-series (primarily for RCRA testing); and the CLP protocols (for hazardous waste site monitoring).

Hardware tuning is performed on each GC/MS prior to calibration as specified in the applicable EPA methods. Ion abundance acceptance criteria for SVOC tuning with DFTPP are given below. Mass calibration is performed as an integral part of tuning.

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION (DFTPP) FOR 525.2	
m/e	Ion Abundance Criteria
51	10-80% of mass 442
68	Less than 2% of mass 69
69	(reference only)
70	Less than 2% of mass 69
127	10-80% of mass 198
197	Less than 2% of mass 198
198	Greater than 50% of mass 442
199	5-9% of mass 198
275	10-60% of mass 442
365	Greater than 1% of mass 442
441	0-100% of mass 443
442	Base peak, 100% relative abundance
443	15-24% of mass 442

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION (DFTPP) FOR 625/8270	
m/e	Ion Abundance Criteria
51	30-60% of mass 198
68	< 2% of mass 69
70	< 2% of mass 69
127	40-60% of mass 198
197	< 1% of mass 198
198	Base peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	> 1% of mass 198
441	Present but less than mass 443
442	> 40% of mass 198
443	17-23% of mass 442

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target compounds with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. After the initial calibration standards are injected, a calibration curve is constructed using either internal standard or external standard methodology. The analyst inspects the curves before proceeding with sample analysis. The correlation coefficient or coefficient of determination of the calibration curve must be greater than or equal to 0.99. An alternative to quantitation from a calibration curve is quantitation from an average response factor. If the %RSD of the calibration curve is less than or equal to the acceptance criteria, the average response factor can be used for quantitation. A midpoint calibration verification standard must be analyzed at the frequency required by the method as a check on the validity of the initial calibration. If the percent difference or percent drift is within the acceptance criteria, the curve is acceptable for quantitation of samples.

The tune check and calibration check must be performed in the following intervals:

625 – every working day.
8270 – every 12 hours.
525.2 – every 12 hours.

Semivolatiles by GC/MS		
Method	**Initial Calibration Check Criteria**	**Continuing Calibration Check Criteria**
625	All targets <35% RSD, or alternatively, construct calibration curve	All targets <20% difference from initial calibration
8270	CCC <30% RSD; if %RSD ≤15%, the average RF can be used for quantitation: if the %RSD >15%, a calibration curve must be constructed and used for quantitation. The correlation coefficient or coefficient of determination for the curve must be greater than or equal to 0.99 SPCC ≥0.050	CCC <20% difference from initial calibration SPCC ≥0.050
525	All targets < 30% RSD, or alternatively, generate linear, 2nd order, or 3rd order calibration curve. (1)	All targets <30% difference from initial calibration, or alternatively, using analyst judgment, all analytes must fall on the initial calibration curve

(1) An alternate single point calibration can be performed if the standard response is within 20% of the sample response.

NOTE: Hexachlorophene exhibits very poor chromatographic behavior within the limits of the working calibration range. If this compound is not detected, ND (not detected) will be reported rather than a detection limit.

9.4.5 High Performance Liquid Chromatography (LC)

Semivolatile organic compounds (SVOC) are analyzed by three LC protocols: 500-series (primarily for drinking water); 600-series (primarily for NPDES compliance); and 8000-series (primarily for RCRA testing). These analyses are generally performed using external standard calibration and quantitation; therefore, absolute retention time window determination and bracketing of the samples by acceptable CCV are required for 8000-series methods. However, internal standard calibration and quantitation may be used and would negate the requirement to calculate absolute retention time windows and bracket the samples with acceptable CCV. The internal standard retention time and response can be used to judged the retention time stability and system response.

Initial calibration is performed upon instrument startup and whenever the continuing calibration verification standard fails the acceptance criteria. A calibration curve is prepared for all target compounds with the lowest standard concentration at or below the reporting limit and the remaining standards defining the working range of the detector. After the initial calibration standards are injected, a calibration curve is constructed using either internal standard or external standard methodology. The analyst inspects the curves before proceeding with sample analysis. The correlation coefficient or coefficient of determination of the calibration curve must be greater than or equal to 0.99. An alternative to quantitation from a calibration curve is quantitation from an average response factor. If the %RSD of the calibration curve is less than or equal to the acceptance criteria, the average response factor can be used for quantitation. A midpoint calibration verification standard must be analyzed at the frequency required by the method as a check on the validity of the initial calibration. If the percent difference or percent drift is within the acceptance criteria, the curve is acceptable for quantitation of samples.

HPLC			
Calibration Check	500-series	600-series	8000-series
Initial calibration -minimum calibration standards	3*	3	5
%RSD criteria	≤20%	≤10%	≤20% (with exceptions noted below)
CCV criteria (%difference or %drift)	+/- 20%	+/-15%	+/-15% (with exceptions noted below)

* An alternate single point calibration can be performed if the standard response is within 20% of the sample response.

8000-series ICAL exception if the %RSD criteria is used to evaluate the calibration curve:
If one or more compounds fail the %RSD criteria, the calibration curve can be used for quantitation if the average %RSD of ALL of the compounds in the calibration standard is less than or equal to 20% and the user of the data is notified of the compounds that fail.

8000-series CCAL exception for %drift or %difference criteria:
If one or more compounds fail the %drift or %difference criteria, the calibration curve can be used for quantitation if the average %drift or %difference of ALL of the compounds in the calibration standard is less than or equal to 15% and the user of the data is notified of the compounds that fail.

If the CCV standard analyzed after the samples fails to meet the acceptance criteria and the response of the mid point standard is *above* the criteria (that is the response of the analytical system has increased), samples which have no target compounds detected above the RL may be reported as <RL, since the compounds would have been detected if present. (SW-846 Method 8000B).

9.4.6 Gas Flow Proportional Counter

Initial calibration is performed at instrument start up, following instrument maintenance or a change in quench gas. Counting voltage is set utilizing a sealed beta source by increasing the voltage through the detector until the beta plateau region is determined. The amount of cross-talk into the alpha channel is then minimized and the beta count maximized utilizing the discriminator. Counting efficiencies are then established utilizing the (relatively) pure beta and alpha source standards. These standards are analyzed daily, and re-calibration is required if their activity count varies 5% or more.

Self-absorption curves are generated at a frequency of once every three months, and the results are plotted on a cumulative scatter plot curve. Values for self-absorption are then taken from the best fit curve generated from this plot and applied to all sample result calculations. Duplicate laboratory control samples are analyzed with each batch of 20 samples to determine accuracy and precision. Additionally, a matrix spike and matrix spike duplicate or sample duplicate are analyzed with each batch of samples. Instrument background counts are also performed daily for use in all sample result calculations for that day.

9.4.7 Radon Flask Counter

Initial calibration is performed at instrument start up or following instrument maintenance. The alpha plateau region is initially determined utilizing a sealed source alpha emitter. Each radon flask is then evacuated, filled with helium at atmospheric pressure, and background counted. Their individual efficiencies are then determined utilizing a standard of known activity. The sealed source alpha emitter is counted daily, and re-calibration is required if its activity varies by 10% or more.

Duplicate laboratory control samples are analyzed with each batch of 20 samples to determine accuracy and precision. Additionally, a matrix spike and matrix spike duplicate or sample duplicate are analyzed with each batch of samples.

9.4.8 Liquid Scintillation Counter

Initial calibration of this instrument is performed at the factory. Following set up and prior to use, the calibration is verified using unquenched Carbon-14 Standard and background water. Quench curves are also factory installed.

9.5 Optional Low Level Calibration Check

For all projects, an additional optional continuing calibration check standard at or below the RL (usually lowest level standard) may be analyzed. This check standard is used to demonstrate that the RL can be achieved and may also be used in conjunction with the calibration check standard for reporting data. If the mid point CCV standard fails acceptance criteria and a standard at the reporting limit (RL) is analyzed within the same analytical clock, samples which have no target compounds detected above the RL may be reported as <RL, if the following criteria are met:

1) all targets in the RL standard are detected at the established RT
2) the surrogate recovery is within acceptance limits
3) the internal standard areas, if applicable, in the samples are within acceptance limits
4) the use of the RL standard for quantitation of non-detects is not extended more than one clock

9.6 Field Instrument Calibration

Calibration of field instrumentation (conductivity/salinity meters, pH meters, DO meters, and turbidimeters) is performed in the field prior to use, in accordance with the manufacturers and method specifications. All calibration data are documented in a bound field notebook.

9.7 Calibration Documentation

All calibration records including raw data, response factors, standard concentrations, curves, reduced data, and instrument settings or conditions are stored and archived according to laboratory standard operating procedures. Current chromatograms, curves, and results transcribed onto forms are kept at the analysts' workstations and periodically archived into a data storage area. Initial and continuing calibrations are stored by date for ease of location. All standard ID numbers appear on graphs, plots, chromatograms, or curves for traceability purposes.

9.8 Thermometer Calibration and Temperature Checks

Equipment such as refrigerators, ovens, waterbaths, hot plates, and incubators are periodically checked with calibrated thermometers. Refrigerators, waterbaths, and incubators are checked daily and the temperatures documented in a notebook. Sample storage refrigerators should be set to 4° C and must be less than 6°C, but must not freeze aqueous samples. All thermometers are calibrated annually against an NIST-certified thermometer.

9.9 Balance Calibration

Electronic analytical balances are calibrated daily with internal mechanisms if available and one Class S weight. Calibration checks are performed and documented on all balances at least weekly with Class S

TABLE 9.1

LABORATORY INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Savannah	Tallahassee	Tampa	Deerfield Beach	Mobile
7	ICP Units	3	1	1	1	1
5	Mercury Cold Vapor Units	1	1	1	1	1
16	Atomic Absorption Furnace/Flame	4	3	3	3	3
28	GC/MS	13	6	3	2	4
65	Gas Chromatographs	19	16	11	11	8
3	TOC Analyzers	1	1			1
6	IR Spectrophotometers	2	1	1	1	1
6	UV-VIS Spectrophotometers	1	2	1	1	1
6	Nutrient Autoanalyzers	3	1		1	1
6	HPLC Units	2	4			
1	Alpha/Beta Counter			1		
1	Scintillation Counter			1		
2	Scaler			2		
2	Radon Flask Counter			2		
1	Ion Chromatograph	1				
9	DO Meters	2	1	3	2	1
8	Turbidimeters	2	1	1	2	2
3	TOX Analyzers	2				1
10	Conductivity Meters	3	1	2	3	1
1	Bomb Calorimeter	1				
27	pH/ISE Meters	12	4	4	5	2
8	Analytical Balances	2	2	1	1	2
24	Top Loading Balances	7	5	3	5	4
5	Autoclaves	1	1	1	1	1
21	Waterbaths	4	7	3	3	4
7	Biological Incubators	1	1	1	1	2
9	BOD Incubators	3	1	1	2	2
28	Drying Ovens	6	9	3	4	6
12	Block Digestors	4	3	1	2	2
5	TCLP (Nonvolatile) Extractor Tumblers	SL Custom	SL Custom	SL Custom	SL Custom	SL Custom
4	TCLP (ZHE) Tumblers	2	1			1
13	Sample Concentrators	4	3	2	2	2
4	Gel Permeation Chromatographs (GPCs)	2	2			
2	Corrosivity Reaction Kettle Apparatus				1	1
56	Cyanide Distillation Setups	20	10		10	16

TABLE 9.2

MAJOR FIELD INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
3	pH/SC/DO/T° Meters	1-Corning Checkmate 90		1-Corning Checkmate 90		1-Corning Checkmate 90
9	pH/Temp Meters		2-Orion 230A	1-Orion SA-230	3-Orion 23A, 1-Orion 290A	1-Orion 23A
8	Conductivity/ Salinity Meters	1 YSI 33	1-YSI 33	1-YSI 33	2-YSI 33 1-Orion 120	1-YSI 33
7	DO Meters		1-YSI 51B	1-YSI 51B	1-YSI 50B 1-YSI 51B	2-YSI 50B
4	Turbidimeters		1-Hach 16800	1-DRT 15C	1-Hach 2100P	1-Hach 16800
8	Water Level Meters		1-Slope 51453	1-Fisher	4-Solinst	1-Rocktest Model CPR6
1	Residual Chlorine Colorimeter				1-Hach Pocket Colorimeter	

TABLE 9.3

STANDARD SOURCE AND PREPARATION FOR LABORATORY INSTRUMENTATION

Instrument Group	Standard Source	How Received	Source Storage	Preparation From Source	Lab Stock Storage	Prep Frequency (Hold / Expiration)
ICP	Baker/Spex	Stock 1,000 or 10,000 ppm solutions	Room temp	Working std prepped directly from stock	Room temp	Same as the analytical hold time of the analyte.
AA	Baker/Spex	Stock 1,000 ppm solutions	Room temp	Intermediate stds prepped from stocks. Working stds prepped from intermediates.	Room temp Room temp	Daily Daily
Autoanalyzer	Fisher Baker	Neat material	Room temp	Stock stds prepped from solids. Intermediate stds from stocks. Working stds from intermediates.	Refrigerator Used immediately Used immediately	Annually Same as the analytical hold time of the analyte. Same as the analytical hold time of the analyte.
Ion Chromatograph	Fisher Baker Mallinckrodt	Neat material	Room temp	Stock stds prepped from solids. Intermediate stds from stocks. Working stds from intermediates.	Refrigerator Used immediately Used immediately	Annually Same as the analytical hold time of the analyte. Same as the analytical hold time of the analyte.
UV-VIS Spectrophotometer	Fisher Baker EM	Neat Material	Room temp	Stock stds prepped from solids. Intermediate stds from stocks. Working stds from intermediates.	Refrigerator Used immediately Used immediately	Annually Same as the analytical hold time of the analyte. Same as the analytical hold time of the analyte.
IR Spectrophotometer	Fisher	Neat liquids	Room temp	Stock std prepped from neat liquid.	Refrigerator	Monthly

TABLE 9.3

STANDARD SOURCE AND PREPARATION FOR LABORATORY INSTRUMENTATION

Instrument Group	Standard Source	How Received	Source Storage	Preparation From Source	Lab Stock Storage	Prep Frequency (Hold / Expiration)
				Working stds from stock.	Refrigerator	Monthly
Turbidimeter	Hach	Standard 4000 ppm formazin solution	Refrigerator	Working stds prepped from stock.	Used immediately	As needed to check Gelex stds
Conductivity Meter	YSI or Fisher	Standard solution or neat KCl	Room temp	Used as is or prepare from neat.	Room temperature	As needed
TOC	Mallinckrodt	Neat KHP	Room temp	Stock std from solid. Working std from stock.	Refrigerator Refrigerator	Annually Monthly
pH Meter	Fisher	Calibration buffer solutions	Room temp	Used as is.	----	----
Ion Selective Electrode (ISE)	Baker	Neat material	Room temp	Stock std from source. Intermediate std from stock. Working std from intermediate.	Refrigerator Refrigerator Used immediately	Annually Same as the analytical hold time of the analyte. Same as the analytical hold time of the analyte.
TOX	Fisher	Neat material	Room temp	Std from source.	Room temp	Annually
Bomb Calorimeter	Parr	Neat tablets	Room temp	Used as is.	----	----
Gas Chromatographs and GC/MS (Volatiles)	Supelco, Ultra, Accustandard, ChemService, Baxter, Aldrich, Restek, NSI	Neat Solutions (50-5000 ppm)	Freezer	Stock stds from neat sources. Intermediate stds from stocks. Working standards from intermediates and/or purchased solutions.	Freezer Freezer Freezer	Monthly Monthly (Gases weekly) Monthly (Gases weekly)
Gas Chromatographs and GC/MS (Semivolatiles)	Supelco, Restek, ChemService, Crescent Chemical,	Neat Solutions (50-10000 ppm)	Refrigerator	Stock stds from neat sources. Intermediate stds from stocks.	Refrigerator or freezer Refrigerator or freezer	6 months 3 months

TABLE 9.3

STANDARD SOURCE AND PREPARATION FOR LABORATORY INSTRUMENTATION

Instrument Group	Standard Source	How Received	Source Storage	Preparation From Source	Lab Stock Storage	Prep Frequency (Hold / Expiration)
	Aldrich, Ultra, NSI			Working standards from intermediates.	Refrigerator or freezer	3 months
High Performance Liquid Chromatographs	ChemService, Chemical, Supelco Accustandard Radian Absolute	Neat Solutions (1000 ppm)	Refrigerator	Stock stds from neat sources.	Refrigerator	6 months
				Intermediate stds from stocks and/or purchased solutions.	Refrigerator	3 months
				Working standards from intermediates.	Refrigerator	3 months
Gas Proportional Counter (alpha/beta)	EPA NIST	Sealed Source	Room temp Metal case	Used as is.	--	--
		Stock Soln.	Room temp	Working std, prepped from stock.	Room temp	As needed
Radon Flask Counter	EPA NIST	Sealed Source	Room temp	Used as is.	--	--
		Stock Soln.	Room temp	Working std, prepped from stock.	Room temp	As needed
Scintillation Counter	Beckman	Sealed Source	Room Temp	Used as is.	--	--

TABLE 9.4

STANDARDIZATION OF TITRATING SOLUTIONS

Analysis	Solution Requiring Standardization	Standard Identity	Standard Source	Frequency of Standardization
Acidity	Sodium Hydroxide (0.02 N)	KHP	Mallinckrodt	With each batch
Alkalinity	Sulfuric acid	Na_2CO_3	Mallinckrodt	With each batch (or purchased certified)
COD	Ferrous ammonium sulfate	$K_2Cr_2O_7$	Mallinckrodt	With each batch
Chloride	Silver nitrate	NaCl	Baker	With each batch (or purchased certified)
Sulfide	Sulfide working standard	$I_2/Na_2S_2O_3$	VWR/Baker	Weekly
TOC (Walkley-Black in Soil)	Ferrous sulfate	$K_2Cr_2O_7$	Fisher	With each batch

TABLE 9.5

BALANCE CALIBRATION CHECKS

Analytical Balance	
Class S Weight	**Tolerance**
0.01 g	± 0.0002 g
0.1 g	± 0.0002 g
0.5 g	± 0.0004 g
1 g	± 0.0004 g
10 g	± 0.0005 g
50 g	± 0.0010 g
Top-Loading Balance	
Class S Weight	**Tolerance**
0.1 g	± 0.02 g
0.5 g	± 0.02 g
1 g	± 0.04 g
5 g	± 0.04 g
10 g	± 0.05 g
50 g	± 0.20 g
100 g	± 0.20 g
300 g	± 0.50 g

*These are representative of the range of weights typically used.

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10.0 PREVENTIVE MAINTENANCE

10.1 Maintenance Schedule

All Savannah Laboratories facilities are equipped with up-to-date computerized instrumentation. In order to gain maximum performance and minimize downtime, regular inspection, maintenance, cleaning, and servicing of all laboratory and field equipment is performed according to the manufacturers' recommendations. A maintenance log is kept for each piece of laboratory and field instrumentation, detailing all maintenance performed on the instrument. Routine repairs and maintenance are performed and documented by the analyst responsible for the particular instrument. Non-routine maintenance is signed and dated by the analyst or repair technician. Routine maintenance procedures for laboratory instrumentation are given in Table 10.1 and each SOP. The frequencies of routine maintenance procedures for Savannah Laboratories' field instrumentation are given in Table 10.2. The service intervals listed in Tables 10.1 and 10.2 are as follows: D=daily; W=weekly; M=monthly; Q=quarterly; SA=semi-annually; A=annually; AN=as needed.

Maintenance contracts are carried for most instrumentation, and close contact is maintained with service personnel to provide optimum instrument functioning.

An extensive spare parts inventory is maintained for routine repairs at the facilities, consisting of GC detectors, AA lamps, fuses, printer heads, flow cells, tubing, certain circuit boards and other common instrumentation components. Since instrumentation is standardized throughout the laboratory network, spare parts and components can be exchanged among the labs.

10.2 Contingency Plan

In general, each facility has at least one backup unit for each critical unit. In the event of instrument failure, portions of the sample load may be diverted to duplicate instrumentation within each facility, the analytical technique switched to an alternate approved technique (such as manual colorimetric determination as opposed to automated colorimetric determination), or samples shipped to another properly certified or approved Savannah Laboratories location (where identical SOPs, QA procedures and instruments are utilized). When shipping samples to another facility, interdivisional chain-of-custody procedures are followed as given in Section 7.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
ICAP								
Pump Tubing	X							Change.
Nebulizer							X	Clean.
Filters			X					Inspect monthly, clean or replace as needed.
Spray Chamber							X	Clean.
Quartz Torch							X	Clean and realign.
D-Shaped Mirrors			X					Inspect monthly, clean or replace as needed.
SMITH-HIEFTJE FURNACE AA SPECTROPHOTOMETER								
Sapphire Window	X							Remove and clean.
Flow Rate	X							Check.
Graphite Tube							X	Replace.
Quartz Windows	X							Clean.
Contact Rings and Plates	X							Clean daily, replace if worn.
Filters			X					Inspect monthly, clean or replace as needed.
ZEEMAN FURNACE AA SPECTROPHOTOMETER								
Sampler syringe	X							Check for air daily, flush syringe as needed.
Graphite Tubes	X							Inspect daily, replace as needed.
Graphite Electrodes				X				Inspect quarterly, replace if worn.
Quartz Windows	X							Remove and clean.
LEEMAN PS200 MERCURY ANALYZER AND AUTOSAMPLER								
Pump Tubing	X							Inspect daily, replace as needed.
Standard Cup	X							Inspect daily, replace as needed.
Drying Tube	X							Repack daily at a minimum.
Mixing Coil		X						Inspect weekly, clean or replace as needed.
Sample Probe			X					Inspect monthly, clean or replace as needed.
Mercury Lamp							X	Clean or replace.
LEEMAN AP200 PREP STATION								
Autosampler		X						Clean and oil rails.
Tubing					X			Inspect semi-annually, replace as needed.
Bottle Caps				X				Inspect quarterly, replace as needed.
Dispenser				X				Inspect semi-annually, replace as needed.
Water Bath			X					Clean.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
CEM MDS 2100 MICROWAVE								
Pressure Control System	X							Flush.
Cavity and exhaust		X						Clean.
Door			X					Inspect seals and locks.
CONTINUUM FURNACE AA SPECTROPHOTOMETER								
Quartz Windows	X							Remove and clean.
Graphite Tubes	X							Inspect daily, replace as needed.
Contact Rings	X							Clean daily and replace if worn.
Filters			X					Inspect monthly, clean or replace as needed.
D2 Arc Lamp							X	Adjust or replace.
TURBIDIMETER				X				Standardize against formazin.
CONDUCTIVITY METER							X	Replatinize cell when 1 umho/cm range exceeds 90-100%, and when erratic readings cannot be corrected.
pH METER							X	Clean or replace probe.
TOX ANALYZER								
Pyrolysis Tube							X	Clean or replace.
Electrodes							X	Clean.
Electrolytes	X							Replace.
ION CHROMATOGRAPH								
Separator Column				X				Clean.
Guard Column				X				Clean.
Pump Pistons						X		Inspect.
Conductivity Cell						X		Clean.
AUTOANALYZER (TRAACS/LACHAT)								
Pump Platen							X	Replace.
Pump Tubes							X	Replace.
Flow Cell							X	Inspect and clean.
BLOCK DIGESTOR						X		Check calibration.
UV/VIS SPECTROPHOTOMETER					X			Check for wavelength verification.
ION SELECTIVE ELECTRODE							X	Polish electrode.
BOMB CALORIMETER							X	Replace seals.
AUTOCLAVE							X	Replace seals.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
TOC ANALYZER								
Catalyst							X	Replace.
Meters (Internal)			X					Check against internal flow meter.
Detector Windows		X						Check and clean.
Humidifiers							X	Fill levels.
Syringe			X					Perform zero point calibration.
GAS CHROMATOGRAPH - SEMIVOLATILES								
Autosampler System							X	Syringe and tubing cleaned. Needles and tubing replace.
Septa	X							Replace as needed.
Column/Injector							X	Change sleeve and cut front of guard column. Replace as needed.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
GAS CHROMATOGRAPH - MASS SPEC SEMIVOLATILES								
Column/Injector							X	Change sleeve and cut front of column.
Septum	X						-	Replace as needed.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
Splitless Disc							X	Replace.
Autosampler							X	Syringe and tubing cleaned. Needles and tubing replaced.
Rough Pump							X	Oil changed by HP service.
Mass Spectrometer							X	Clean.
Tape Head							X	Clean.
Tape Drive							X	Clean.
GAS CHROMATOGRAPH - VOLATILES								
Column							X	Replace.
Septum							X	Replace as needed.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
GAS CHROMATOGRAPH - MASS SPEC VOLATILES								
Column							X	Replace.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
Rough Pump							X	Oil change by HP service.
Gas Manifold	X							Inspect daily, change when pressure reads <500 psi.
Tape Head							X	Clean.
Tape Drive							X	Clean.
GAS CHROMATOGRAPH - SCREENING FOR VOLATILES								
Autosampler							X	Syringe and tubing cleaned. Needles and tubing replaced.
Septa	X							Replace as needed.
Column							X	Replace.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
GAS CHROMATOGRAPH - DAI								
Autosampler							X	Syringe and tubing cleaned. Needles and tubing replaced.
Column							X	Replace.
Septa	X							Replace as needed.
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
GAS CHROMATOGRAPH - MASS SPEC AIR ANALYSIS								
TDC Detector								
Gas Cylinder	X							Inspect daily, change when pressure reads <500 psi.
Hydrocarbon/Moisture Trap							X	Replace.
Filament	X							Checked for proper temperature when analysis required.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
Injector Loop	X	X						Change daily for analysis of atmospheric gases. Change weekly for analysis of non-atmospheric gases.
Column							X	Replace.
Mass Spec								
Cryo-column	X							Inspect for breaks.
Septa		X						Replace as needed.
Column							X	Replace.
Rough Pump							X	Oil change by HP service representative.
Mass Spectrometer							X	Clean.
PURGE AND TRAP								
Sorbent Trap							X	Change.
Purge Flow					X			Inspect semi-annually. Adjust as needed.
HPLC SYSTEMS								
Pumps	X							Pressure check daily, change guard column as needed. Visual leak check daily.
Pump Seals				X				Inspect seals quarterly, replace as needed.
Column	X							Pressure check. Visual leak check.
Detector Fittings	X							Visual leak check.
Detector Optics				X				Remove and inspect filter quarterly, clean or replace as needed.
Autosampler	X							Check seal pack for leaks.
TENNELEC LB5100								
Sample Change				X				Inspect moving parts quarterly, lubricate as needed.
Detector	X							Inspect for proper operation and response. Serviced by manufacturer only.
Detector gas			X					Inspect monthly, change tank when pressure reads <500 psi. Allow new tanks to dissipate radon for two weeks before use.
Flow Meter	X							Inspect for proper operation.
BECKMAN LS6500 Liquid Scintillation Counter		X						Inspect for proper operation prior to use. Serviced by manufacturer only.
LUDLUM MEASUREMENTS 2000	X							Inspect for proper operation prior to use. Serviced by manufacturer only.

TABLE 10.1								
LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE								
EQUIPMENT ITEM	Service Interval							SERVICE LEVEL
	D	W	M	Q	SA	A	AN	
LUDLUM MEASUREMENTS 182	X							Inspect push rod for high voltage engagement. Inspect instrument noise level without flask.
TCLP EQUIPMENT								
Volatile Rotator			X					Check rotation.
Semivolatiles/Metals Rotator		X						Check rotation.

TABLE 10.2						
FIELD EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE						
EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
TURBIDIMETER HACH 16800/DRT-15C	X					Inspect daily prior to sampling and replace cell as needed.
CONDUCTANCE METER YSI 33	X					Inspect daily, replatinize cell as needed.
pH METER	X					Inspect daily prior to sampling, add filling solution as needed.
CORNING CHECKMATE 90 pH/SC/DO/T° METER	X					Inspect probe, membrane, battery daily prior to sampling. Change parts as needed.
YSI MODEL 50B/51B DISSOLVED OXYGEN METER	X					Inspect probe daily prior to sampling, change as needed.
WATER LEVEL INDICATOR	X					Inspect probe and meter prior to use at every well.

11.0 QUALITY CONTROL CHECKS AND ROUTINES TO ASSESS PRECISION AND ACCURACY AND CALCULATIONS OF METHOD DETECTION LIMITS

The key to a successful QA/QC program is strict adherence to the program during all phases of the project, including: presampling discussions; sample collection, preservation, storage and analysis; and validation and reporting of results.

If project-specific quality assurance plan (QAPP) QC requirements are more stringent than the general procedures given below, QAPP requirements are followed.

11.1 Field QC Checks

Savannah Laboratories recommends to their clients that proper control procedures meet or exceed the appropriate regulatory agency field QC requirements.

Blanks which are collected in the field are an important link in the quality control data chain for a set of samples. The analytical data derived from these blanks are necessary to assess field sampling operations. These blanks are used to verify that sample containers, preserving reagents and equipment are contaminant-free. Blanks are also used as a check for potential on-site environmental contamination, to evaluate personnel expertise in sample collection and to reveal problems that may occur in sample storage and transport.

The field quality control blanks should not be isolated from actual samples. They must be considered as samples and treated identically (preserved with the same reagents, stored and transported in the same containers as the samples, etc.).

The types and frequency of blanks must be included in all quality assurance plans. In cases where data quality objectives dictate more stringent controls, additional field quality control blanks may be required. The following protocol outlines the minimum field blank requirements necessary to assure the validity and integrity of any sampling episode.

Field QC check samples will be analyzed according to the client's instructions and invoiced as samples. Since field QC check samples are usually liquids, they are prepared and analyzed by liquid procedures and reported as liquids. However for batching purposes, unless requested by clients or required by a project specific QA plan, lab QC deliverables are not provided for field QC check samples. Liquid QC samples are batched with soil samples for methods where preparation procedures are the same for both matrices (i.e., volatiles, cyanide, etc.).

11.1.1 Trip Blanks

PURPOSE: The trip blank is to be used when sampling for volatile organics. The purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transportation due to exposure to volatile organics (e.g., gasoline fumes) and other environmental conditions during the sampling event.

PREPARATION: Trip blanks are prepared prior to the sampling event either by the laboratory providing sample containers, or by field team personnel who are responsible for the initial preparation of sample containers and field equipment. The water must be free of volatile organic contaminants. Any appropriate preservatives must be added at the time that the blanks are prepared. The sample containers are sealed, labeled appropriately, and transported to the field in the same sampling kits as the sample vials. These blanks are not to be opened in the field. They are to be transferred to the sample container designated for volatile sample storage, and transported with the samples to the laboratory.

FREQUENCY: One trip blank for each volatile organic analysis (601, 602, 624, 8010 etc.) should be provided per cooler used for storing and transporting volatile sample vials. If a laboratory requires submission of multiple vials for a method, the same number of vials must be submitted for the trip blank.

11.1.2 Field Blanks

PURPOSE: Field blanks are used to evaluate the effects of on-site environmental contaminants, the purity of reagents used as preservatives or additives and the general sample container filling/collection techniques. Field blanks are recommended for all parameters.

PREPARATION: Field blanks are prepared on-site by filling the sample container(s) with analyte-free water, adding preservatives, sealing the containers and completing the appropriate documentation. The field blanks must be handled in the same manner as the sample group for which it was intended (i.e., blanks must be stored and transported with the sample group).

FREQUENCY: One field blank per parameter group per day or at a frequency of 5% of the samples in the parameter group per day, whichever is greater.

11.1.3 Equipment Blanks

PURPOSE: Equipment blanks are recommended if sampling equipment is precleaned or field-cleaned. These blanks are used to determine the effectiveness of field cleaning procedures as well as to reveal those sources of contamination that may be found in a trip blank. Equipment blanks should be collected and analyzed for all parameter groups and matrices.

PROCEDURE: The final rinse water (analyte-free) shall be rinsed on or through the sampling equipment, whether precleaned or field cleaned, collected, and placed in appropriate preserved containers. These blanks must be stored and transported with the samples.

FREQUENCY: When less than five samples of a similar matrix are taken, one equipment blank prepared on-site for precleaned or field-cleaned equipment should be collected and analyzed for each parameter.

When five to ten samples of a similar matrix are taken, one equipment blank should be collected on field-cleaned equipment or one on-site blank should be collected in precleaned equipment if no equipment is cleaned in the field.

For sampling events involving ten or more samples, a minimum of one blank should be taken on precleaned equipment or at the rate of 5% (whichever is greater) of the samples in each analyte group for all matrices. One blank should be taken on field-cleaned equipment or at the rate of 5% (whichever is greater) of the samples in each analyte group for all matrices.

11.1.4 Field Duplicates

Field duplicates are taken, analyzed, reported and invoiced as required. A minimum of one duplicate for 10% of samples should be taken for all parameter groups and matrices to be collected and analyzed.

11.1.5 Field QC Summary

The recommended frequency of field blanks and duplicates is summarized below:

No. Samples	Precleaned Equipment Blanks	Field-Cleaned Equipment Blanks	Trip Blank (VOCs)	Duplicates
10+	Minimum of one, then 5%	Minimum of one, then 5%	One per cooler	Minimum of one, then 10%
5-9	One*	One*	One per cooler	One
<5	One*	One*	One per cooler	Not required

* Note: For nine or fewer samples, one equipment blank should be required from either precleaned or field-cleaned equipment.

If any equipment is cleaned in the field, the blank should be taken from the field-cleaned equipment.

11.2 Laboratory QC Checks

The laboratories employ control samples to assess the validity of the analytical results. Determination of the validity of sample results is based on the acceptance criteria being met by the control samples. The acceptance criteria for each type of control sample are defined in the appropriate SOP. These acceptance criteria are per method requirements or calculated annually from historical data.

Matrix spike results will be utilized for laboratory control when specified by the method. If matrix spikes are out of control, or control is based on laboratory control standards (LCS), then LCS results and method control criteria will ultimately be used to accept or reject the analytical batch. Clients are requested to provide sufficient sample for matrix spikes.

For CLP protocols or other cases (i.e., client or project specific QAP mandated) where "sample specific" (non-batch) QC is required, matrix spike/duplicate analysis will be conducted on replicate samples provided by the client. In all other cases, matrix spikes will be on a batch- (not client-, project- or sample-) specific basis.

When possible, aliquots for matrix spikes are taken from the same container as the field sample. In some cases with liquid samples, this is not possible, i.e., semivolatile extractables, oil and grease, TPH, etc.

An analytical batch is defined as a group of field samples which are processed as a unit. If the number of field samples in the group is greater than 20, each group of 20 samples or less is handled as a separate batch.

Other QC check samples are analyzed for performance evaluations or as part of internal or external audits as given in Section 14.

If QAPP QC requirements are more stringent than the general procedures given below, QAPP QC requirements are followed.

11.2.1 Organics

Method Blanks: A method blank will be analyzed for each batch of samples.

Lab Control Standards: A blank spike or lab control standard will be processed and analyzed (per method requirement) with each batch of samples. For drinking water samples, analyte spike concentrations will be at or near reporting limits as specified for lab-fortified blanks in the 500 series methods.

Surrogates: Appropriate surrogate(s) (see Tables 5.1 and 5.2) will be added to all samples, standards and blanks.

Matrix Spikes: Matrix spikes will be analyzed at a frequency of 5% of samples. If a method does not specify matrix spiking compounds, the SW-846 or CLP matrix spiking compounds will be used. Appropriate matrix spikes will be used for other chromatographic methods. Matrix spikes containing all method specified compounds should be analyzed monthly to generate accuracy and precision limits.

Matrix Spike Duplicates/Sample Duplicates: Duplicate samples or matrix spike duplicates will be analyzed at a frequency of 5% of samples. In cases where duplicate matrix spikes are used, precision data are obtained on only the matrix spiking compounds.

Full List Spikes: For projects that require spiking a laboratory control sample (LCS) or matrix spike (MS) with all target compounds, re-extraction and/or re-analysis of the samples in the batch will not be performed if:

1) The recoveries of no more than one (1) compound when 5 to 10 compounds are spiked, two (2) compounds when 11 to 20 compounds are spiked, three (3) compounds when 21-30 compounds are spiked, or five (5) compounds when more than 30 compounds are spiked are determined to be outside the control limits, and recoveries for all spiked compounds are positive. When <5 compounds are spiked, all compounds should be within control limits.

2) The recovery of a spike exceeds the upper control limit (UCL) and the compound is not detected in any sample in the analytical batch.

As indicated in Methods 8260 and 8270, the following compounds are not stable under the routine conditions of the preparation and analytical procedures and will not be evaluated for corrective action if included in the LCS or MS:

VOC:
- Acrolein
- Benzyl chloride
- Carbon disulfide
- 2-chloroethyl vinyl ether
- Pentachloroethane

SVOC:
- Aniline
- Benzidine
- Benzoic acid
- Hexachlorocyclopentadiene
- Hexachlorophene
- Kepone

The above guidance is to used as the default for evaluation of full target spikes in organic analyses unless other corrective actions are defined in a project-specific quality assurance plan or in an SL pre-project plan.

11.2.2 Inorganic and General Chemistry

Calibration Blanks: Calibration blanks are nondigested blanks which are analyzed at a frequency of 10% of samples.

Method Blanks: Method blanks should be processed and analyzed with each batch at a frequency of 5% of samples of the same matrix.

Lab Control Standards: A blank spike or lab control standard will be processed and analyzed with each batch of samples.

Matrix Spikes: Matrix spikes will be analyzed at a frequency of 5% of samples.

Matrix Spike Duplicates/Sample Duplicates: Duplicate samples or duplicate matrix spikes will be analyzed at a frequency of 5% of samples.

11.2.3 Microbiology

Quality control checks are routinely performed for all microbiological analyses. Strict requirements for the house deionized water must be met before it can be used in any testing. Each monitored parameter, its monitoring frequency, and its acceptance limits is as follows: residual chlorine, monthly, < 1.0 mg/L; trace metals (total Cd, Cr, Cu, Ni, Pb, Zn), annually, < 1.0 mg/L, individual metals < 0.05 mg/L; conductivity, daily < 2.0 umho/cm; heterotrophic plate count, monthly, < 500 CFU/mL; inhibitory residue, annually or for each new lot of detergent, less than 15% difference between groups; suitability, annually, ratio between 0.8 and 3.0.

Other laboratory QC practices are utilized to provide accurate microbiological results. Positive and negative microbiological controls are run with each new lot of medium. Autoclave tape is used to ensure proper sterilization of sample containers, media, etc. Incubators are maintained at 35 ± 0.5° C and water baths at 44.5 ± 0.2° C. Thermometers used for these monitoring purposes are calibrated annually against an NIST-certified thermometer. Other equipment, such as the dissecting microscope and colony counter are maintained in clean operating condition at all times.

Microbiological samples are analyzed in duplicate at a rate of 10% of positive samples. A positive control sample is analyzed with each batch of coliform samples. A negative control is analyzed at least monthly. Additionally, all drinking water samples positive for total coliform must be confirmed. For environmental samples, 10% of samples positive for total coliform must be confirmed. A completed test for MPN analysis must be performed on 10% of all confirmed samples or at least quarterly.

Blanks are routinely analyzed with microbiological samples. For membrane filter analyses, a sterile dilution water blank is run initially, after every 10 samples, and at the end of each analytical run. For MPN analysis, sterile dilution water is added to a lauryl tryptose broth tube for a blank for each analytical run.

11.2.4 Radiochemistry

Background Count: Background counts are obtained at a frequency of once per day for gross alpha, gross beta and radium 228; and determined for each flask prior to sample introduction for radium 226.

Method Blanks: Method blanks are analyzed at a frequency of 5% of samples of the same matrix.

Lab Control Standards: Lab control standards are analyzed with each batch of 20 samples of the same matrix.

Matrix Spike/Matrix Spike Duplicate or Sample Duplicates: These are analyzed with each batch of 20 samples of the same matrix.

11.3 Routine Methods Used to Assess Precision and Accuracy

A system for assessing accuracy and precision is maintained in the LIMS. Tabulations are initiated for each parameter upon method validation and maintained for each parameter where method-specified limits are not published.. The archived data in the LIMS are used to update the control limits annually. Control limits are established for each parameter at ± 3 standard deviations from the calculated mean based on a minimum of ten (10) data points. Formulae used for calculations of accuracy and precision are provided in Section 5.0. Control calculations are based on procedures in *The Handbook for Analytical Quality Control in Water and Wastewater Laboratories* (EPA, 1979)

11.4 Method Detection Limits and Reporting Limits

Method detection limits (MDLs) are determined annually in accordance with the procedures in SW-846 and Appendix B of 40 CFR Part 136. This procedure includes analyzing seven or more (40 CFR Part 136) or a minimum of three (SW-846 Chapter One) prepared spikes or standards in reagent water at levels 3-5 times the estimated detection limit. The standard deviation of the replicate measurements is calculated, and the MDL is computed by multiplying by the appropriate Student's t value (n-1 degrees of freedom) for the appropriate 99% confidence level (for seven replicates, $t = 3.14$).

The MDL calculated by the procedure described above is defined as the minimum concentration of a substance that can be measured in reagent water and reported with a given confidence that the analyte concentration is greater than zero. SL makes no claim that the MDLs determined by this statistical procedure are obtainable in environmental samples.

For other protocols (i.e., Contract Laboratory), other procedures are used to estimate detection limits.

Since MDLs are based on the analyses of standards in reagent water, they may not be useful in reporting data for environmental samples; therefore, practical quantitation limits (PQL) or reporting limits (RL) are typically used for reporting a non-detected parameter. Practical quantitation limits or reporting limits are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Reporting limits for radiological analyses are from recommended values in EPA 40 CFR Chapter 1 (7-1-93 Edition) Section 141.

12.0 DATA REDUCTION, REVIEW, AND REPORTING

12.1 Introduction

In order to provide the highest quality data possible, an extensive system for sample custody, data reduction, review, and reporting has been implemented.

12.2 Sample Custody

Upon receipt of the samples, the custody forms are checked against the sample identifications listed on the containers by the custody technicians, and a unique SL log number is assigned to each sample group. Any discrepancies are noted, including cooler temperatures, broken bottles and/or misidentified samples. Clients are immediately notified if discrepancies exist.

After receipt, the samples are delivered to the appropriate laboratory sections where the samples are checked for proper preservation and this information is recorded in bound notebooks when applicable. When necessary, the samples are then stored in refrigerators that are monitored for temperature.

12.3 Organization and Initiation of Sample Analyses

The key to Savannah Laboratories' sample flow, analysis, data/QA review, archiving, and reporting system is the single LIMS network which controls the day to day production of the laboratories. This system, which is summarized in Figure 12.1, provides project managers, QA personnel, and all analysts immediate information on the status of any sample in all five facilities. This system schedules and prioritizes all work, provides a mechanism for sample tracking, review of reportables and QC data, generation of reports and invoices, and archiving of all reports and associated QC data.

Upon receipt of custody forms, the project manager instructs data management personnel to log the sample analysis request and identification into the LIMS. The LIMS is based on an ADDS Mentor 7000 computer (NCR) which links the laboratories via telephone multiplex. This enables any project manager, section manager, QA manager, laboratory director, or analyst with authority to access and check the status of all projects.

If special handling or data packaging is required, the QA department and the laboratory receive copies of the custody forms and computer acknowledgements or preproject plan. A sample delivery group (SDG) sheet is established and distributed to all affected departments including the various laboratory analysts, project managers, and section managers.

After the sample analysis request is logged into the LIMS and approved, the LIMS generates worksheets which are printed and distributed.

12.4 Sample Analysis and Data Reduction

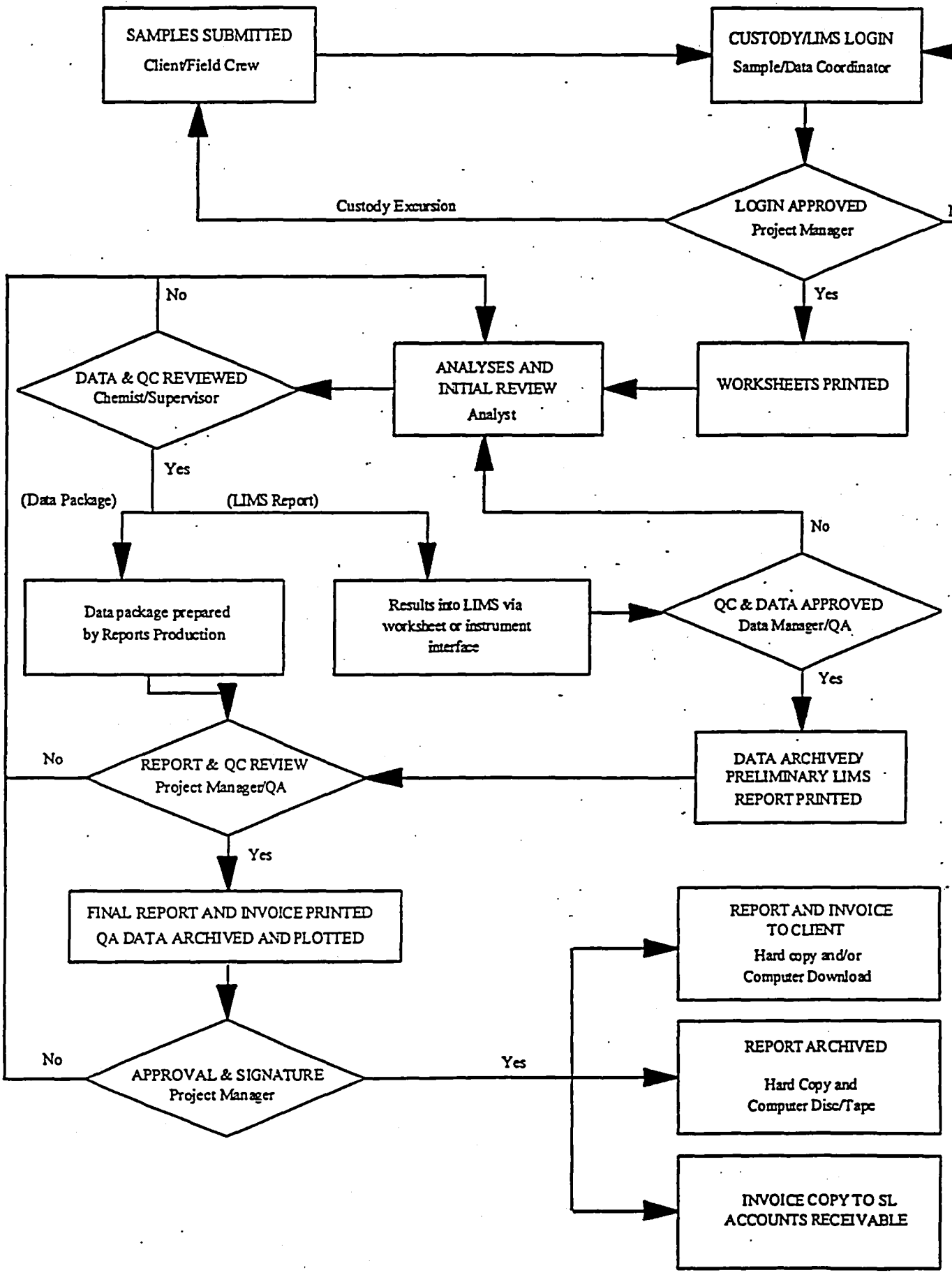
Through the use of the worksheets and/or SDG sheets, the samples are prepared following the procedures given in each of EPA's approved methods. The preparation information is recorded in signed notebooks throughout the laboratory.

12.4.1 Data Reduction

Most sample concentration results are read directly from instrumentation without further reduction or calculations. Dilution factors are applied upon the dilution of samples having concentrations above the calibration range.

In many cases, these are input into the instrument computer and correct results are calculated automatically. In other cases, a manual calculation may be made. Soil/solid waste concentration results for all laboratory

FIGURE 12.1 - FLOW CHART OF SL COMPUTERIZED LIMS



sections are calculated on a dry weight basis, prior to reporting, by dividing the instrument result by the fractional dry weight.

Other than the cases discussed above, data obtained by the following method/instrument are directly reportable: GC, GC/MS, metals, general chemistry automated colorimetry, TOC, DO, turbidity, and pH.

Data from methods requiring reduction prior to reporting include titrimetric methods, BOD, COD, conductivity, manual UV/VIS/IR, residue, TOX, and radiochemical parameters.

Table 12.1 gives equations used in computer-controlled instrumentation for data reduction as well as equations used for the manual calculation of reportable concentration results.

The laboratory raw data containing the instrument-generated reports, manually calculated results, and all supporting preparation, calibration, and analytical data are retained at the individual work stations until reports are issued unless additional handling or data packaging is required.

All pH and conductivity meters are temperature compensated. Cell constants for field conductivity meters are determined by laboratory personnel annually as given in Section 9.6. Field conductivity is calculated as given in Table 12.1. All other field data are read directly from instrumentation.

Bound field notebooks are used for documentation of required data reduction. Calculations are recorded in waterproof ink.

12.4.2 Chromatographic and Data File Identification

Chromatograms and data files are given a unique alphanumeric identification by the analysts initiating the analyses in each section where appropriate. These file identification numbers reflect either the date the sequence was initiated (GC sections), the order in which the samples were analyzed (GC/MS sections), and/or the sample identification and log numbers given by the client and listed on the LIMS.

12.5 Data Transfer and Review

12.5.1 Data Transfer to LIMS

The analytical results are entered on the department worksheets after review or by direct electronic transfer from the instrument data system. After the data are entered into the LIMS, approval sheets are printed and checked against the information entered into the LIMS for transfer errors and anomalies.

12.5.2 Data Review

Laboratory analytical results are reviewed by a second analyst or a section supervisor. Prior to entering the reportable data into the LIMS, laboratory raw data have been reviewed, stamped, and signed to ensure that all of the method specifications have been met. This includes checking the extraction, digestion, distillation, and other preparation logs, as well as ensuring that all precision and accuracy requirements are addressed, and all steps of the analyses have been completed. If any problems arise during the analysis of the sample batch, it is the responsibility of the analyst and the section supervisor to bring this to the attention of the project manager, section manager, and QA manager through a written corrective action report.

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
BN/A Extractables by GC/MS [Internal Standard Method (625 and 8270)]	Liquid	Solid
	ug/L (or mg/L)	ug/Kg (or mg/Kg)

$$RRF_s = \frac{A_S}{A_{IS}} \times \frac{C_{IS}}{C_S}$$

RRFs = relative response factor of standard
A_s = area of standard (area counts)
A_{IS} = area of internal standard (area counts)
C_{IS} = concentration of internal standard (ug/ml)
C_s = concentration of standard (ug/ml)

$$Water\ conc\ (ug/L) = \frac{A_S}{A_{IS}} \times \frac{C_{IS}}{RRF_S} \times \frac{V_f}{V_i} \times DF$$

V_f = final extract volume (ml)
V_i = initial sample volume extracted (L)
DF = dilution factor

$$Soil\ conc.\ (ug/kg) = \frac{A_S}{A_{IS}} \times \frac{C_{IS}}{RRF_S} \times \frac{V_f}{W_{spl}} \times \frac{1}{(\%solids \times 0.01)} \times DF$$

W_{spl} = weight of sample extracted (Kg)

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
VOCs by GC/MS and GC	**Liquid**	**Solid**
	ug/L (or mg/L)	ug/Kg (or mg/Kg)

$$Relative\ Response\ Factor\ (RRF_S) = \frac{A_S}{A_{IS}} \times \frac{W_{IS}}{W_S}$$

A_S = area of standard (area counts)
A_{IS} = area of internal standard (area counts
W_{IS} = weight of internal standard (ug)
W_S = weight of standard (ug)

$$Water\ conc.\ (ug/L) = \frac{A_S}{A_{IS}} \times \frac{W_{IS}}{RRF_S} \times \frac{DF}{V_{spl}}$$

DF = dilution factor
V_{spl} = sample volume purged (L)

$$Soil\ conc.\ (ug/kg\text{-}dw) = \frac{A_S}{A_{IS}} \times \frac{W_{IS}}{RRF_S} \times \frac{DF}{W_{spl}} \times \frac{1}{(\%solids \times 0.01)}$$

W_{spl} = Weight of sample purged (Kg)

Pesticides/PCBs and Other GC Procedures	**Liquid**	**Solid**
	ug/L (or mg/L)	ug/Kg (or mg/Kg)

$$Response\ Factor\ (RF_s) = \frac{ug\ of\ standard}{peak\ area}$$

$$Water\ conc.,\ (ug/L) = RF_s \times peak\ area \times \frac{V_f}{V_i} \times \frac{DF}{V_j}$$

V_i = initial sample volume (L)
V_f = final extract volume (ml)
V_j = injection volume (ml)
DF = dilution factor

$$Sediment\ conc.,\ (ug/kg\text{-}dw) = RF \times peak\ area \times \frac{V_f}{(W_{spl})(\%solids \times 0.01)(V_j)}$$

W_{spl} = weight of sample extracted (Kg)

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
Metals	**Liquid**	**Solid**
$$Water\ conc.\ (mg/L) = \frac{y - b}{m} \times \frac{V_f}{V_i} \times DF$$	ug/L (or mg/L) mg/L (or ug/L)	ug/Kg (or mg/Kg) mg/Kg (or ug/Kg)
y = $absorbance_{spl}$ b = y intercept from calibration curve (absorbance) m = slope from calibration curve (absorbance/(mg/ml) V_f = volum of digest (ml) V_i = volume of sample (L) DF = dilution factor		
$$Soil\ conc.\ (mg/kg\text{-}dw) = \frac{y - b}{m} \times \frac{V_f}{W_{spl}} \times \frac{1}{(\%solids \times 0.01)} \times DF$$		
W_{spl} = weight of sample (Kg)		
UV/VIS and IR Procedures	**Liquid**	**Solid**
$$Water\ conc.\ (mg/L) = \frac{y - b}{m} \times \frac{V_f}{V_i} \times DF$$	mg/L	mg/Kg
y = $absorbance_{spl}$ b = y intercept from calibration curve (absorbance) m = slope from calibration curve (absorbance/(mg/ml) V_f = final digest volume (mL) V_i = volume of sample (L) DF = dilution factor		
$$Soil\ conc.\ (mg/kg\text{-}dw) = \frac{y - b}{m} \times \frac{V_f}{W_{spl}} \times \frac{1}{(\%solids \times 0.01)} \times DF$$		
W_{spl} = weight of sample (Kg)		

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
General Titrimetric Procedures	**Liquid**	
Analyte, mg/L = $\frac{N_{titrant} \times \text{Titer}}{\text{Vol. of sample titrated}} \times \text{eq. wt.} \times 1000$	mg/L	
BOD	**Liquid**	
BOD, mg/L = $\frac{(\text{Int. DO} - \text{Final DO}) - \text{Seed Correction Factor}}{\text{Vol. fraction of sample}}$	mg/L	
COD	**Liquid**	
COD, mg/L = $\frac{(\text{Blk titer} - \text{sample titer}) \times N_{FAS} \times 8000}{\text{Vol. of sample, mL}}$	mg/L	
Conductivity	**Liquid**	
Cell constant = $\frac{1000}{\text{Observed conductivity of 1000 - µS/cm std.}}$	µS/cm	
Residue	**Liquid**	
Residue, mg/L = $\frac{\text{Total wt.} - \text{Wt. of dish or filter}}{\text{Vol. of sample, L}}$	mg/L	
TOX	**Liquid**	**Solid**
TOX, µg/L = $(C_1 + C_2 - 2C_3) \times \frac{1000\text{ mL}}{\text{Vol. of sample}}$ C_1 = instrument reading of 1 column C_2 = instrument reading of 2 column C_3 = instrument reading of blank column TOX, mg/kg = $\frac{\text{instrument reading}}{\text{µL injected}} \times \frac{5}{\text{dry wt. fraction}}$	mg/L	mg/Kg

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
	Liquid	Solid
Gross Alpha, Gross Beta		
Gross α or β = $\frac{(\text{cpm sample - cpm background})(1000)}{(2.22)(E_1)(\text{sample volume in mL or sample mass in mg})}$ E_1 = counting efficiency Counting error = $\frac{(A+B)^{1/2}(1.96)(1000)}{(2.22)(E_1)(\text{sample volume in mL or sample mass in mg})}$ A = gross counts/(count time in min)^2 B = background counts/(count time in min)^2	pCi/L	pCi/g
Radium 226	Liquid	
$Ra\text{-}226 = \frac{C \times zt_3}{(2.22)(E)(V)(1 - e^{-zt_1})(e^{-zt_2})(1 - e^{-zt_3})}$ C = net count rate E = calibration constant for system and scintillation cell V = sample volume in liters t_1 = elapsed time (days) between first and second de-emanations, and z = 0.181 days^{-1} t_2 = elapsed time (h) between second de-emanation and counting, and z = 0.00755 h^{-1} t_3 = counting time (min), and z = 1.26x10^{-4} h^{-1} z = decay constant for Radon 222	pCi/L	

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units
Radium 228	**Liquid**
$$Ra\text{-}228 = \frac{C \times zt_3}{(2.22)(E)(V)(R)(1 - e^{-zt_1})(e^{-zt_2})(1 - e^{-zt_3})}$$ C = net count rate E = counter efficiency for Actinium 228 V = sample volume in liters R = (fractional chemical yield of yttrium carrier (fractional chemical yield of barium carrier) z = decay constant for Actinium 228 (0.001884 min^{-1}) t_1 = ingrowth time (min) t_2 = time interval between first yttrium hydroxide precipitation and start of counting time t_3 = counting time interval (min)	pCi/L
Tritium	pCi/L
$$\text{Tritium} = \frac{C}{2.22} \times \frac{1000}{\text{sample size (mls)}}$$ C = Net count rate in disintegrations/minute	
Data for solid or semisolid samples are reported on a dry weight basis.	

The field/sampling manager is responsible for data review of all field-generated data. This includes verifying that all field descriptive data is recorded as per Section 6, that all field calibration requirements have been met as per Section 9, that all field QC data have met criteria given in Table 5.5, and that field data are entered accurately on worksheets.

Data flags are used on reports as needed to inform the project manager and the client of any additional information that might aid in the interpretation of the data. The data flagging system incorporates data qualifiers which are similar to flags specified in the Contract Laboratory Program protocols, as well as additional flags used to help explain batch specific events.

When data acquisition and reporting have been completed, the project manager reviews and prepares the final report. Because the project managers have extensive experience in evaluating analytical data, they have developed both objective and subjective techniques for data review. Each value reported is reviewed in the context of the respective environmental matrix and all available QC/QA data. Outliers or other abnormal values are carefully scrutinized, and samples are reanalyzed if the abnormalities cannot be explained. Where there are cases in which the results from spiked samples suggest interferences, attempts are made to remove the interferences, or alternate analytical procedures are used. If the interference problem cannot be resolved, the data are flagged and/or a project narrative is included with the report.

12.5.3 Special Project or Data Package Review

If special handling and/or data packages are requested by the client, QA personnel also review the project report and the raw data. This includes checking that holding time requirements are met, checking calibrations, reviewing all quality control data and/or control charts, and initiating any corrective action or reanalyses that might be appropriate.

12.6 Reporting

The final report is printed and signed by the project manager after all review has been completed. The data flags that may appear in a project report are defined on the signature page, and any additional comments are also footnoted on this page.

If requested by the client or a project specific QA Plan, custom reports or CLP data packages with diskette deliverables can be provided. If data packaging is requested, a paginated data package is provided in addition to the project report. The format of the project report and/or data package can be adjusted to meet the needs of the client. All LIMS reports can be downloaded onto diskettes or to most clients' computers.

12.7 Data Storage

After the projects are completed, the data are transfered to a secured area and filed chronologically by laboratory section in boxes and maintained for a period of three (3) years or the term specified in a client contract. In cases where data are reviewed on a computer screen, and a tape backup system is available, electronic files of data are stored on tape in lieu of paper data. If the data are to be purged to the client or need to be separated from the general raw data files, the data can be boxed, labeled and stored in a separate secured area.

All in-lab data generated by computer systems are stored to tape when the capability exists. The tapes are labeled and stored at the individual work stations or maintained by a data systems manager and serve as the lab's raw data files.

Hard copies of all LIMS reports are maintained for five years in client files. All LIMS reports and associated QC data are kept for a minimum of three years on the LIMS hard diskettes and/or magnetic tape. All data on the LIMS are backed up daily on magnetic tape.

Keys to the data storage areas are retained by the QA staff and the section/department managers.

13.0 NONCONFORMANCE AND CORRECTIVE ACTION PROCEDURES

A nonconformance is defined as any occurrence that prevents the lab from delivering data that are compliant with the control criteria published or incorporated by reference in an applicable quality assurance plan. The non-conformance report (NCR) form (Figure 13.1) is used to document nonconformance conditions and to specify the necessary action(s) taken to correct the specific problem. The corrective action report (CAR) form (Figure 13.2) is used in situations where a recurring problem or breakdown in systems is observed and warrants a more thorough investigation than a single event NCR. CARs may be initiated from:

- a specified NCR
- an observed trend or frequency of events that warrant corrective action
- an audit finding

Some situations that develop and require formal documentation may not be appropriate for an NCR and CAR. Some of these anomalous situations are detailed on the Anomaly Report (Figure 13.3).

The status of all NCRs and CARs are tracked in registries located in various departments or centrally located in the lab. Summaries of the NCRs and CARs are provided to the Lab Director and management periodically so that overall trends in nonconformances and corrective actions can be evaluated. The procedures for preparation, tracking and disposition of NCRs, CARs, and Anomaly Reports are given in SL SOP CA85: *Nonconformance and Corrective Action Procedures.*

Table 13.1 summarizes the checks, the acceptance criteria, and the recommended corrective action for various QC activities. This table and SL SOP AN02: *Analytical Batching* are used to evaluate sample and batch QC.

FIGURE 13.1

Nonconformance Report (NCR)

Initiated by:_____ Date initiated:_____ Client:_____ NCR #:_____

Issuing department/(division): _____ Project manager/(division) :_____ Method:_____

Project/SDG#:_____ Sample(s) affected:_____ Batch ID:_____

1	Nonconformance condition: Indicate and describe details (if necessary) Describe reason problem occurred (root cause):	☐ Holding time ☐ Catastrophic Failure ☐ LCS/MS ☐ Method blank ☐ Calibration ☐ Internal standards ☐ Surrogates ☐ Other
2	Action taken (add details if necessary): PM Initials/date: TM/DM/PS Initials/date:	☐ Proceed with analysis ☐ Reprep/reanalyze ☐ Do not analyze ☐ Case narrative (discuss in Sect. 5) ☐ No action taken (justify)
3	Result of action taken in 2, above (add details if necessary):	☐ Reprep/reanalysis acceptable ☐ Reprep/reanalysis agrees w/ original ☐ Other
4	Case Narrative Comments (if necessary) Initials/date:	
5	Close-out: Additional corrective action required to prevent recurrence? ☐ YES ☐ NO If YES, initiate corrective action report (CAR): CAR Initiated #: _____ Closed by: Date:	

FIGURE 13.2

Corrective Action Report (CAR)

CAR #:_____ Initiated by/date:_____

Lab Director attn. requested? ☐ Yes ☐ No (*if yes, copy LD after completing section 1, below*)

1	Responsible TM/DM - summarize non-conformance incident and comments:
2	State root cause Initials: Date:
	CORRECTIVE ACTION Assigned To:_____Target completion date:_____ Corrective action has been completed on (date):_____ By (initials):
4	QA Department Comments By (initials): Date:
5	Follow-up dates / comments (if no comments, indicate as "none") Initial 2 week 2 month ☐ Add to internal systems checklist?

FIGURE 13.3

ANOMALY REPORT			
Date: _____	Log #: _____	Sample ID: _____	Client: _____
Dept: ___EX ___GE ___LC ___ME ___RA ___CU ___SG ___SM ___VG ___VM ___AI		Analysis: _____	Reported by: _____

Anomaly:

☐ Sample matrix is different than indicated by log-in.

Logged in as	*Best described as*
Water	*Water*
Soil	*Non-aqueous liquid*
Oil	*Soil*
	Sludge
	Oil
	Product
	Other _____

☐ Sample was received with inadequate preservation, and was preserved upon receipt.

☐ Sample received in an incompatible sample container. ____ *glass* ____ *plastic* ____ *other* _____

☐ MS/MSD failed while the LCS/LCSD passed criteria, for a drinking water parameter. Method indicates data flagging.

☐ Target analyte(s) detected in drinking water sample. (Describe below)

☐ Sample exhibits gross non-homogeneity. (Describe below)

☐ Insufficient sample received for analysis.

☐ Data flag may be needed. Discuss with DM/LM before reporting.

Other _____

Custody: *ALWAYS ATTACH A COPY OF COC WITH HIGHLIGHTED DEFICIENCY

☐ Sample description discrepancy between COC & Container
☐ Sample container breakage
☐ Cooler temp >6°C or frozen
☐ Sample received not listed on COC
☐ Custody seals broken
☐ Incomplete COC
☐ Sample container partially filled
☐ Improperly preserved sample

Comments:	Client Notified: ☐Yes ☐No Contact:
	Date:
	Resolution:

Route to:
Division PM:

Other Div. PM: SL_____ ML_____ NL_____ FL_____ TL_____ BL_____

TABLE 13.1		
CORRECTIVE ACTION		
QC Activity	Acceptance Criteria	Recommended Corrective Action
GC/MS tuning	Chapter 9.0	Do not analyze samples unless criteria are met.
Initial calibration standards	Chapter 9.0	Reanalyze standards. If still unacceptable, remake standards or instrument corrections.
Continuing calibration standard	Chapter 9.0	Reanalyze standard. If still unacceptable, remake standards, or recalibrate.
Method or calibration blanks	< RL (for CLP procedures, use SOW guidelines)	Reanalyze blank. If problem, determine source of contamination. If necessary or possible, redigest/extract batch and reanalyze. (Unless samples do not contain the corresponding target compounds)
Surrogate recovery (GC/MS semivolatiles)	Tables 5.1 - 5.8, or program/ project specific. One acid and one base may be out of criteria., but must be recovered at least 10%.	Follow method guidelines.
Surrogate recovery (GC/MS volatiles)	Tables 5.1 - 5.8, or program/project specific	Follow method guidelines.
Surrogate recovery GC or LC	Tables 5.1 - 5.8, or program/project specific	Check for possible matrix interferences or other causes and follow method guidelines.
Matrix spike recoveries	Tables 5.1 - 5.8, or program/project specific	Check for possible matrix interferences or other causes. If still out, evaluate LCS.
Lab control standard (LCS) recoveries	Tables 5.1 - 5.8, or program/project specific	Check calculations, reanalyze standards, and if necessary or possible, redigest or extract batch and reanalyze.
Precision of MS/MSD or sample duplicate	Tables 5.1 - 5.8, or program/project specific	Check calculation. Check for possible matrix interference or other causes.
Internal standards (organics)	Method or protocol-required limits	Follow method or protocol guidelines.
Trip blanks	≤ RL	Check related method blank for contamination.
Field Blanks	≤ RL	Check related method blank for contamination.
Equipment blanks	≤ RL	Check related method blank for contamination.
Field duplicates	Follow project/program requirements	Follow project/program requirements
Microbiology + and - controls for media	Should be + and -, respectively	Reject medium.
Microbiology duplicates	RPD with established limits	Follow agency requirements.
Sample results	Calibration	If the calibration fails for a target and the corresponding target is not detected, the results may be reported as < RL if the RL standard is analyzed and detected.
	Spike criteria limits	If a limited list MS or LCS is high biased and no targets are detected above the RL, results are reported as < RL. When a full compound spike is utilized, and the MS or LCS result is high biased, and the corresponding target is not detected, the result for the corresponding target is reported as <RL, regardless of the other targets.
	Surrogate criteria limits	If surrogate recovery is high biased and no target is detected, the results are reported as <RL.
External Quality control check samples	Defined by the program or project.	Defined by the program or project.

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.0 ERFORMANCE AND SYSTEM AUDITS

.1 Internal System Audits

.1.1 Laboratory Audits

ınual internal laboratory audits are conducted by the division QA Manager or QA Officer. The scope and pth of the audit are determined according to the requirements of the division. The system audit includes, but not limited to:

- evaluation of the procedures and items listed on the audit checklist
- review of compliance with the SL SOPs
- review of the compliance with this quality assurance plan
- review of the training records
- review of nonconformance and anomaly reports and follow up on corrective actions from previous audits, external audits, or PE samples.

ome items may require more frequent auditing to determine if non-compliant procedures have been corrected. The internal audit may be performed quarterly for one or two sections with the goal of auditing of all systems nce per year.

A r of the internal systems audit is prepared and submitted to the lab director and to the Corporate QA Ma by the end of January .

14.1.2 Corporate Systems Audit

A systems audit of each division is conducted annually by the Corporate QA Manager to determine if the procedures implemented by the SL divisions are in compliance with this quality assurance plan and the standard operating procedures (SOPs). This is primarily accomplished by the review of the following:

- the annual systems audit performed by the division QA Manager of QA Officer
- the findings and responses to external audits
- the results of PE samples
- summaries of nonconformance and corrective action taken by the lab.

The annual systems audit is performed by the Corporate QA Manager by the end of February. The Corporate QA Manager may request additional information or documentation of implementation. If necessary, the Corporate QA Manager will schedule an on-site reevaluation of the division laboratories.

14.1.3 Field Audits

An audit of the field sampling procedures is performed annually. These systems audits are conducted by the QA Officer, an external auditor, or a regulatory agency. The audit includes all aspects of field sampling operations. Section 6.0 of this document defines the elements that serve as a basis for this audit.

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14.2 External System Audits

Each laboratory may be certified by a number of state agencies, governmental agencies or private certification programs. Most of these programs require continuing on-site system audits of the laboratory. The laboratories submit to these on-sites as required by these certifying agencies and organizations and respond to any noted nonconformances with corrective actions.

Field system audits are performed periodically by various federal and state regulatory agencies. Field sampling and documentation procedures are examined to ensure sampling is performed according to the agency protocols.

14.3 Performance Audits

14.3.1 Internal Performance Audits

Internal performance audits or evaluations are routinely performed by Savannah Laboratories. Single blind performance audits are employed for several reasons. One purpose is to provide corrective action for parameters judged to be unacceptable on WP, WS or other major external performance audits. Periodic internal performance audits are also used to test parameters that are not routinely tested by external performance audits. Finally, single blind performance audits are employed to satisfy certain certification requirements, to satisfy auditors' specific requests for performance audit samples, or provide additional evidence of data quality to clients with specific questions regarding laboratory performance.

14.3.2 External Performance Audits

All facilities participate in each of the following performance evaluation audits semiannually:

1. U. S. EPA Water Supply Study (WS Series).
2. U. S. EPA Water Pollution Study (WP Series).

All facilities participate on an annual basis in a microbiology proficiency testing program.

Additionally, the laboratories participate in several regulatory agency, certifying group, or client requested performance audits. These performance audits include both single and double blind P.E. samples. Internal performance audits are logged into the LIMS system and reported in the same manner as samples. Results from these performance audits are reported to management, agencies, and clients as required. Nonconformance Reports (NCR) and Corrective Action Reports (CAR) are issued when appropriate.

Results from agency performance audits are supplied to clients upon request.

16.0 TRAINING AND QUALIFICATIONS

Savannah Laboratories' greatest asset is its well qualified and trained staff. The duties and responsibilities of management and staff positions are described in Section 4.0 of this manual. In addition, the qualifications for each of these positions can be obtained from the Corporate Human Resources Director at the Savannah Division.

SL SOP CA01 (*SL Training SOP)* describes the procedures and documentation required to adequately train the analytical staff. All new employees are required to undergo an introduction to Savannah Labs' policies described in SL SOP CA10: *Procedures for New Employee Orientation.*

17.0 DOCUMENTS AND RECORDS

All documentation and records are maintained in accordance with SL SOPs AN45:*Laboratory Notebooks,*CA02:*Divisional Document Control and Distribution,* and CA80:*Data Generation, Entry, Review, Approval, and Reporting..*

Section 12 (Data Reduction, Review, and Reporting) of this manual describes the flow of data through the laboratory and the SL policy for document and record retention (Section 12.7).

18.0 PROCUREMENT

The SL policies and procedures for procurement are described in SL SOP CA 45: *Procurement.*

19.0 QUALITY IMPROVEMENT/MANAGEMENT ASSESSMENT

Savannah Laboratories and Environmental Services, Inc., is committed to quality improvement and customer service. All aspects of the laboratories operations are monitored and input from clients is evaluated to determine if present policies and procedures are meeting the objectives defined in Section 3.0 of this manual. The following SOPs have been implemented to address and document quality improvement:

Procurement of Laboratory Materials-SL SOP CA45: *Procurement*
Analytical Training- SL SOP CA01: *SL Training SOP*
Client Satisfaction and Complaint Resolution - SL SOP CA95: *Complaint Resolution*
Non-Conformance and Corrective Action - SL SOP CA85:*Noncomformance and Corrective Action Procedures*
Auditing (Divisional and Corporate) - SL SOP CA05:*Technical and Systems Audits (Divisional and Corporate)*

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STATE OF NORTH CAROLINA DEPARTMENT OF THE
ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF WATER QUALITY
LABORATORY CERTIFICATION PROGRAM

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

SAVANNAH LABS. & ENV. SERV. INC.

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

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

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

This certificate shall be valid until December 31, 2000

Certificate No. 269

James W Meyer
for Bernard E. Sims, PhD

Attachment I

North Carolina Wastewater/Groundwater Laboratory Certification

Certified Parameters Listing

ab i	Savannah Labs. & Env. Serv. Inc.	Certificate Number:	269
ddress:	P.O. Box 13548 5102 La Roche Ave. Savannah, GA 31404-	Effective Date:	1/1/98
		Expiration Date:	12/31/2000
		Date of Last Amendment:	

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

CERTIFIED PARAMETERS

NORGANIC
BOD
COD
CHLORIDE
COLOR, PLATINUM COBALT
CONDUCTIVITY
CYANIDE
FLUORIDE
HARDNESS, TOTAL
MBAS
METALS I, REGULAR LEVEL
ALUMINUM
ARSENIC
BERYLLIUM
CADMIUM
CHROMIUM, TOTAL
COBALT
COPPER
IRON
LEAD
MANGANESE
NICKEL
SELENIUM
VANADIUM
ZINC
METALS II, REGULAR LEVEL
ANTIMONY
SILVER
THALLIUM
METALS I, LOW LEVEL
ARSENIC
BERYLLIUM
CADMIUM
CHROMIUM, TOTAL
COBALT
COPPER
IRON
LEAD
MANGANESE
NICKEL
SELENIUM
VANADIUM
ZINC
METALS II, LOW LEVEL
ANTIMONY
SILVER
THALLIUM
BARIUM
MERCURY

AMMONIA NITROGEN
TOTAL KJELDAHL NITROGEN
NO2 + NO3 NITROGEN
NITRATE NITROGEN
NITRITE NITROGEN
TOTAL PHOSPHORUS
ORTHOPHOSPHATE
OIL & GREASE - WATER
OIL & GREASE - EPA 9071
pH
INORGANIC PHENOLS
RESIDUE, SETTLEABLE
RESIDUE, TOTAL
RESIDUE, DISSOLVED 180 C
RESIDUE, SUSPENDED
SULFATE
SULFIDE
TOTAL ORGANIC CARBON
TURBIDITY
TCLP
TCLP METALS
TCLP ORGANICS

ORGANIC
PURGEABLE HALOCARBONS
EPA 601
EPA 5030 + 8010
PURGEABLE AROMATICS
EPA 602
EPA 5030 + 8020
ACROLEIN, ACRYLONITRILE, ACETONITRILE
EPA 603
EPA 5030 + 8030
ORGANIC PHENOLS
EPA 604
EPA 8040 + 3500 SERIES
ORGANOCHLORINE PESTICIDES & PCBs
EPA 608
EPA 8080 + 3500 SERIES
NITROAROMATICS & ISOPHORONE
EPA 609
EPA 8090 + 3500 SERIES
POLYNUCLEAR AROMATICS HYDROCARBONS
EPA 610
EPA 8100 + 3500 SERIES
PURGABLE ORGANICS
EPA 624
EPA 5030 + 8240

EPA 5030 + 8260
BASE NEUTRAL/ACID ORGANICS
EPA 625
EPA 8270 + 3500 SERIES
CHLORINATED ACID HERBICIDES
EPA 8150 + 3500 SERIES
ORGANOPHOSPHORUS PESTICIDES
EPA 8140 + 3500 SERIES
TOTAL PETROLEUM HYDROCARBONS (TPH) CALIFORNIA METHOD
GASOLINE RANGE
DIESEL RANGE
NONHALOGENATED VOLATILE ORGANICS
EPA 8015A
1,2, DIBROMOETHANE (EDB)
EPA 504

This certification requires maintance of an acceptable quality assurance program, use of approved methodology, and satisfactory performance on evaluation samples. Laboratories are

REFERENCE 73

FINAL
FIELD STUDY PLAN
EXPANDED SITE INSPECTION

Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

EPA ID № NCD058517467
WasteLAN № 02821

Prepared Under
CONTRACT № 68-W9-0055

For the

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

Prepared by

BLACK & VEATCH SPECIAL PROJECTS, CORP.
Atlanta, Georgia

Project № 52014.755

April 26, 1996

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FIELD STUDY PLAN
EXPANDED SITE INSPECTION
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina
EPA ID Nº NCD058517467
WasteLAN Nº 02821

April 26, 1996

1.0 Introduction

May 21, 1996

May 8, 1996

Black & Veatch Special Projects Corp. (Black &Veatch) has been tasked by the U. S. Environmental Protection Agency (EPA), Waste Management Division, Region IV to conduct an Expanded Site Inspection (ESI) at the former Southern Wood Piedmont (SWP) site in Wilmington, New Hanover County, North Carolina. The inspection will be performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

1.1 Objectives

The objectives of the ESI are to further determine the nature of contaminants present at the site, to determine if a release of hazardous materials to the environment has occurred or may occur, and if a release has occurred, to determine attribution of those contaminants to the site. Furthermore, this inspection seeks to further define the possible pathways by which contamination could migrate from the site and the populations and environments it potentially affects. The purpose of this inspection is to provide information needed to evaluate the site using the Hazard Ranking System (HRS).

Specific elements include:

- Outline the major milestones, develop a schedule, and determine the level of effort (LOE) required to complete the ESI.
- Identify the data gaps that need to be addressed by the ESI.
- Further define the site characteristics and contaminant sources, including waste type and volume.

- Determine human population, sensitive environments and fisheries that are threatened or potentially threatened by releases of hazardous materials from the site.
- Develop a sampling strategy to obtain the additional analytical data to support the HRS score.

1.2 Scope of Work

The scope of this investigation includes the following activities:

- Obtain and review background materials relevant to assessing the potential health and environmental hazards posed by the site.
- Obtain aerial photographs and maps of site, if possible.
- Obtain information on local water systems.
- Evaluate target populations associated with the groundwater, surface water, and air migration pathways and the onsite soil exposure pathway.
- Determine location and distance to nearest potable well.
- Develop a site sketch.
- Install and sample groundwater monitoring wells.
- Sample existing groundwater monitoring wells.
- Collect various types of environmental samples.
- Characterize source areas at the site.

1.3 Schedule

Fieldwork for the SWP site is scheduled for the week of May 20, 1996.

1.4 Personnel

Site Manager: Robert Mangum
Site Safety Coordinator: Eric Mosley
Sampling Officer/Sampler: Joe Slykerman
Samplers: Carol King and Paul Moisan
HRS Coordinator: Paul Moisan

1.5 Permits and Authorization Requirements

EPA is responsible for obtaining access to the site, permission to take photographs of the site, and permission to return investigation derived wastes to the property. In addition, EPA is responsible for all permits which may be required to accomplish these tasks.

1.6 Site Description and History

1.6.1 Site Description

The SWP site is located on Greenfield Street in Wilmington, New Hanover County, North Carolina (Refs. 1; 2). The geologic coordinates of the site are 34° 12' 59" North latitude and 77° 57' 7" West longitude (Ref. 3). The area of the SWP site is approximately 52 acres of vacant land along the east bank of the Cape Fear River (Ref. 2). The site is currently owned by the City of Wilmington (COW) and the North Carolina State Port's Authority (NCSPA). Thirty-five acres in the northern and central portion of the site are owned by the COW, and the remaining seventeen acres are owned by the NCSPA (Ref. 2). The site is bordered by the Amerada Hess Petroleum Terminal to the north, by the Paktank Petroleum Terminal to the south, by the Cape Fear River to the west, and by Optimist Park and Front Street to the east (Ref. 4, Fig. 3). The site location and site layout are shown on Figures 1 and 2, respectively.

1.6.2 Site History

The SWP site was developed as a construction site for concrete barges and ships during World War I. Operations at the site changed to wood-treating beginning in the 1930s. Southern Wood Preserving Company (presently Southern Wood Piedmont) began operating in 1964 at the site. Prior to 1972, creosote was the only wood preservative in use at the site. Chromated copper arsenate (CCA) was introduced at the site after 1972 as a wood preservative. Pentachlorophenol (PCP) was added as a wood preservative after 1980. Site closure activities began about 1975 when SWP reportedly obtained a permit to bury an onsite drainage ditch which contained creosote sludge. The ditch was subsequently covered with fill material. In May 1983, wood treatment operations on site ceased and the site equipment was removed (Ref. 5).

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DATE: 3-11-96
PLOT SCALE: 1=1
ORIGINAL DWG SIZE
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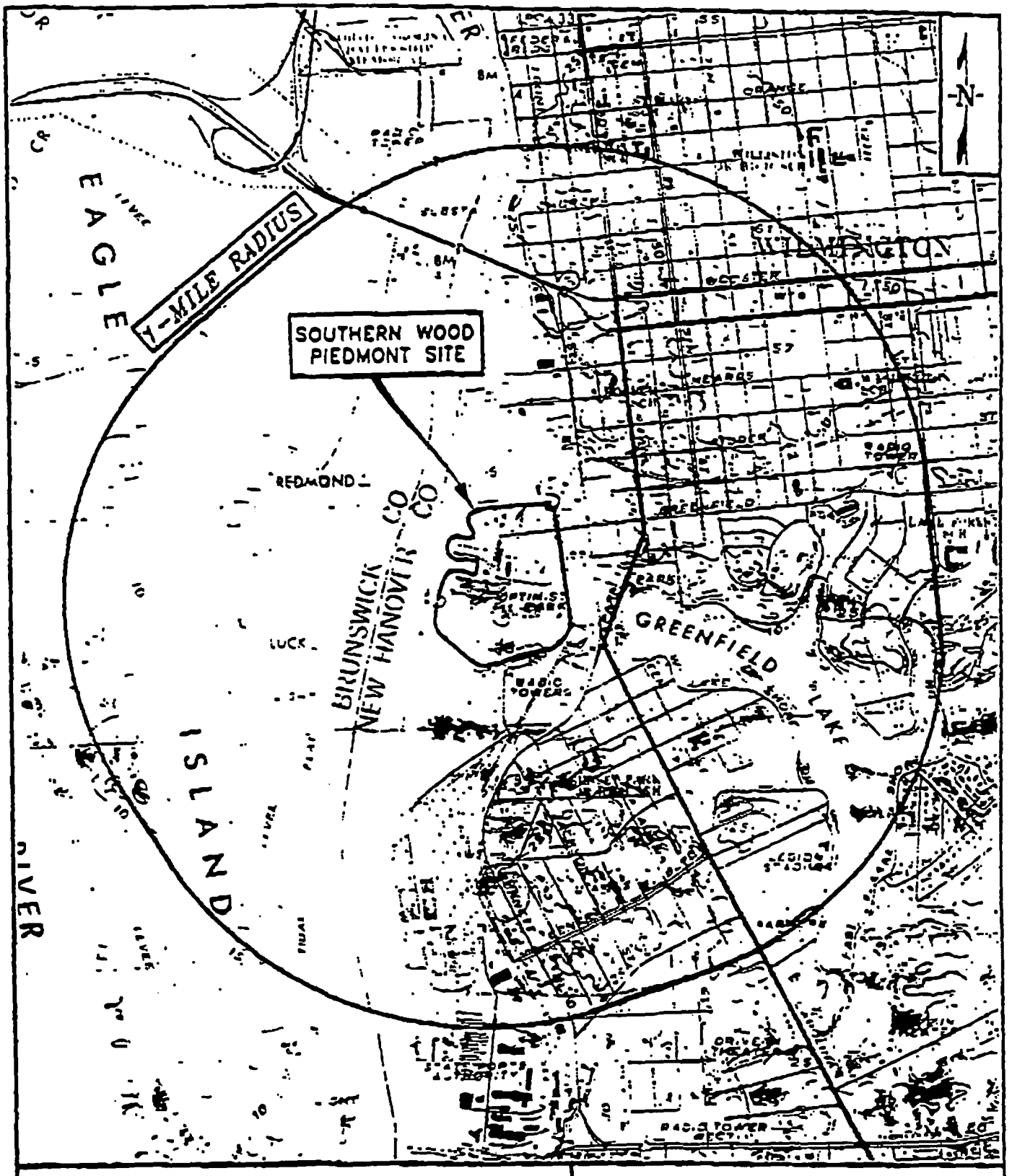


SCALE IN FEET

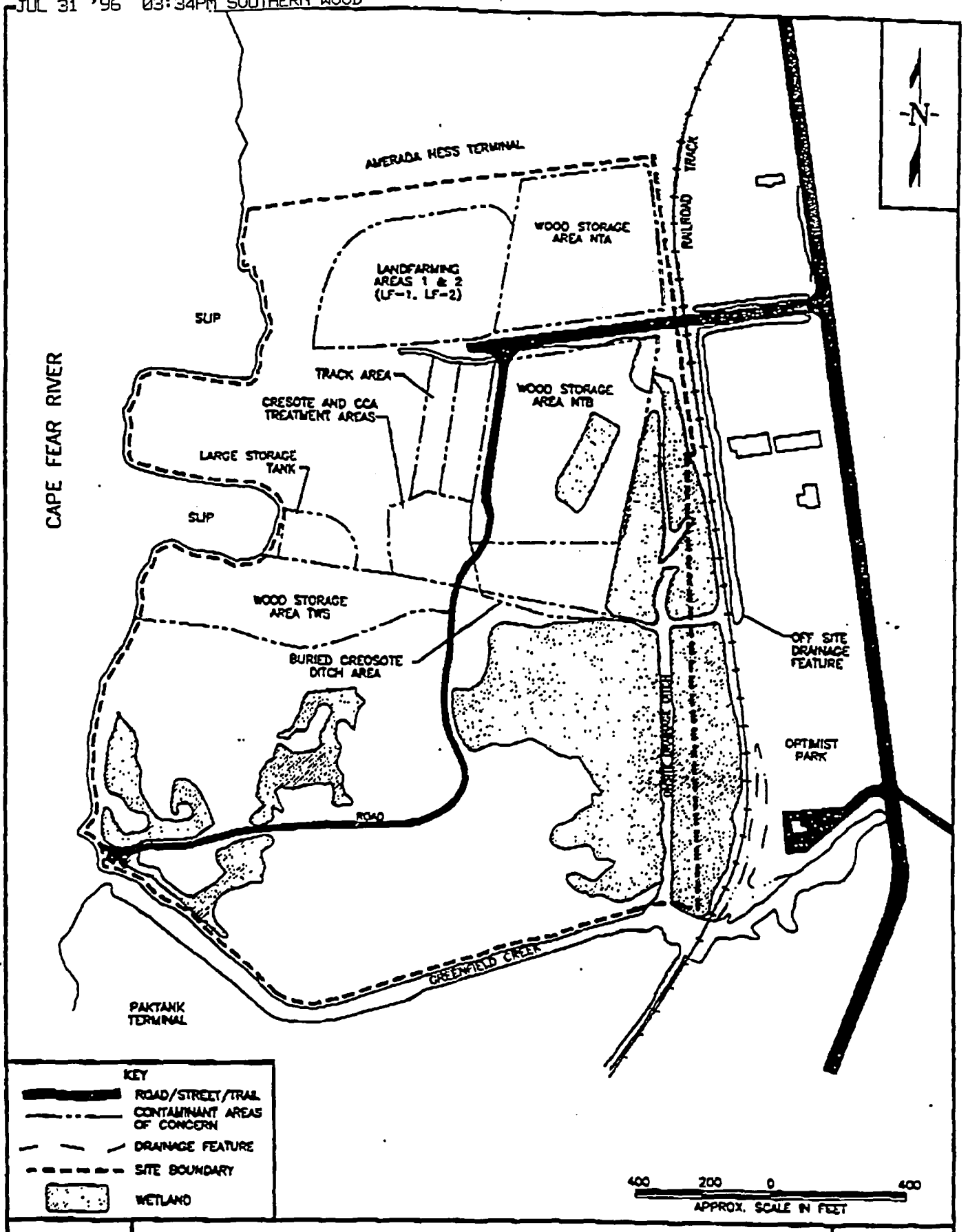
0 2000' 4000'

CONTOUR INTERVAL 5 FEET

SOURCE: BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP OF WILMINGTON, NORTH CAROLINA, PHOTOREVISED 1979.

SITE LOCATION MAP
SOUTHERN WOOD PIEDMONT SITE
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 1



SITE LAYOUT MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 2

1.6.3 Source Areas

Source areas include an area of contaminated soil which was once utilized for wood preserving and storage activities, the large storage tank area, the cresote treatment area, the covered sludge ditch, and the small diesel storage area.

1.6.4 Prior Site Investigations

In 1981, COW authorized Soil and Materials Engineering, Inc. (SME) to install five soil borings on the thirty-five acres of the site which the COW owns. Four of the borings were completed as shallow monitoring wells (screened above the peat) (Ref. 6). The additional boring was completed as an intermediate monitoring well (screened below the peat, but above the limestone believed to be the Pee Dee formation). As part of this field work, groundwater samples were obtained for inorganic and organic analyses (Ref. 6).

A Preliminary Assessment of the site was completed in July 1984 by the North Carolina Department of Human Resources (Ref. 7). Representatives of NCDHR observed visibly stained soil in the main production area, near a cluster of creosote storage tanks, and in the vicinity of the covered sludge ditch. Surface water and shallow groundwater were both noted as having an oily sheen present at several locations (Ref. 7). No samples were collected during the Preliminary Assessment.

A Screening Site Investigation (SSI) was conducted for the EPA by Halliburton Corporation (NUS) in January 1985. Sampling for this investigation included the following: four of the five COW groundwater monitoring wells, one groundwater monitoring well at Greenfield Lake, and subsurface soil samples in the landfarming areas, on the jetty, and near the boat slips. In addition, NUS representatives collected one surface water and one sediment sample adjacent to the site in the Cape Fear River. A background surface water and sediment sample were obtained from the overflow stream from Greenfield Lake (Ref. 8).

An Administrative Order of Consent between the State of North Carolina and SWP was agreed upon in May of 1985 (Ref. 9). As part of the order, one upgradient and three downgradient wells were installed to monitor groundwater during the landfarming activities outlined in the Order. Periodic landfarm soil monitoring and biannual water quality monitoring were also part of the Administrative Order. Landfarming continued from the mid-1980s through the early 1990s. During this

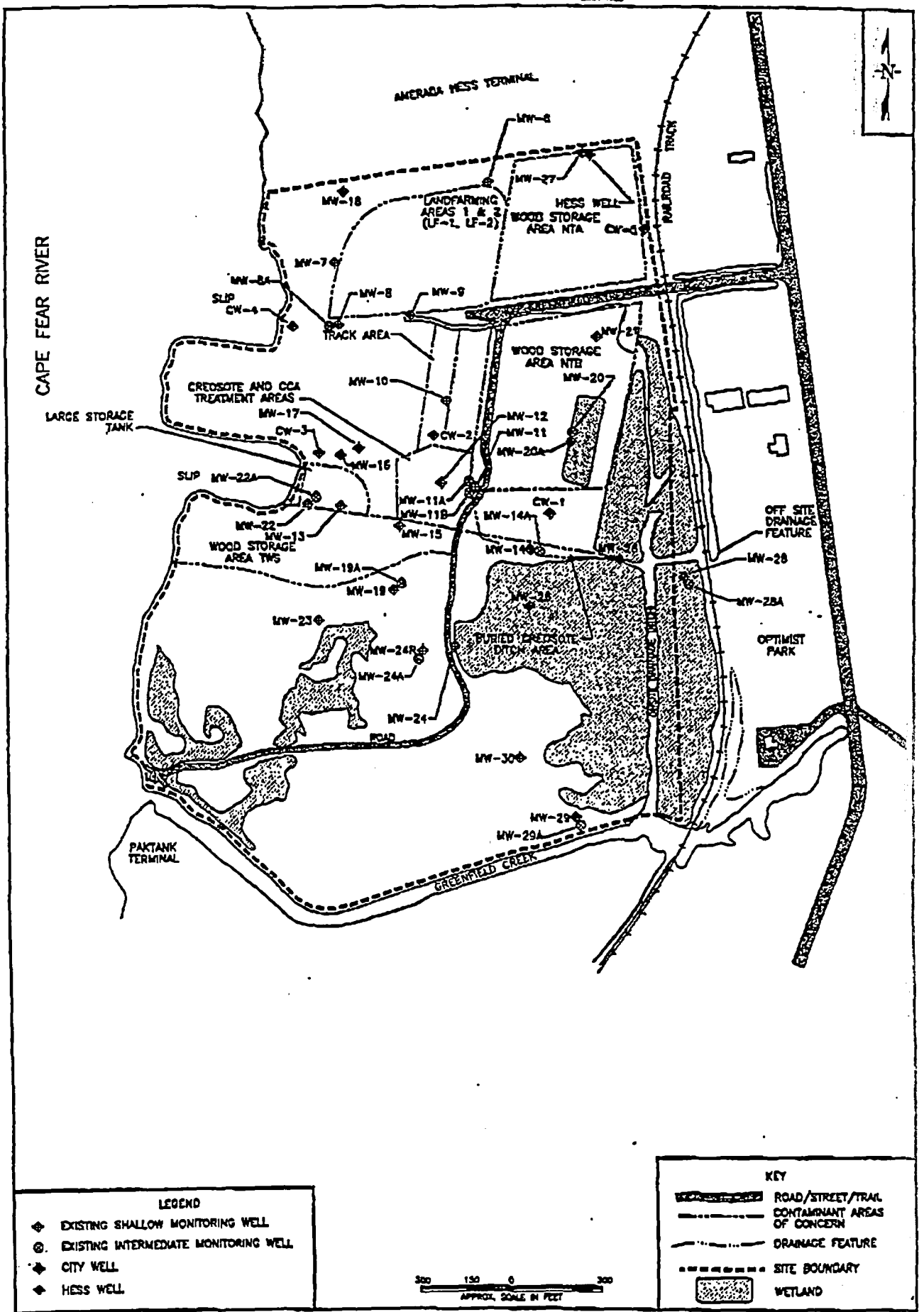
time, SWP collected 59 composite soil samples from Landfarming Area 1 (LF-1) and 37 composite soil samples from Landfarming Area 2 (LF-2) (Ref. 2). Analyses included phosphorous, chloride, total organic carbon (TOC), pH, polynuclear aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), phenol, and microbial content (Ref. 2).

In September 1985, Law Environmental installed four groundwater monitoring wells outside the perimeter of the landfill areas. These wells were sampled for PCP and semivolatile organics (Semivols) between 1985 and 1990 (Ref. 2). Geraghty & Miller, Inc. (G & M), conducted soil investigations in 1991 at three areas (outdoor wood storage areas) which were not excavated for land farming. A total of forty-eight shallow soil samples were collected from two nontreated wood storage areas and one treated wood storage area. G & M also conducted soil borings and sampling at LF-1 and LF-2 in October 1990 and October 1991. Composite soil samples were obtained from five borings during these investigations and groundwater samples were taken from the four groundwater monitoring wells installed at the perimeter of the landfarming areas (Ref. 10).

In February 1992, Environmental Technology Engineering, Inc. (ETE), began a groundwater investigation comprised of three phases. During Phase I, five temporary and eight permanent groundwater monitoring wells were installed and subsequently sampled. Phase II consisted of the abandonment of the five temporary wells and the placement of an additional twelve permanent groundwater monitoring wells. In December 1992, soil and sediment samples were taken from surface drainage areas including the onsite drainage ditch and Greenfield Creek. Phase III began in October 1993 and involved the installation of another eleven permanent groundwater monitoring wells, sampling of these wells, and the resampling of the preexisting wells (Ref. 4). The locations of all of the preexisting monitoring wells are presented on Figure 3.

The North Carolina Department of Health, Environment, and Natural Resources (NCDEHNR) conducted a Site Inspection Prioritization (SIP) in January 1995 for the purpose of collecting sufficient information to assess threats to human health and the environment. Based on the information collected, the SWP site was recommended as a high priority for an Expanded Site Inspection (Ref. 2).

Subsequent NiroGreen work?



EXISTING MONITORING WELL LOCATION MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 3

1.7 Regional Hydrogeology

The SWP site lies within the Coastal Plain physiographic region in southeast North Carolina (Ref. 11). Topography in the region extends from flat, low-lying swamps and marshes 3 to 6 feet above mean sea level (amsl) to rolling uplands, 300 to 600 feet amsl (Ref. 12, p. 271). More specifically, the site lies approximately 5 feet amsl on urban lands derived from Urban land complex (Refs. 1; 13, pp. 6, 8, sheet 18). These complexes consist of sands and sandy loams which have been disturbed and appear to be derived from the floodplain or tidal sediments surrounding the site (Ref. 13, pp. 6, 8). The sandy nature results in relatively high permeabilities for these soils (Ref. 13, p. 6). The soil encountered beneath the existing drainage ditch and the southeastern portion of the site is believed to be in the Dorovan Series (Ref. 2).

The region is underlain by unconsolidated sediments that thicken toward the coast. These sediments consist of sands, silts, and clays which are generally of fluvial origin (Ref. 12, p. 271). These sediments are usually 50 feet thick and overlie the Castle Hayne marl of the upper Eocene (Ref. 14, p. 221). The Castle Hayne Formation is approximately 150 feet thick in southern New Hanover County. Beneath the Castle Hayne Formation lie the Cretaceous sediments comprising the Peedee, the Black Creek, and the Tuscaloosa formations, which together are approximately 1300 feet thick (Ref. 14, p. 221). The Peedee Formation consists of well-sorted quartz sand and clays while the Black Creek contains more clay and appears to function as a confining unit for both the Peedee and the underlying Tuscaloosa Formations (Ref. 15, pp. 11, 13).

Beneath the SWP site, three principal aquifers are present: the upper sandy aquifer, the limestone aquifer, and the lower sandy aquifer. The upper sandy aquifer is approximately 50 feet thick and confines the underlying limestone aquifer which is also approximately 50 feet in thickness (Ref. 14, p. 221). The limestone aquifer is composed of carbonates of the Castle Hayne marl. Below the Castle Hayne marl lies the lower sandy aquifer which consists of the sandy sediments of the Peedee, Black Creek and Tuscaloosa formations. The lower sandy aquifer has a maximum thickness of 1300 feet although the fresh water portion of the aquifer is relatively thin in New Hanover County (Ref. 14, p. 221). Both the limestone aquifer and the lower sandy aquifer are capable of yielding significant water supplies. Groundwater in the unconfined surficial (upper sandy) aquifer can be obtained at depths of only 10 feet in New Hanover County (Ref. 16, p.29). Within this region, brackish water encroachment from the ocean and the Cape Fear River significantly affects water

quality at depths between 100 and 300 feet below land surface (bls) (Ref. 16). Generally, groundwater flows to the southeast in New Hanover County (Ref. 16, plate 6). Beneath the site, groundwater flow is to the south and southeast toward Greenfield Creek and southeast toward the onsite drainage ditch (Ref. 2). Hydraulic conductivities for sands similar to those of the upper and lower sandy aquifers range from 1×10^{-3} to 1.0 cm/sec. The limestone aquifer may exhibit hydraulic conductivities ranging from 1×10^{-4} to 1×10^{-1} cm/sec (Ref. 17, p. 29).

1.8 Groundwater Pathway Targets

There are no municipal water supply wells within 4 miles of the site (Ref. 2). The City of Wilmington draws its water supply from surface water intakes upstream of the site on the Cape Fear River (Ref. 2). Three community wells, which serve an estimated 680 residents, exist within a 4-mile radius of the site. Two of these wells supply an estimated 625 residents. These two wells are situated 1.7 and 3.8 miles east-northeast of the site. The remaining 55 residents utilize a well approximately 1.6 miles west of the site (Ref. 2).

across Cape Fear River — upgradient

A house count shows approximately 1,449 people receiving water from private wells within a 4-mile radius of the site (Ref. 2). The nearest groundwater supply to the site are springs which provide water for outdoor faucets at the Greenfield Park, approximately 1/4 to 1/2 mile east of the SWP site (Ref. 2). Additional water supplies close to the site include the private wells located approximately 1.6 miles west of the site and the community well approximately 1.7 miles east of the site (Ref. 2). across the River

Radial Distance (miles)	Target Population (Groundwater)
0.00 - 0.25	0
>0.25 - 0.50	0
>0.50 - 1.00	0
>1.00 - 2.00	153
>2.00 - 3.00	188
>3.00 - 4.00	1,788

1.9 Surface Water Pathway Targets

Overland runoff from the site generally flows south and southeast toward the onsite drainage ditch and Greenfield Creek which discharges into the Cape Fear River (Ref. 18). The surface water pathway begins in the upper end of the drainage ditch along the southeastern portion of the site. The pathway continues southward for approximately 1,500 feet, where it then empties into Greenfield Creek. The surface water pathway continues west approximately 1,800 feet before discharging into the Cape Fear River (Ref. 2, Fig. 2). The surface water pathway continues in the Cape Fear River for a distance of approximately 15 miles both upstream and 15 miles downstream due to tidal influence from the Atlantic Ocean (Ref. 2).

The active intake for the City of Wilmington is located more than 15 miles upstream of the site at Riegelwood. Aproximately 0.45 miles of wetland exists along the southern portion of the site (Ref. 2). Approximately 170 miles of wetland frontage have been mapped along the 15 miles of the surface water pathway, both upstream and downstream (Ref. 2). Ten rare animal species and eight rare plant species have been reported to exist near the surface water pathway (Ref. 2). There are four animal species and two plant species located along the surface water pathway which are endangered or threatened in the United States (US) and North Carolina (NC) (Ref. 2). The Shortnose Sturgeon (*Acipenser brevirostrum*) is a NC endangered animal species which was identified 1/2 mile upstream on the Cape Fear River. The NC and US threatened species, the American Alligator (*Alligator mississippiensis*), has been identified at 16 locations on the Cape Fear River system. The NC endangered snail Magnificent Ram's Horn (*Planorbella magnifica*), and the US and NC endangered mammal, West Indian Manatee (*Trichecus manatus*), have been reported in the Cape Fear estuary approximately 7.4 and 12 miles downstream of the site, respectively. The NC threatened plants, Carolina Grasswort (*Lilaeopsis caroliniansis*) and the Snowy Orchid (*Platanthera nivea*), were reported on a tidal flat 2.4 and 3 miles downriver, respectively (Ref. 2).

1.10 Soil and Air Exposure Pathway Targets

The SWP site is currently inactive and all previous site structures have been demolished and removed. (Ref. 2). Unpaved site areas are covered by grass and other vegetation. The site is not fenced, but does have an entrance to prevent vehicular traffic. The site is accessible by foot. The former landfarm areas have been bermed to prevent surface water runoff. The site is located near downtown Wilmington, North Carolina on the east bank of the Cape Fear River (Fig. 1). The

population within 4 miles of the site is approximately 51,914 (Ref. 2). The estimated population within the 4-mile radius of the site is distributed as follows: 0 - 0.25 mile, 527 persons; 0.25 - 0.50 mile, 828 persons; 0.5 - 1 mile, 7,206 persons; 1 - 2 miles, 16,147 persons; 2 - 3 miles, 12,212 persons; and 3 - 4 miles, 14,994 persons (Ref. 2). The closest workers to the site are likely to be at the Amerada Hess terminal north of the site and the Greenfield Transmission Company and Locke Industries to the east of the site. The nearest residents are located approximately 400 east of the site (Ref. 2). The school closest to the site is approximately 1/2 mile south of the site. Day care facilities are located approximately 1/4 mile east of the site. A park is located less than a 1/4 mile east of site, separated from the site by an elevated railroad bed, vegetation, and the onsite drainage ditch (Ref. 2).

2.0 Sampling Investigation

The sampling investigation will include the collection of groundwater, surface water, surface soil, subsurface soil, sediment, and biological tissue samples. All samples collected will be analyzed for extractable and purgeable organic compounds, pesticides, PCBs, cyanide, and metals. Additionally, select samples will be analyzed for dioxins and furans. Most sample analyses will be performed under the Contract Laboratory Program (CLP) for routine analytical services (RAS). Dioxin furan analyses will be preformed under CLP for special analytical services (SAS). All water samples will be field tested for temperature, turbidity, pH, and conductivity. Quality Assurance/Quality Control (QA/QC) samples will also be collected. QA/QC samples will include a rinsate sample for each set of equipment that has been decontaminated in the field, a trip blank, and a preservative blank for each week of sampling, and a matrix duplicate for every 20 samples in each media (soil and water). Sample codes, descriptions, locations, and sampling rationale are shown in Table 1. Sample locations are shown on Figure 4. All sample locations are subject to change as field conditions warrant.

2.1 Surface Soil Sampling

Twenty-one surface soil samples will be collected in association with the SWP site at depths no greater than two feet bls. Six samples will be taken in former wood storage and landfarming areas. Five samples will be located in previously identified contamination source areas. Seven samples are to be taken in areas which have not been previously sampled. Three samples will be collected as background samples

Table 1
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SS-01 / SP-SB-01	Surface Soil / Subsurface Soil	Upgradient of LF-1 & LF-2.	To establish background levels.
SP-SS-02 / SP-SB-02	Surface Soil / Subsurface Soil	Northeast of the site.	To establish background levels.
SP-SS-03 / SP-SB-03	Surface Soil / Subsurface Soil	Southeast of the site.	To establish background levels.
SP-SS-04 / SP-SB-04	Surface Soil / Subsurface Soil	Northeast Wood Storage Area (NTA).	To confirm presence or absence of contamination.
SP-SS-05 / SP-SB-05	Surface Soil / Subsurface Soil	Southeast Wood Storage Area (NTB).	To confirm presence or absence of contamination.
SP-SS-06 / SP-SB-06	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-07 / SP-SB-07	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-08 / SP-SB-08	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-09 / SP-SB-09	Surface Soil / Subsurface Soil	Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.
SP-SS-10 / SP-SB-10	Surface Soil / Subsurface Soil	Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.
SP-SS-11 / SP-SB-11	Surface Soil / Subsurface Soil	Large Storage Tank Area.	To confirm presence or absence of contamination.
SP-SS-12 / SP-SB-12	Surface Soil / Subsurface Soil	West of road near center of site.	To confirm presence or absence of contamination.
SP-SS-13 / SP-SB-13	Surface Soil / Subsurface Soil	North of Buried Creosote Ditch Area.	To confirm presence or absence of contamination.
SP-SS-14 / SP-SB-14	Surface Soil / Subsurface Soil	Northcentral portion of LF-1 and LF-2	To confirm presence or absence of contamination.
SP-SS-15 / SP-SB-15	Surface Soil / Subsurface Soil	South of Buried Creosote Ditch Area.	To confirm presence or absence of contamination.
SP-SS-16 / SP-SB-16	Surface Soil / Subsurface Soil	Between wetlants north of road.	To confirm presence or absence of contamination.
SP-SS-17 / SP-SB-17	Surface Soil / Subsurface Soil	Southcentral portion of site near Greenfield Creek.	To confirm presence or absence of contamination.
SP-SS-18 / SP-SB-18	Surface Soil / Subsurface Soil	West of road and east of east wetland.	To confirm presence or absence of contamination.
SP-SS-19 / SP-SB-19	Surface Soil / Subsurface Soil	South of Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SS-20 / SP-SB-20	Surface Soil / Subsurface Soil	Southeast of north slip.	To confirm presence or absence of contamination.
SP-SS-21 / SP-SB-21	Surface Soil / Subsurface Soil	Track area west of road.	To confirm presence or absence of contamination.
SP-SD-01	Sediment	East of the site near the intersection of Front and Greenfield Streets.	To establish background levels.
SP-SD-02	Sediment	On Greenfield Creek south of Optimist Park.	To establish background levels.
SP-SD-03	Sediment	On a drainage feature midway and east of the site.	To determine presence or absence of contamination.
SP-SD-04	Sediment	East of the rail line on Greenfield Creek.	To determine presence or absence of contamination.
SP-SD-05	Sediment	Drainage feature south of Northeast Wood Storage Area (NTA) and south of Greenfield Street.	To determine presence or absence of contamination.
SP-SD-06	Sediment	Onsite drainage ditch southeast of Southeast Wood Storage Area (NTB).	To determine presence or absence of contamination.
SP-SD-07	Sediment	Onsite drainage ditch west of Optimist Park.	To determine presence or absence of contamination.
SP-SD-08	Sediment	Greenfield Creek downstream of the confluence with the on site drainage ditch.	To determine presence or absence of contamination.
SP-SD-09	Sediment	Greenfield Creek downstream of SP-SD-08.	To determine presence or absence of contamination.
SP-SD-10	Sediment	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-SD-11	Sediment	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-SD-12	Sediment	Northwest property boundary at the Cape Fear River.	To determine presence or absence of contamination.
SP-SD-13	Sediment	In the wetland area of Southeast Wood Storage Area (NTB) near MW-20.	To determine presence or absence of contamination.
SP-SD-14	Sediment	In the wetland area south of the buried creosote ditch area.	To determine presence or absence of contamination.
SP-SD-15	Sediment	West of road in northern portion of east wetland.	To determine presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SD-16	Sediment	North of road in southern portion of east wetland area.	To determine presence or absence of contamination.
SP-SD-17	Sediment	In the west wetland area north of road.	To determine presence or absence of contamination.
SP-SD-18	Sediment	In the west wetland area north of road.	To determine presence or absence of contamination.
SP-SD-19	Sediment	In the wetland area south of road at western boundary of site.	To determine presence or absence of contamination.
SP-SD-20	Sediment	In the wetland area west of SP-SD-04.	To determine presence or absence of contamination.
SP-SW-01	Surface Water	Same location as SP-SD-01.	To establish background levels.
SP-SW-02	Surface Water	Same location as SP-SD-02.	To establish background levels.
SP-SW-03	Surface Water	Same location as SP-SD-04.	To determine presence or absence of contamination.
SP-SW-04	Surface Water	Same location as SP-SD-07.	To determine presence or absence of contamination.
SP-SW-05	Surface Water	Same location as SP-SD-08.	To determine presence or absence of contamination.
SP-SW-06	Surface Water	Same location as SP-SD-09.	To determine presence or absence of contamination.
SP-SW-07	Surface Water	Same location as SP-SD-10.	To determine presence or absence of contamination.
SP-SW-08	Surface Water	Same location as SP-SD-11.	To determine presence or absence of contamination.
SP-SW-09	Surface Water	Same location as SP-SD-12.	To determine presence or absence of contamination.
SP-MW-08	Groundwater	Southwest of LF-1 and LF-2.	To determine presence or absence of contamination.
SP-MW-08A	Groundwater	West of MW-08.	To determine presence or absence of contamination.
SP-MW-11	Groundwater	Southwest corner of Wood Storage Area (NTB).	To determine presence or absence of contamination.
SP-MW-11A	Groundwater	Northwest of MW-11.	To determine presence or absence of contamination.
SP-MW-11B	Groundwater	Southwest of MW-11.	To determine presence or absence of contamination.

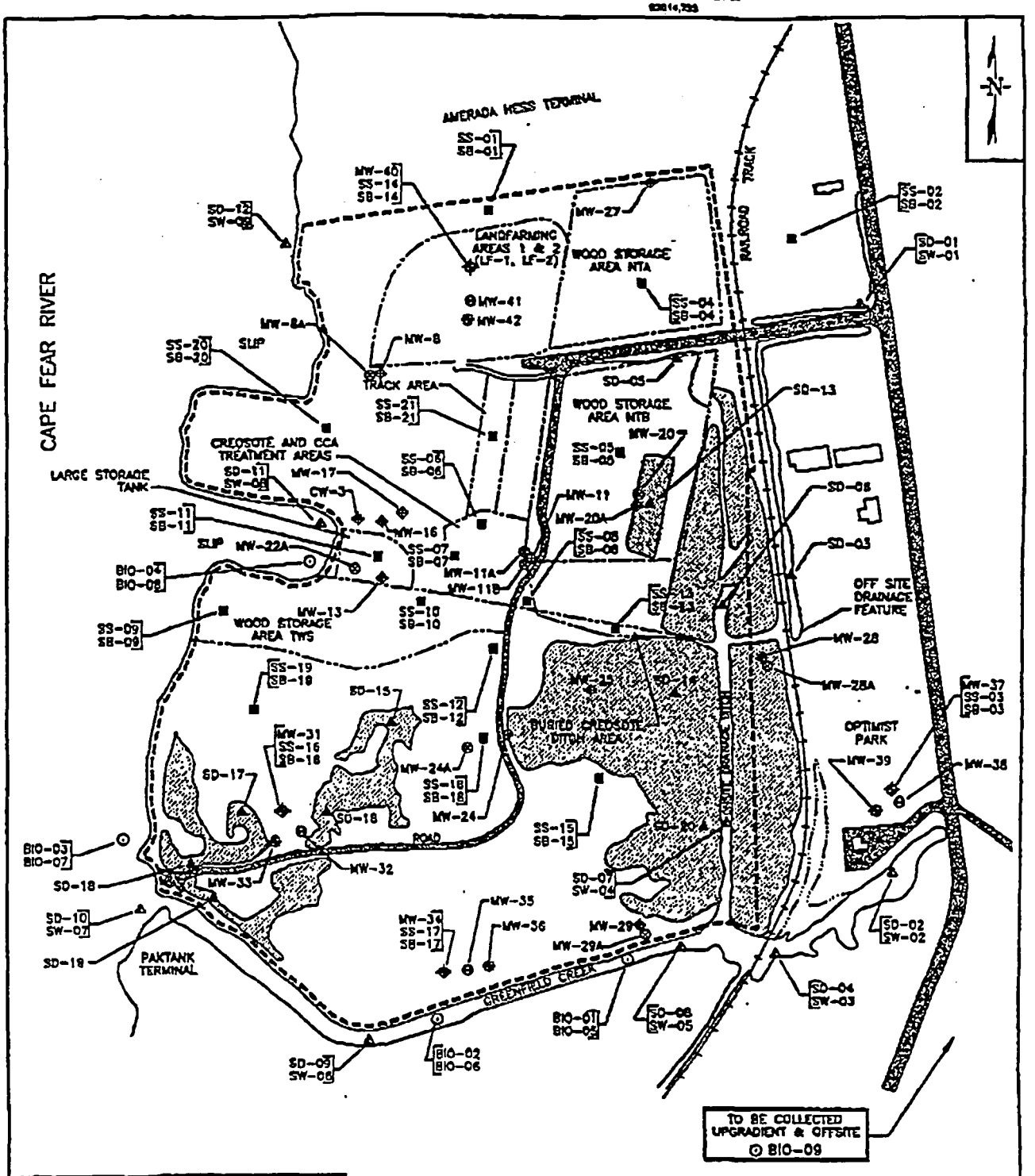
Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-MW-13	Groundwater	Southcentral portion of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-MW-16	Groundwater	North of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-MW-17	Groundwater	North between Large Storage Tank Area and Creosote and CCA Treatment Areas.	To determine presence or absence of contamination.
SP-MW-20	Groundwater	In wetland in Wood Storage Area NTB.	To determine presence or absence of contamination.
SP-MW-20A	Groundwater	South of MW-20.	To determine presence or absence of contamination.
SP-MW-22A	Groundwater	East of south slip in Large Storage Area.	To determine presence or absence of contamination.
SP-MW-24	Groundwater	East of road and west of wetland.	To determine presence or absence of contamination.
SP-MW-24A	Groundwater	Southwest of MW-24.	To determine presence or absence of contamination.
SP-MW-25	Groundwater	In wetland south of Buried Creosote Ditch Area.	To determine presence or absence of contamination.
SP-MW-27	Groundwater	Northeast corner of site.	To determine presence or absence of contamination.
SP-MW-28	Groundwater	West of railroad tracks at east central portion of the site.	To determine presence or absence of contamination.
SP-MW-28A	Groundwater	Southeast of MW-28.	To determine presence or absence of contamination.
SP-MW-29	Groundwater	Southeastern portion of site.	To determine presence or absence of contamination.
SP-MW-29A	Groundwater	Southeast of MW-29.	To determine presence or absence of contamination.
SP-MW-31	Groundwater	Between wetlands located north of road.	To determine presence or absence of contamination.
SP-MW-32	Groundwater	Southeast of MW-31.	To determine presence or absence of contamination.
SP-MW-33	Groundwater	Southwest of MW-31.	To determine presence or absence of contamination.
SP-MW-34	Groundwater	Southcentral portion of site.	To determine presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-MW-35	Groundwater	East of MW-34.	To determine presence or absence of contamination.
SP-MW-36	Groundwater	East of MW-35.	To determine presence or absence of contamination.
SP-MW-37	Groundwater	Southern portion of Optimist Park.	To establish background levels.
SP-MW-38	Groundwater	Southeast of MW-37.	To establish background levels.
SP-MW-39	Groundwater	Southwest of MW-37.	To establish background levels.
SP-MW-40	Groundwater	In LF-1 and LF-2.	To determine presence or absence of contamination.
SP-MW-41	Groundwater	South of MW-40.	To determine presence or absence of contamination.
SP-MW-42	Groundwater	South of MW-41.	To determine presence or absence of contamination.
SP-BIO-01	Biological, Sessile	Greenfield Creek downstream of the confluence with the onsite drainage ditch.	To determine presence or absence of contamination.
SP-BIO-02	Biological, Sessile	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-BIO-03	Biological, Sessile	In Cape Fear River near southwestern portion of site.	To determine presence or absence of contamination.
SP-BIO-04	Biological, Sessile	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-BIO-05	Biological, Fish Tissue	Greenfield Creek downstream of the confluence with the onsite drainage ditch.	To determine presence or absence of contamination.
SP-BIO-06	Biological, Fish Tissue	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-BIO-07	Biological, Fish Tissue	In Cape Fear River near southwestern portion of site.	To determine presence or absence of contamination.
SP-BIO-08	Biological, Fish Tissue	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-BIO-09	Biological, Sessile	Upgradient of Site.	To establish background levels.

SP - Southern Wood Piedmont
SD - Sediment Sample
SS - Surface Soil Sample
SB - Subsurface Soil Sample
MW - Monitoring Well
SW - Surface Water
BIO - Biological Sample



SAMPLE LOCATION MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 4

with two of these to be located northeast and southeast of the site. An adc background sample will be collected along the north property boundary, betw 1 & LF-2 and the Amerada Hess Terminal. Sample codes and descriptions a in Table 1 and are shown on Figure 4.

2.2 Subsurface Soil Sampling

Twenty-one subsurface soil samples will be collected at the same locations that the surface soil samples are to be collected at including the background locations. The samples will be collected at depths greater than two feet bls, but above the water table. Sample codes and descriptions are listed in Table 1 and are shown on Figure 4.

2.3 Monitoring Well Installation

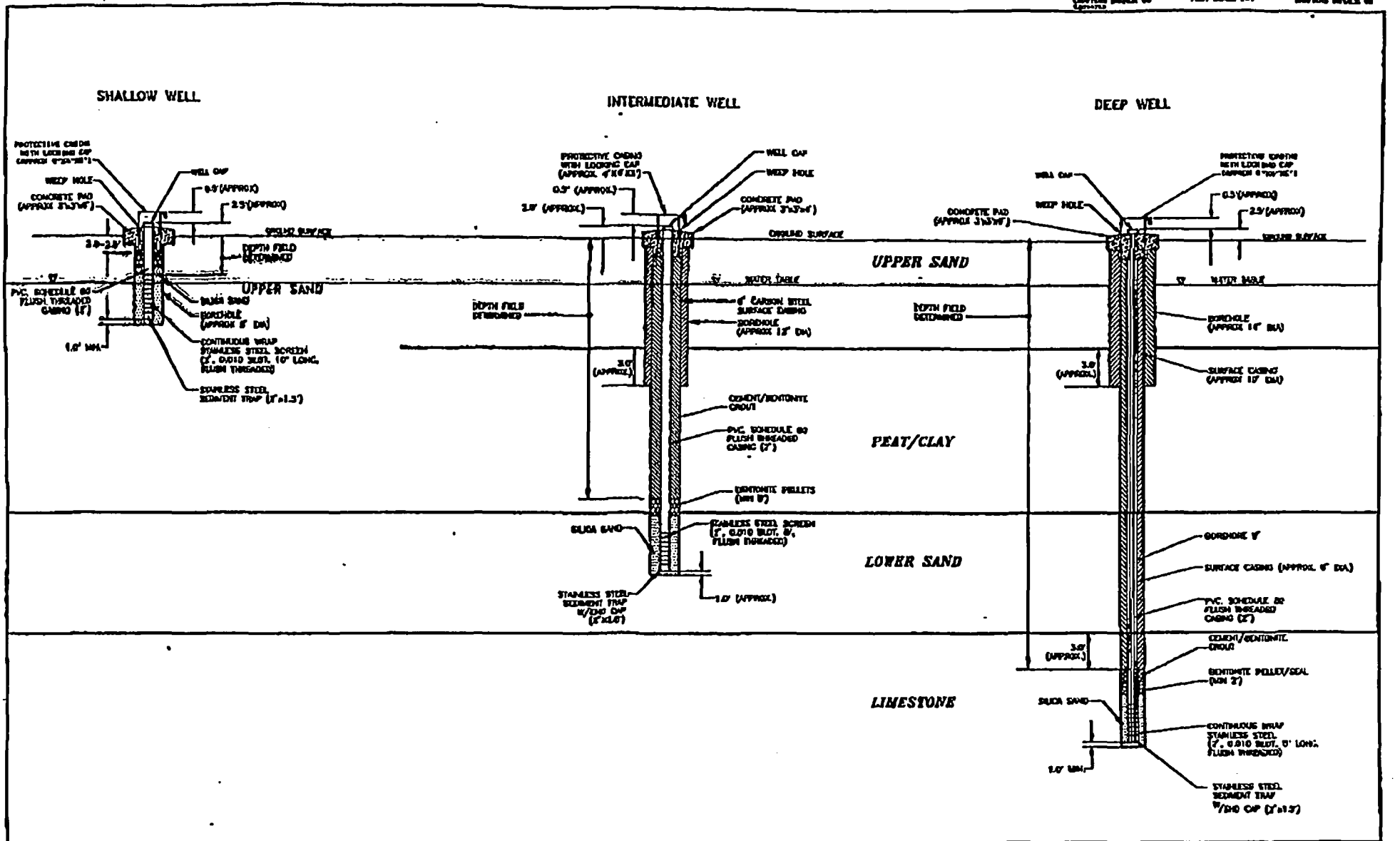
Twelve monitoring wells are to be installed by a drilling subcontractor. Four shallow wells are to be constructed with their screen sections intersecting the unconfined water table aquifer. Four intermediate wells will be screened in the semi-confined aquifer beneath the peat/clay layer. Four deep wells will be screened in the confined limestone of the upper PeeDee Formation. The wells will provide information required to help characterize the site hydrogeology and assess the nature and extent of groundwater contamination. The monitoring well locations are presented on Figure 4. Details of the monitoring wells construction are shown on Figure 5.

2.4 Groundwater Sampling

To characterize the groundwater at the SWP site, groundwater samples will be collected from 31 permanent monitoring wells. Nineteen of the wells were previously installed and 12 wells are to be installed during the ESI. Sample codes and descriptions are listed in Table 1 and shown on Figure 4.

2.5 Surface Water Sampling

Nine surface water samples will be collected at the same sample locations as nine of the sediment sample locations around the site. The nine sediment sample locations chosen for surface water collection are as follows: SD-01, SD-02, SD-04, SD-07 through SD-12. Background surface water sample locations will be from SD-01 and SD-02 sediment sample locations.



RV	SOUTHERN WOOD PIEDMONT WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA	MONITORING WELL CONSTRUCTION DIAGRAM	FIGURE 5

2.6 Sediment Sampling

Twenty sediment samples will be collected during the ESI at the SWP site. Two of the sediment samples will be collected as background samples, inland and upgradient of the location where the onsite drainage empties into Greenfield Creek. Three sediment samples will be collected in the Cape Fear River, one at the northwest property boundary, one in the south boat slip, and one at the outfall of Greenfield Creek into the Cape Fear River. Three sediment samples will be taken from Greenfield Creek, downstream of one of the background sediment locations. Two samples will be collected in the onsite drainage feature. One sediment sample will come from an offsite drainage feature which lies parallel to the onsite drainage feature. A total of five sediment samples will be taken in the wetland areas located in the southwestern portion of the site. Two samples will come from the wetland area south of the buried creosote sludge ditch. The last two sediment samples will be taken from wetlands in and around the southeast wood storage area (NTB).

2.7 Biological Sampling

Nine biological tissue samples, consisting of five sessile organism samples and four fish tissue samples, will be collected in the surface waters near to the site. Two of each will be collected in Greenfield Creek, downstream of the confluence with the onsite drainage ditch. One of each sample will be collected in the Cape Fear River, upstream of the Greenfield Creek confluence, and one of each will be collected in the south slip on the western portion of the site. A sessile background sample will be collected upgradient of the site.

2.8 Analytical and Container Requirements

Sample containers used will be in accordance with the requirements specified in the Environmental Compliance Branch's Standard Operating Procedures and Quality Assurance Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, February 1, 1991. The following is a description of the analyses and types of containers required.

Analyses	Container	Preservatives*
Extractable Organics, Water	1 gal. amber glass jug **	None
Volatile Organics, Water	3-40 mL glass vials ***	HCl to pH < 2
Metals, Water	1 L polyethylene bottle	HNO_3 to pH < 2

Cyanide, Water	1 L polyethylene bottle	NaOH to pH > 12
Extractable Organics Soil / Sediment	8 oz. glass jar**	None
Volatile Organics Soil / Sediment	2 oz. (60 mL VOA jar)***	None
Inorganics Soil / Sediment	8 oz. glass jar**	None
SAS Dioxins/Furans Soil Only	8-oz. glass jar**	None
Organic Compounds Biological Tissue	Aluminum foil	Freeze
Metals/Other Inorganics	Zip lock bags	Freeze

* All samples will be iced to 4°C upon collection.
** Sample container lids are lined with teflon.
*** Sample container lids for VOA samples have teflon-lined septum screw caps.

2.9 Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in Sections 3 and 4 of the Environmental Compliance Branch's Standard Operating Procedures and Quality Assurance Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, February 1, 1991 (Ref. 19). Soil and water matrix duplicate sample will be collected each week for quality control purposes.

All laboratory analyses and laboratory quality assurance procedures used during this investigation will be in accordance with standard procedures and protocols as specified in the Analytical Support Branch's Laboratory Operations and Quality Control Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, October 1990, or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the Contract Laboratory Program (CLP). Analysis for dioxins will be by EPA SW-846 method 8290 for select soil samples. All samples will be submitted to CLP laboratories, as appropriate, at the time of sampling.

2.9.1 *Surface Soil and Sediment Sampling Procedures*

Surface soil and sediment samples will be collected using a stainless steel spoon and a 2-quart or equivalent glass or stainless steel bowl. Some sediment samples may be collected using stainless steel open or closed bucket hand augers, and/or Ponar dredge samplers. Samples being analyzed for volatile organic compounds (VOC), will be collected first and placed directly into the appropriate containers. The remainder of the sample will be placed into the bowl, mixed thoroughly, then distributed to the appropriate containers. The surface soil samples will be collected from a depth of no more than two feet bls.

2.9.2 *Subsurface Soil Sampling Procedures*

Subsurface soil samples will be collected by using a stainless steel spoon or 24" long split spoon constructed of either stainless steel for chemical analyses or carbon steel for stratigraphic interpretation, and a 2-quart or equivalent glass or stainless steel bowl. The sample will be obtained using a hand auger, if possible, from a depth of greater than 2 feet bls but less than water table depth. If a hand auger does not suffice, a drill rig using hollow stem augers of appropriate size will be used. The VOC sample will be collected first and placed directly into the sample container. The remainder of the sample will be thoroughly mixed in the bowl and placed into the appropriate containers.

2.9.3 *Monitoring Well Installation Procedures*

The borings for the shallow wells will be advanced using nominal 6.25-inch ID hollow-stem augers. The 6.25-inch hollow-stem augers will provide an approximate two-inch annular space between the outside of the well casing and inside wall of the auger to facilitate the placement of well construction materials. Alternate drilling methods, such as rotary wash, may be employed if subsurface conditions are not suitable for hollow-stem augering techniques. The monitoring well borings will provide a minimum two-inch annular space between the well casing and borehole wall. The anticipated total depths of the shallow wells could range from approximately 10 to 15 feet bls, with screens on these wells positioned to intersect the water table. The screen in the shallow wells will be approximately 10 feet in length. The intermediate wells should be placed such that their screen lengths are below the peat/clay layer, with a total depth of possibly 40 to 50 feet bls. The well screen lengths will be five feet for the intermediate wells. It is anticipated that the deep wells will be installed

to total depths of approximately 60 to 70 feet bls. The deep wells will contain screen lengths of five feet. The intermediate wells will likely require one surface casing each to prevent downward migration of contaminants. The deep wells will probably require two surface casings each to avoid creating contaminant pathways between aquifers. Screens in the deep wells will be located at the bottom of the well casing. The surface casings will be installed first to allow adequate time for the grout seals to cure. Following the setting of the surface cuttings, the shallow wells will be installed. The actual depths of the wells will be determined in the field.

During the well installation, subsurface soil samples will be collected for stratigraphic interpretation of the site specific geology. Continuous sampling will be performed down to the top of the water table aquifer. Subsequent to encounter the water table, samples will be collected every 5 feet for interpretation. Each sample will be field logged by a qualified Black & Veatch geotechnical/engineering geologist or geologist for soil classification, color, grain size, moisture, texture, consistency, and geologic characteristics. The information included on the field log will be in keeping with the borehole logging standards provided by USEPA. In addition, each sample will be screened with an HNu photoionization detector (PID) or Foxboro organic vapor analyzer with a flame ionization detector (FID) to detect the presence of volatile organic vapors. PID or FID readings will be recorded on the boring log. Both, nominal two-inch and three-inch diameter split spoon samplers, will be used as appropriate. Construction details for the proposed monitoring wells are described herein and illustrated on Figure 4. Upon completion of the monitoring well borings, appropriately sized, clean, silica sand will be poured through the augers downhole to form an approximate one-foot sand base at the bottom of the borehole. Decontaminated, two-inch diameter well screen and riser pipe will then be installed through the augers. The riser pipe will be constructed of flush threaded, Schedule 80, Polyvinyl Chloride (PVC) and well screen will be constructed of flush threaded, Type 304, Schedule 5 stainless steel, as instructed by USEPA for this site. The well screen will be continuous wire wrap screen with 0.010-inch openings. A 2.5-foot long stainless-steel sediment trap equipped with a stainless-steel end cap will be placed at the bottom of the well pipe for each well. A washed silica sand filter pack, appropriately sized, will be placed around the screen using a tremie pipe to a height of approximately two feet above the top of the screen section. The silica sand will conform to screen gradation requirements of not less than 95 percent of the sand

passing U.S. Standard Sieve size No. 20 and not more than 5 percent passing U.S. Standard Sieve size No. 40. Bentonite pellets will then be placed down the annular space to provide a minimum two-foot seal above the sand pack. Depths to the top of the sand pack and the top of the bentonite pellet seal will be measured using a weighted measuring tape. Subsequent to bentonite pellet hydration (eight hours minimum), the remaining annular space will be grouted to within approximately two feet of the surface with a cement-bentonite slurry (approximately 95 percent cement to 5 percent bentonite) using a tremie pipe. The well will be sealed to the ground surface with concrete and completed with a three-foot by three-foot by four-inch thick concrete surface pad that slopes away from the protective casing. A lockable steel protective casing, approximately four-inches by four-inches by five-feet long with an approximate 2.5 foot stick-up will be installed in the concrete to provide well-head security. The protective casing will include a plaque or label that clearly identifies the well as a monitoring well. A weep hole will be drilled into the protective casing above the level of the concrete pad.

2.9.4 Well Development Procedures

The general procedures described above will apply to the installation of the shallow, intermediate, and deep wells. The monitoring wells installed during the ESI will be developed by the drilling subcontractor prior to initiating groundwater sampling. Development may involve pumping, surging, or bailing to remove fines and stimulate yield. It is anticipated that pumping will be the primary development method. A minimum of three borehole volumes will be removed from each well during the development process; however, development will continue until the water removed from the well exhibits stabilized pH, temperature, conductivity, and turbidity measurements (pH readings within 0.1 units, temperature within 0.5 degrees Celsius, specific conductance within three percent, and turbidity at or below 5 nephelometric units). Development fluids will be containerized in DOT approved 55-gallon drums. Equipment used for well development will be decontaminated.

Specific conductivity, pH, turbidity, and temperature measurements will be recorded in the field logbook during the development process. Water will be withdrawn from the well and poured into a clean glass container. The temperature of the collected water will be taken immediately after the water is collected. The specific conductivity meter will be adjusted for water temperature prior to taking the measurement. The

pH probe will then be placed in the aliquot to measure pH. Field instruments to be used to measure field parameters during well development and during well purging, prior to sampling, will be field calibrated prior to use each day and at the end of each day's use.

2.9.5 Groundwater Sampling Procedures

Groundwater samples from monitoring wells will be collected after the wells have been installed and properly developed. After unlocking the well and removing the well cap, the ambient air and air in the well will be monitored using a PID or FID to detect the presence of organic vapors. Readings on the PID or FID will be recorded in the field logbook. Plastic sheeting will be placed around the well to keep equipment from coming in contact with the ground surface. An electric water level indicator decontaminated will then be placed into the well to measure the depth of the static water level and total depth of the well. Measurements will be measured to the nearest 0.01 foot and will be taken from a reference notch etched at the top of the casing. The volume of the well casing will then be calculated. Depth measurements and volume calculations will be recorded in the field logbook. A decontaminated submersible pump will be used to purge the wells in a way that will minimize turbidity. Care will be exercised in maintaining the location of the pump or teflon hose just below the level of water in the well to assure that the entire static volume is removed. If the recovery of the well is at least as fast as the pumping rate, the intake line may be left at the initial level until adequate volume has been purged. To minimize cross contamination between wells, no more than five feet of hose from the pump will be lowered into the water column. After the pump is removed from the well, all wetted portions of the pump and related tubing will be decontaminated. The pump will be a submersible pump constructed of stainless steel and equipped with Teflon tubing. During well purging, field parameters (pH, temperature, specific conductance, and turbidity) will be measured and recorded. Purging will terminate when a minimum of three casing volumes has been withdrawn and field parameter readings have stabilized (pH readings within 0.1 units, temperature within 0.5 degrees Celsius, specific conductance within three percent, and turbidity at or below 20 nephelometric units) or upon evacuating five casing volumes from each well. Water from well purging activities will be containerized.

Teflon® tubing will be inserted into the well casing, and a peristaltic (low flow) pump will be used to remove groundwater from the well and place it into the appropriate sample container. For wells that are too deep to use a peristaltic pump, the sampling personnel will initiate sampling using a Teflon, closed-top bailer. The time of sampling will be recorded in the field logbook. VOC samples are to be collected first by manually trapping water in the Teflon® tubing, removing the tubing from the well and then filling VOA containers with this water. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each groundwater sample. Each portion of the sample will be properly preserved upon collection.

2.9.6 *Surface Water Sampling Procedures*

Surface water samples will be obtained from the Cape Fear River and Greenfield Creek by use of a small boat. The most downstream sample will be collected first and obtained by orienting the sampler and sample container upstream. The intent of this sampling method is to obtain the most representative and least disturbed surafe water samples. Due to tidal influence in the Cape Fear River and Greenfield Creek, it may be necessary to select different sample locations based upon conditions in the field. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each surface water sample. Each portion of the sample will be properly preserved upon collection.

2.9.7 *Biological Tissue Sampling Procedures*

Biological tissue samples will be collected from the Cape Fear River and Greenfield Creek by use of a small boat. Biological tissue samples will consist of fish and sessile benthic organism tissue.

Four fish tissue samples will be collected to determine the human health exposure risk from the site. The target species for this sampling event will be commercial and recreational species. The sampling areas will be the Cape Fear River and Greenfield Creek in areas potentially effected by the site. Two samples will be collected in the Cape Fear River and two samples collected in Greenfield Creek. The fish collection method in the Cape Fear River will be rod and reel. The fish collection method in Greenfield Creek will be conducted using a combination of seining and rod and reel techniques depending upon water depth and available fish habitat.

Upon collection of the desired fish species, the specimen will be rinsed with surface water from the collection point, identified, weighed, measured, catalogued, and visually inspected for any lesions or other physical abnormalities. After recording this information on field data sheets, the fish species will be weighed and collection will occur until the sample weight determined by the analytical laboratory is obtained. The recommended weight for one sample is 500 grams, which often requires the collection of three to ten individuals. One sample will be identified when the weight of the combined target species is achieved. The combined fish sample will then be prepared for shipment to the analytical laboratory. Depending on the laboratory requirements, the fish will either be filleted in the field or by the laboratory. The fish samples will be wrapped in aluminum foil, placed in a waterproof freezer bag, labelled, stored on either dry ice or wet ice, and shipped to the laboratory following laboratory protocols. If the time between field sampling and laboratory preparation is greater than 48 hours, the fish will be frozen until shipped to the laboratory.

Since fish are typically a mobile life form, attempts will also be made to obtain biological samples from sessile benthic organisms which are in the human food chain such as oysters or mussels. These life forms are believed to be less mobile and therefore better indicators of long term exposure. Samples will be obtained using the least intrusive techniques available. Dredge samplers operated from a small boat will be the first equipment used to obtain oysters or mussels. If attempts with the dredge samplers are unsuccessful, it will be necessary to use other equipment such as oyster tongs to retrieve sample organisms. A sufficient quantity of organisms will be collected at each sample location. Upon collection of the organisms, their genus and species will be identified. The organisms will be weighed and their general apparance will be described and recorded in the field book. Each sample will be placed in foil,

wrapped tightly, placed in plastic bags, and stored on ice for the remainder of the sampling day. If the selected laboratory provides sample packaging materials, the sampler will ensure that this provided packing material is kept clean prior to use. Steps will be taken to rinse the organisms in water free from any controllable pollution source, such as the boat engine. All samples collected from one sampling location may be wrapped together in one foil package. Laboratory protocols for sample preservation will be followed. If the laboratory does not specify sample preservation methods, the samples will be frozen as soon as possible, packed into watertight coolers and loaded with dry ice, and shipped overnight to the analytical laboratory. A chain of custody record will be completed by the sampler and included in the shipment of the samples to the laboratory. These chain of custody forms will be provided by the laboratory.

2.10 Decontamination Procedures

Procedures for equipment decontamination will be implemented to avoid cross-contamination of subsurface strata and samples of various media which are to be submitted for chemical analyses. Drill rigs and all drilling and sampling equipment will be thoroughly cleaned and decontaminated before initial use and between sample locations.

Before being mobilized to the site, the drill rig and related sampling equipment will be cleaned. The drill rig will be cleaned with a steam cleaner or hand washed with a brush and detergent to remove oil, grease, and hydraulic fluid. If necessary, downhole drilling and sampling equipment will be sandblasted to remove any paint, dried caked-on mud, or heavy rust accumulation. The drill rig will be inspected prior to initiation of drilling activities.

A decontamination station will be constructed at a suitable onsite location. In general, the station will be covered with plastic sheeting such that decontamination fluids can flow into a lined collection pit, sump, trench, or drum. Fluids generated as a result of decontamination will be placed in drums.

Initial and intermediate decontamination of subsurface drilling equipment, sampling equipment, and well construction materials (riser and screen) will include the following steps:

- Wash equipment thoroughly with laboratory detergent and potable water using a brush to remove any particulate matter or surface film.
- Rinse equipment thoroughly with potable water.
- Rinse equipment thoroughly with deionized water.
- Rinse equipment twice with pesticide-grade isopropanol.
- Rinse thoroughly with organic-free water and allow to air dry as long as possible.
- Wrap with aluminum foil, if appropriate, to prevent contamination of equipment if equipment is going to be stored or transported. Clean plastic can be used to wrap augers, drill rods, casings, etc.

Organic-free water should contain no pesticides, herbicides, extractable organic compounds, and less than 50 ug/l of purgeable organic compounds. In addition, no metals or other organic compounds should be detected at routine detection limits. Deionized water, organic-free water, and isopropanol must be applied using non-interfering containers made of glass, Teflon, or stainless-steel. The drill rig will be steam cleaned before drilling each boring.

The electronic water-level indicator will be decontaminated as follows:

- Wash with laboratory detergent and potable water.
- Rinse with potable water.
- Rinse with deionized water.
- The instrument will be placed in a clean polyethylene bag to prevent contamination during transit or storage.

A final decontamination of all equipment used to complete the drilling, well installation, and sampling effort will be required prior to equipment demobilization from the site. This decontamination step is required to prevent the movement of contaminants from being transported offsite by subcontractors vehicles. Final

decontamination will be performed at the decontamination pad and will be witnessed by field personnel.

For sampling equipment (stainless steel spoons, bowls, knives, split-spoon sampler, etc.), the second phase of initial decontamination will include the following:

(1) Wash equipment with a non-phosphate detergent.
(2) Rinse with tap water.
(3) Rinse with 0.1 N nitric acid (non-metallic utensils).
(4) Rinse with deionized/distilled water.
(5) Rinse with pesticide grade isopropanol.
(6) Rinse twice with deionized/distilled water.
(7) Rinse once with organic free (HPLC-grade) water.
(8) Allow to air dry.
(9) Wrap with aluminum foil and plastic to prevent contamination before use.

Following completion of decontamination, if the decontaminated equipment touches the ground, it will be considered contaminated and will require decontamination before use.

3.0 Investigation Derived Waste

Field investigation activities will result in the production of potentially contaminated waste materials that must be properly managed. Potentially contaminated materials generated during the field investigation will include surface and subsurface soils, decontamination solutions, disposable equipment, drill cuttings, well-development fluids, and well-purge water. The disposable equipment and cuttings will be placed in 55-gallon drums segregated by boring. Liquid wastes will be placed in 55-gallon drums and staged at an onsite accumulation area. The containers will be labeled to indicate contents.

Wastes produced by the field operations are divided into seven categories:

- Surface and subsurface soils collected from the background locations will be returned to the locations from which they were collected provided OVA readings or observations by well installation or sampling personnel do not indicate that they should be placed in 55-gallon drums and staged at a predetermined accumulation area for disposal at a later date.

- Personal Decontamination Station Liquids. These liquids include the wash water from the boot wash and the hand and face wash containers. Contaminants typically found in these liquids result from activities which bring personnel in contact with soil and groundwater. The water will be placed in 55-gallon drums and staged at a predetermined accumulation area on site for disposal at a later date.

- Drill Cuttings. These materials are generated during the drilling of the boreholes. The procedure for handling the drill cuttings will be: containerizing the cuttings separately from each borehole in DOT-approved 55-gallon drums, labeling to indicate contents, and staging of the drums at a predetermined accumulation area onsite. If drilling fluids are used, waste fluids will also be placed in drums and staged at a predetermined area for disposal at a later date.

- Personal Protective Clothing. This category includes the disposable work clothing such as booties, gloves, coveralls, and spent respirator cartridges worn by field personnel during the ESI field investigation. The procedure for handling disposable personal protective clothing will be to collect such articles and remove them from the site for disposal at a later date.

- Decontamination Fluids. These fluids include wash waters used to decontaminate the drilling and sampling equipment. The wash waters will be containerized in DOT-approved 55-gallon drums and staged at a predetermined location on site for disposal at a later date.

- Well development and Purge Water. These fluids include the groundwater obtained from monitoring well development and pre-sampling well purging activities. The development and purge water will be containerized in DOT approved 55-gallon drums, labeled to indicate contents, and staged on site in a predetermined location for disposal at a later date.

Drums containing cuttings and waste fluids will be staged at a designated onsite area at the completion of the field investigation and will be placed on pallets and covered with a protective tarp. The tarp will be secured to the drums with rope. The contents of the drums will be disposed of as determined by U.S. EPA Region IV. All

investigation derived wastes will be disposed of in accordance with the requirements specified in the Management of Investigation Derived Wastes During Site Inspections, Environmental Protection Agency, May, 1991.

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FINAL
FIELD STUDY PLAN
EXPANDED SITE INSPECTION

Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

EPA ID № NCD058517467
WasteLAN № 02821

Prepared Under
CONTRACT № 68-W9-0055

For the

WASTE MANAGEMENT DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

Prepared by

BLACK & VEATCH SPECIAL PROJECTS, CORP.
Atlanta, Georgia

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FIELD STUDY PLAN
EXPANDED SITE INSPECTION
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina
EPA ID №: NCD058517467
WasteLAN №: 02821

1.0 Introduction

Black & Veatch Special Projects Corp. (Blach &Veatch) has been tasked by the U. S. Environmental Protection Agency (EPA), Waste Management Division, Region IV to conduct an Expanded Site Inspection (ESI) at the former Southern Wood Piedmont (SWP) site in Wilmington, New Hanover County, North Carolina. The inspection will be performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

1.1 Objectives

The objectives of the ESI are to further determine the nature of contaminants present at the site, to determine if a release of hazardous materials to the environment has occurred or may/occur, and if a release has occurred, to determine attribution of those contaminants to the site. Furthermore, this inspection seeks to further define the possible pathways by which contamination could migrate from the site and the populations and environments it potentially affects. The purpose of this inspection is to provide information needed to evaluate the site using the Hazard Ranking System (HRS).

Specific elements include:

- Outline the major milestones, develop a schedule, and determine the level of effort (LOE) required to complete the ESI.
- Identify the data gaps that need to be addressed by the ESI.
- Further define the site characteristics and contaminant sources, including waste type and volume.

- Determine human population, sensitive environments and fisheries that are threatened or potentially threatened by releases of hazardous materials from the site.
- Develop a sampling strategy to obtain the additional analytical data to support the HRS score.

1.2 Scope of Work

The scope of this investigation includes the following activities:

- Obtain and review background materials relevant to assessing the potential health and environmental hazards posed by the site.
- Obtain aerial photographs and maps of site, if possible.
- Obtain information on local water systems.
- Evaluate target populations associated with the groundwater, surface water, and air migration pathways and the onsite soil exposure pathway.
- Determine location and distance to nearest potable well.
- Develop a site sketch.
- Install and sample groundwater monitoring wells.
- Sample existing groundwater monitoring wells.
- Collect various types of environmental samples.
- Characterize source areas at the site.

1.3 Schedule

Fieldwork for the SWP site is scheduled for the week of May 20, 1996.

1.4 Personnel

Site Manager: Robert Mangum
Site Safety Coordinator: Eric Mosley
Sampling Officer/Sampler: Joe Slykerman
Samplers: Carol King and Paul Moisan
HRS Coordinator: Paul Moisan

1.5 Permits and Authorization Requirements

EPA is responsible for obtaining access to the site, permission to take photographs of the site, and permission to return investigation derived wastes to the property. In addition, EPA is responsible for all permits which may be required to accomplish these tasks.

1.6 Site Description and History

1.6.1 Site Description

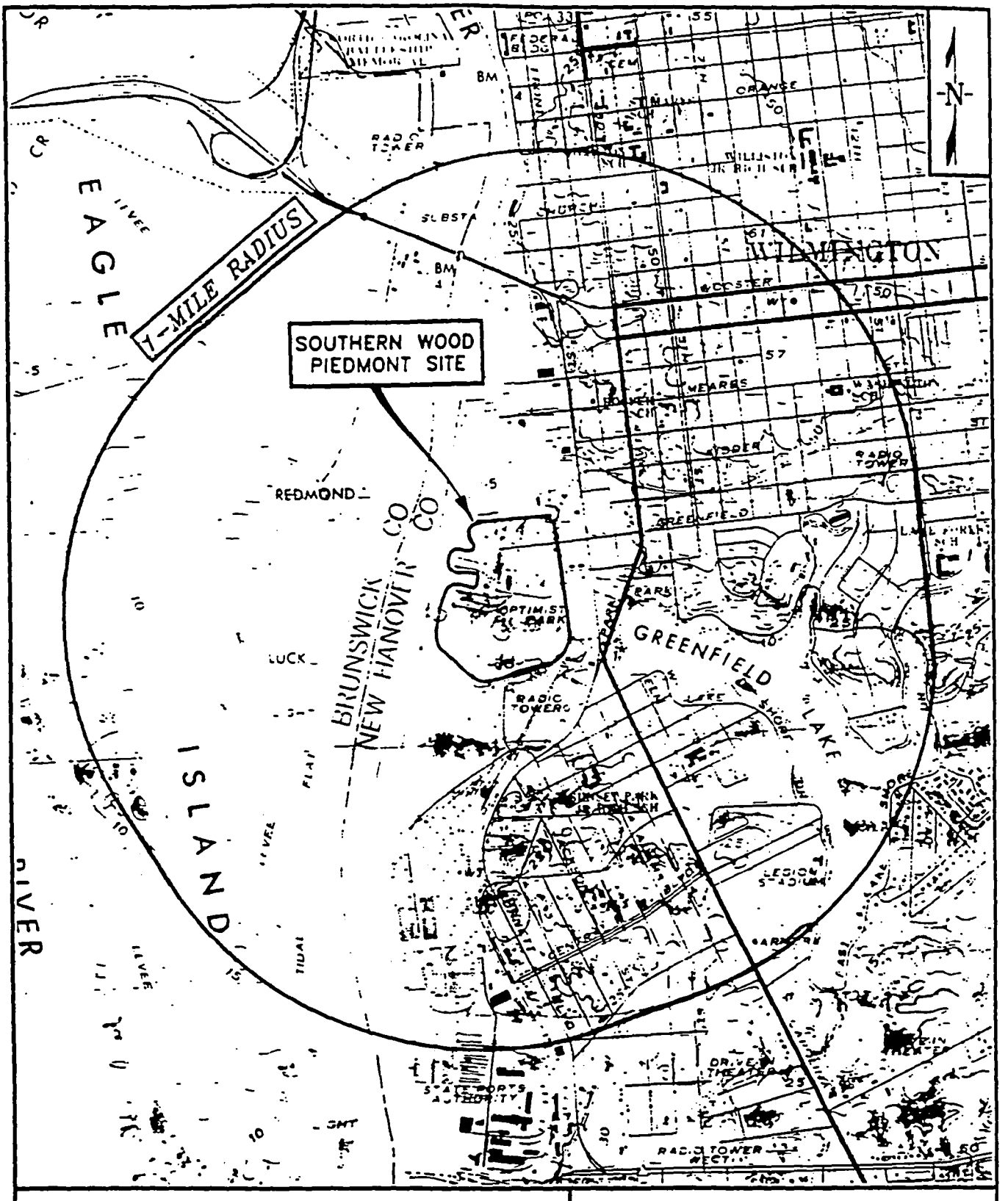
The SWP site is located on Greenfield Street in Wilmington, New Hanover County, North Carolina (Refs. 1; 2). The geologic coordinates of the site are 34° 12' 59" North latitude and 77° 57' 7" West longitude (Ref. 3). The area of the SWP site is approximately 52 acres of vacant land along the east bank of the Cape Fear River (Ref. 2). The site is currently owned by the City of Wilmington (COW) and the North Carolina State Port's Authority (NCSPA). Thirty-five acres in the northern and central portion of the site are owned by the COW, and the remaining seventeen acres are owned by the NCSPA (Ref. 2). The site is bordered by the Amerada Hess Petroleum Terminal to the north, by the Paktank Petroleum Terminal to the south, by the Cape Fear River to the west, and by Optimist Park and Front Street to the east (Ref. 4, Fig. 3). The site location and site layout are shown on Figures 1 and 2, respectively.

1.6.2 Site History

The SWP site was developed as a construction site for concrete barges and ships during World War I. Operations at the site changed to wood-treating beginning in the 1930s. Southern Wood Preserving Company (presently Southern Wood Piedmont) began operating in 1964 at the site. Prior to 1972, creosote was the only wood preservative in use at the site. Chromated copper arsenate (CCA) was introduced at the site after 1972 as a wood preservative. Pentachlorophenol (PCP) was added as a wood preservative after 1980. Site closure activities began about 1975 when SWP reportedly obtained a permit to bury an onsite drainage ditch which contained creosote sludge. The ditch was subsequently covered with fill material. In May 1983, wood treatment operations on site ceased and the site equipment was removed (Ref. 5).

CAD DWG NO: ESSWLC01
DATE: 3-11-96
PLOT SCALE: 1=1

ORIGINAL DWG SIZE
8.5 x 11



SCALE IN FEET

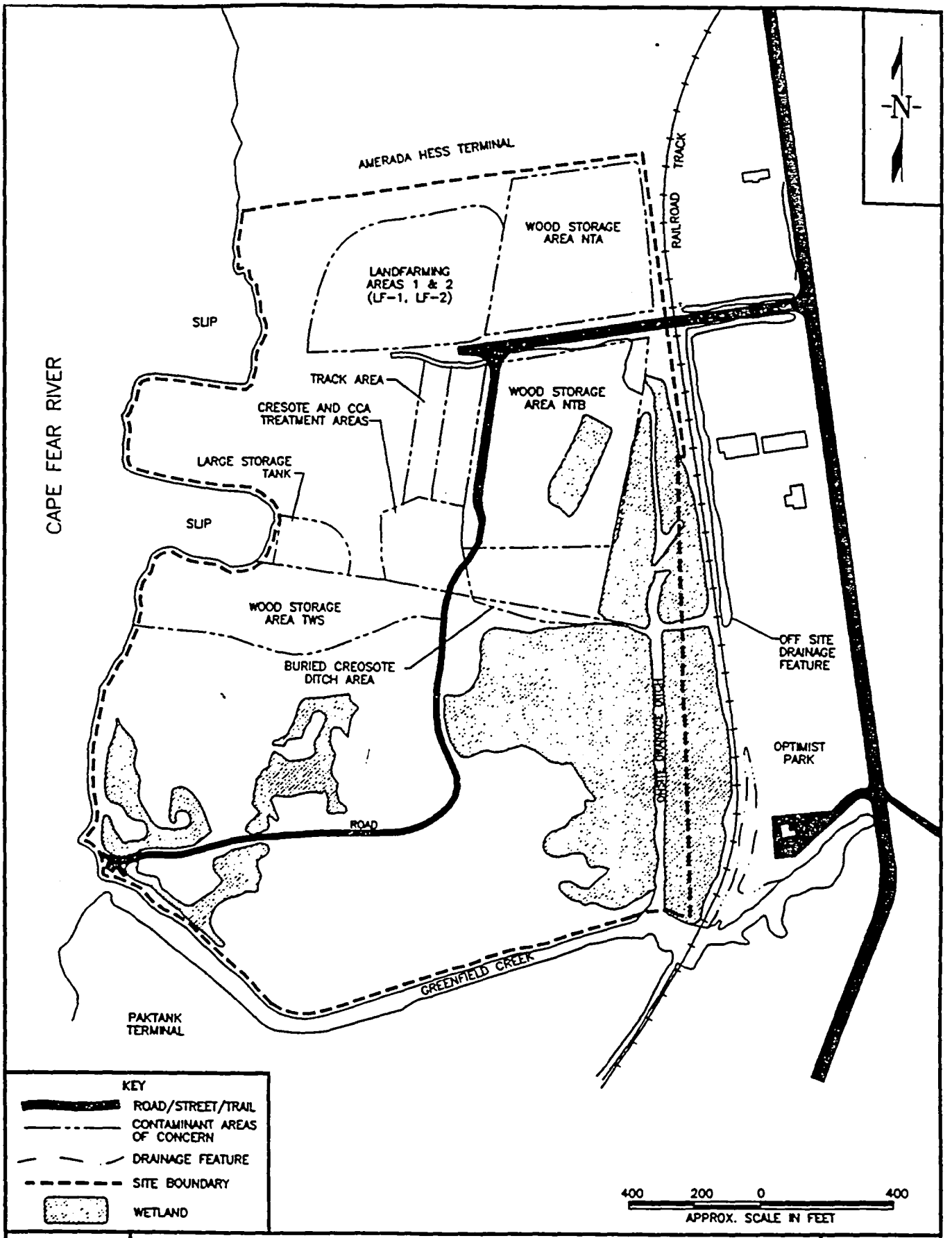
0 2000' 4000'

CONTOUR INTERVAL 5 FEET

SOURCE: BASE MAP IS A PORTION OF THE USGS 7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP OF WILMINGTON, NORTH CAROLINA, PHOTOREVISED 1979.

SITE LOCATION MAP
SOUTHERN WOOD PIEDMONT SITE
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE
1



SITE LAYOUT MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 2

MOST RECENT REVISION: REVISION DATE: 3-13-98 DRAFTERS INITIALS: GB
ORIGINAL DWG SIZE 8.5 x 11 PLOT SCALE: 1=1
CAD DWG NO: ESSWLY01 CREATION DATE: 3-9-98 DRAFTERS INITIALS: GB 52014.750

1.6.3 Source Areas

Source areas include an area of contaminated soil which was once utilized for wood preserving and storage activities, the large storage tank area, the cresote treatment area, the covered sludge ditch, and the small diesel storage area.

1.6.4 Prior Site Investigations

In 1981, COW authorized Soil and Materials Engineering, Inc. (SME) to install five soil borings on the thirty-five acres of the site which the COW owns. Four of the borings were completed as shallow monitoring wells (screened above the peat) (Ref. 6). The additional boring was completed as an intermediate monitoring well (screened below the peat, but above the limestone believed to be the Pee Dee formation). As part of this field work, groundwater samples were obtained for inorganic and organic analyses (Ref. 6).

A Preliminary Assessment of the site was completed in July 1984 by the North Carolina Department of Human Resources (Ref. 7). Representatives of NCDHR observed visibly stained soil in the main production area, near a cluster of creosote storage tanks, and in the vicinity of the covered sludge ditch. Surface water and shallow groundwater were both noted as having an oily sheen present at several locations (Ref. 7). No samples were collected during the Preliminary Assessment.

A Screening Site Investigation (SSI) was conducted for the EPA by Halliburton Corporation (NUS) in January 1985. Sampling for this investigation included the following: four of the five COW groundwater monitoring wells, one groundwater monitoring well at Greenfield Lake, and subsurface soil samples in the landfarming areas, on the jetty, and near the boat slips. In addition, NUS representatives collected one surface water and one sediment sample adjacent to the site in the Cape Fear River. A background surface water and sediment sample were obtained from the overflow stream from Greenfield Lake (Ref. 8).

An Administrative Order of Consent between the State of North Carolina and SWP was agreed upon in May of 1985 (Ref. 9). As part of the order, one upgradient and three downgradient wells were installed to monitor groundwater during the landfarming activities outlined in the Order. Periodic landfarm soil monitoring and biannual water quality monitoring were also part of the Administrative Order. Landfarming continued from the mid-1980s through the early 1990s. During this

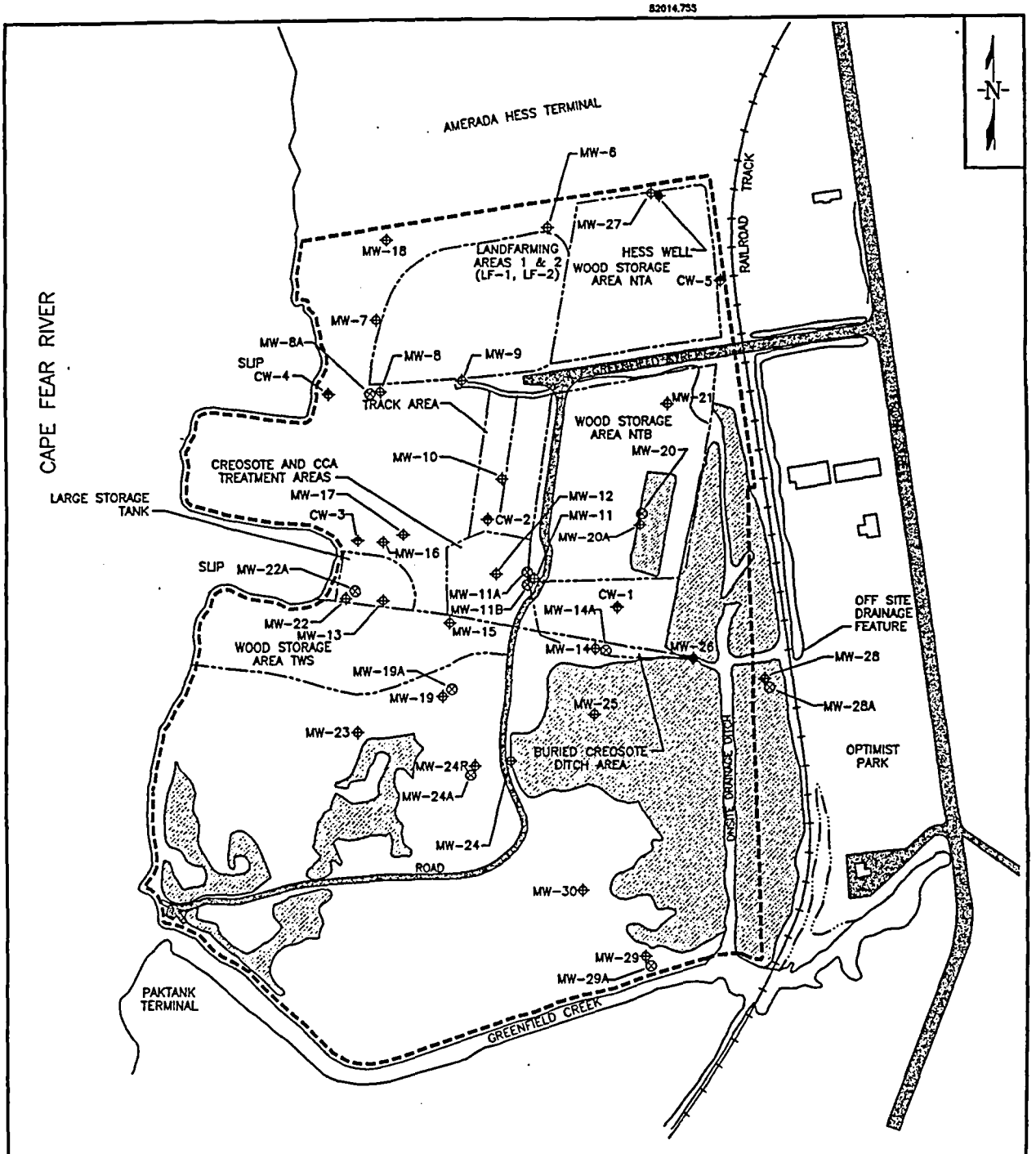
time, SWP collected 59 composite soil samples from Landfarming Area 1 (LF-1) and 37 composite soil samples from Landfarming Area 2 (LF-2) (Ref. 2). Analyses included phosphorous, chloride, total organic carbon (TOC), pH, polynuclear aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), phenol, and microbial content (Ref. 2).

In September 1985, Law Environmental installed four groundwater monitoring wells outside the perimeter of the landfill areas. These wells were sampled for PCP and semivolatile organics (Semivols) between 1985 and 1990 (Ref. 2). Geraghty & Miller, Inc. (G & M), conducted soil investigations in 1991 at three areas (outdoor wood storage areas) which were not excavated for land farming. A total of forty-eight shallow soil samples were collected from two nontreated wood storage areas and one treated wood storage area. G & M also conducted soil borings and sampling at LF-1 and LF-2 in October 1990 and October 1991. Composite soil samples were obtained from five borings during these investigations and groundwater samples were taken from the four groundwater monitoring wells installed at the perimeter of the landfarming areas (Ref. 10).

In February 1992, Environmental Technology Engineering, Inc. (ETE), began a groundwater investigation comprised of three phases. During Phase I, five temporary and eight permanent groundwater monitoring wells were installed and subsequently sampled. Phase II consisted of the abandonment of the five temporary wells and the placement of an additional twelve permanent groundwater monitoring wells. In December 1992, soil and sediment samples were taken from surface drainage areas including the onsite drainage ditch and Greenfield Creek. Phase III began in October 1993 and involved the installation of another eleven permanent groundwater monitoring wells, sampling of these wells, and the resampling of the preexisting wells (Ref. 4). The locations of all of the preexisting monitoring wells are presented on Figure 3.

The North Carolina Department of Health, Environment, and Natural Resources (NCDEHNR) conducted a Site Inspection Prioritization (SIP) in January 1995 for the purpose of collecting sufficient information to assess threats to human health and the environment. Based on the information collected, the SWP site was recommended as a high priority for an Expanded Site Inspection (Ref. 2).

CREATION DATE: 4-16-96 DRAFTERS INITIALS: GB 82014.753 | 11 x 17 PLOT SCALE: 1=1 | REVISION DATE: DRAFTERS INITIALS:



LEGEND

- EXISTING SHALLOW MONITORING WELL
- EXISTING INTERMEDIATE MONITORING WELL
- CITY WELL
- HESS WELL

300 150 0 300
APPROX. SCALE IN FEET

KEY

- ROAD/STREET/TRAIL
- CONTAMINANT AREAS OF CONCERN
- DRAINAGE FEATURE
- SITE BOUNDARY
- WETLAND

EXISTING MONITORING WELL LOCATION MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 3

1.7 Regional Hydrogeology

The SWP site lies within the Coastal Plain physiographic region in southeast North Carolina (Ref. 11). Topography in the region extends from flat, low-lying swamps and marshes 3 to 6 feet above mean sea level (amsl) to rolling uplands, 300 to 600 feet amsl (Ref. 12, p. 271). More specifically, the site lies approximately 5 feet amsl on urban lands derived from Urban land complex (Refs. 1; 13, pp. 6, 8, sheet 18). These complexes consist of sands and sandy loams which have been disturbed and appear to be derived from the floodplain or tidal sediments surrounding the site (Ref. 13, pp. 6, 8). The sandy nature results in relatively high permeabilities for these soils (Ref. 13, p. 6). The soil encountered beneath the existing drainage ditch and the southeastern portion of the site is believed to be in the Dorovan Series (Ref. 2).

The region is underlain by unconsolidated sediments that thicken toward the coast. These sediments consist of sands, silts, and clays which are generally of fluvial origin (Ref. 12, p. 271). These sediments are usually 50 feet thick and overlie the Castle Hayne marl of the upper Eocene (Ref. 14, p. 221). The Castle Hayne Formation is approximately 150 feet thick in southern New Hanover County. Beneath the Castle Hayne Formation lie the Cretaceous sediments comprising the Peedee, the Black Creek, and the Tuscaloosa formations, which together are approximately 1300 feet thick (Ref. 14, p. 221). The Peedee Formation consists of well-sorted quartz sand and clays while the Black Creek contains more clay and appears to function as a confining unit for both the Peedee/ and the underlying Tuscaloosa Formations (Ref. 15, pp. 11, 13).

Beneath the SWP site, three principal aquifers are present: the upper sandy aquifer, the limestone aquifer, and the lower sandy aquifer. The upper sandy aquifer is approximately 50 feet thick and confines the underlying limestone aquifer which is also approximately 50 feet in thickness (Ref. 14, p. 221). The limestone aquifer is composed of carbonates of the Castle Hayne marl. Below the Castle Hayne marl lies the lower sandy aquifer which consists of the sandy sediments of the Peedee, Black Creek and Tuscaloosa formations. The lower sandy aquifer has a maximum thickness of 1300 feet although the fresh water portion of the aquifer is relatively thin in New Hanover County (Ref. 14, p. 221). Both the limestone aquifer and the lower sandy aquifer are capable of yielding significant water supplies. Groundwater in the unconfined surficial (upper sandy) aquifer can be obtained at depths of only 10 feet in New Hanover County (Ref. 16, p.29). Within this region, brackish water encroachment from the ocean and the Cape Fear River significantly affects water

quality at depths between 100 and 300 feet below land surface (bls) (Ref. 16). Generally, groundwater flows to the southeast in New Hanover County (Ref. 16, plate 6). Beneath the site, groundwater flow is to the south and southeast toward Greenfield Creek and southeast toward the onsite drainage ditch (Ref. 2). Hydraulic conductivities for sands similar to those of the upper and lower sandy aquifers range from 1×10^{-3} to 1.0 cm/sec. The limestone aquifer may exhibit hydraulic conductivities ranging from 1×10^{-4} to 1×10^{-1} cm/sec (Ref. 17, p. 29).

1.8 Groundwater Pathway Targets

There are no municipal water supply wells within 4 miles of the site (Ref. 2). The City of Wilmington draws its water supply from surface water intakes upstream of the site on the Cape Fear River (Ref. 2). Three community wells, which serve an estimated 680 residents, exist within a 4-mile radius of the site. Two of these wells supply an estimated 625 residents. These two wells are situated 1.7 and 3.8 miles east-northeast of the site. The remaining 55 residents utilize a well approximately 1.6 miles west of the site (Ref. 2).

A house count shows approximately 1,449 people receiving water from private wells within a 4-mile radius of the site (Ref. 2). The nearest groundwater supply to the site are springs which provide water for outdoor faucets at the Greenfield Park, approximately 1/4 to 1/2 mile east of the SWP site (Ref. 2). Additional water supplies close to the site include the private wells located approximately 1.6 miles west of the site and the community well approximately 1.7 miles east of the site (Ref. 2).

Radial Distance (miles)	Target Population (Groundwater)
0.00 - 0.25	0
>0.25 - 0.50	0
>0.50 - 1.00	0
>1.00 - 2.00	153
>2.00 - 3.00	188
>3.00 - 4.00	1,788

1.9 Surface Water Pathway Targets

Overland runoff from the site generally flows south and southeast toward the onsite drainage ditch and Greenfield Creek which discharges into the Cape Fear River (Ref. 18). The surface water pathway begins in the upper end of the drainage ditch along the southeastern portion of the site. The pathway continues southward for approximately 1,500 feet, where it then empties into Greenfield Creek. The surface water pathway continues west approximately 1,800 feet before discharging into the Cape Fear River (Ref. 2, Fig. 2). The surface water pathway continues in the Cape Fear River for a distance of approximately 15 miles both upstream and 15 miles downstream due to tidal influence from the Atlantic Ocean (Ref. 2).

The active intake for the City of Wilmington is located more than 15 miles upstream of the site at Riegelwood. Aproximately 0.45 miles of wetland exists along the southern portion of the site (Ref. 2). Approximately 170 miles of wetland frontage have been mapped along the 15 miles of the surface water pathway, both upstream and downstream (Ref. 2). Ten rare animal species and eight rare plant species have been reported to exist near the surface water pathway (Ref. 2). There are four animal species and two plant species located along the surface water pathway which are endangered or threatened in the United States (US) and North Carolina (NC) (Ref. 2). The Shortnose Sturgeon (*Acipenser brevirostrum*) is a NC endangered animal species which was identified 1/2 mile upstream on the Cape Fear River. The NC and US threatened species, the American Alligator (*Alligator mississippiensis*), has been identified at 16 locations on the Cape Fear River system. The NC endangered snail Magnificent Ram's Horn (*Planorbella magnifica*), and the US and NC endangered mammal, West Indian Manatee (*Trichecus manatus*), have been reported in the Cape Fear estuary approximately 7.4 and 12 miles downstream of the site, respectively. The NC threatened plants, Carolina Grasswort (*Lilaeopsis caroliniansis)* and the Snowy Orchid (*Platanthera nivea*), were reported on a tidal flat 2.4 and 3 miles downriver, respectively (Ref. 2).

1.10 Soil and Air Exposure Pathway Targets

The SWP site is currently inactive and all previous site structures have been demolished and removed. (Ref. 2). Unpaved site areas are covered by grass and other vegetation. The site is not fenced, but does have an entrance to prevent vehicular traffic. The site is accessible by foot. The former landfarm areas have been bermed to prevent surface water runoff. The site is located near downtown Wilmington, North Carolina on the east bank of the Cape Fear River (Fig. 1). The

population within 4 miles of the site is approximately 51,914 (Ref. 2). The estimated population within the 4-mile radius of the site is distributed as follows: 0 - 0.25 mile, 527 persons; 0.25 - 0.50 mile, 828 persons; 0.5 - 1 mile, 7,206 persons; 1 - 2 miles, 16,147 persons; 2 - 3 miles, 12,212 persons; and 3 - 4 miles, 14,994 persons (Ref. 2). The closest workers to the site are likely to be at the Amerada Hess terminal north of the site and the Greenfield Transmission Company and Locke Industries to the east of the site. The nearest residents are located approximately 400 east of the site (Ref. 2). The school closest to the site is approximately 1/2 mile south of the site. Day care facilities are located approximately 1/4 mile east of the site. A park is located less than a 1/4 mile east of site, separated from the site by an elevated railroad bed, vegetation, and the onsite drainage ditch (Ref. 2).

2.0 Sampling Investigation

The sampling investigation will include the collection of groundwater, surface water, surface soil, subsurface soil, sediment, and biological tissue samples. All samples collected will be analyzed for extractable and purgeable organic compounds, pesticides, PCBs, cyanide, and metals. Additionally, select samples will be analyzed for dioxins and furans. Most sample analyses will be performed under the Contract Laboratory Program (CLP) for routine analytical services (RAS). Dioxin furan analyses will be preformed under CLP for special analytical services (SAS). All water samples will be field tested for temperature, turbidity, pH, and conductivity. Quality Assurance/Quality Control (QA/QC) samples will also be collected. QA/QC samples will include a rinsate sample for each set of equipment that has been decontaminated in the field, a trip blank, and a preservative blank for each week of sampling, and a matrix duplicate for every 20 samples in each media (soil and water). Sample codes, descriptions, locations, and sampling rationale are shown in Table 1. Sample locations are shown on Figure 4. All sample locations are subject to change as field conditions warrant.

2.1 Surface Soil Sampling

Twenty-one surface soil samples will be collected in association with the SWP site at depths no greater than two feet bls. Six samples will be taken in former wood storage and landfarming areas. Five samples will be located in previously identified contamination source areas. Seven samples are to be taken in areas which have not been previously sampled. Three samples will be collected as background samples

Table 1
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SS-01 / SP-SB-01	Surface Soil / Subsurface Soil	Upgradient of LF-1 & LF-2.	To establish background levels.
SP-SS-02 / SP-SB-02	Surface Soil / Subsurface Soil	Northeast of the site.	To establish background levels.
SP-SS-03 / SP-SB-03	Surface Soil / Subsurface Soil	Southeast of the site.	To establish background levels.
SP-SS-04 / SP-SB-04	Surface Soil / Subsurface Soil	Northeast Wood Storage Area (NTA).	To confirm presence or absence of contamination.
SP-SS-05 / SP-SB-05	Surface Soil / Subsurface Soil	Southeast Wood Storage Area (NTB).	To confirm presence or absence of contamination.
SP-SS-06 / SP-SB-06	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-07 / SP-SB-07	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-08 / SP-SB-08	Surface Soil / Subsurface Soil	CCA and Creosote Treatment Area.	To confirm presence or absence of contamination.
SP-SS-09 / SP-SB-09	Surface Soil / Subsurface Soil	Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.
SP-SS-10 / SP-SB-10	Surface Soil / Subsurface / Soil	Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.
SP-SS-11 / SP-SB-11	Surface Soil / Subsurface Soil	Large Storage Tank Area.	To confirm presence or absence of contamination.
SP-SS-12 / SP-SB-12	Surface Soil / Subsurface Soil	West of road near center of site.	To confirm presence or absence of contamination.
SP-SS-13 / SP-SB-13	Surface Soil / Subsurface Soil	North of Buried Creosote Ditch Area.	To confirm presence or absence of contamination.
SP-SS-14 / SP-SB-14	Surface Soil / Subsurface Soil	Northcentral portion of LF-1 and LF-2	To confirm presence or absence of contamination.
SP-SS-15 / SP-SB-15	Surface Soil / Subsurface Soil	South of Buried Creosote Ditch Area.	To confirm presence or absence of contamination.
SP-SS-16 / SP-SB-16	Surface Soil / Subsurface Soil	Between wetlants north of road.	To confirm presence or absence of contamination.
SP-SS-17 / SP-SB-17	Surface Soil / Subsurface Soil	Southcentral portion of site near Greenfield Creek.	To confirm presence or absence of contamination.
SP-SS-18 / SP-SB-18	Surface Soil / Subsurface Soil	West of road and east of east wetland.	To confirm presence or absence of contamination.
SP-SS-19 / SP-SB-19	Surface Soil / Subsurface Soil	South of Southwest Wood Storage Area (TWS).	To confirm presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SS-20 / SP-SB-20	Surface Soil / Subsurface Soil	Southeast of north slip.	To confirm presence or absence of contamination.
SP-SS-21 / SP-SB-21	Surface Soil / Subsurface Soil	Track area west of road.	To confirm presence or absence of contamination.
SP-SD-01	Sediment	East of the site near the intersection of Front and Greenfield Streets.	To establish background levels.
SP-SD-02	Sediment	On Greenfield Creek south of Optimist Park.	To establish background levels.
SP-SD-03	Sediment	On a drainage feature midway and east of the site.	To determine presence or absence of contamination.
SP-SD-04	Sediment	East of the rail line on Greenfield Creek.	To determine presence or absence of contamination.
SP-SD-05	Sediment	Drainage feature south of Northeast Wood Storage Area (NTA) and sourth of Greenfield Street.	To determine presence or absence of contamination.
SP-SD-06	Sediment	Onsite drainage ditch southeast of Southeast Wood Storage Area (NTB).	To determine presence or absence of contamination.
SP-SD-07	Sediment	Onsite drainage ditch west of Optimist Park.	To determine presence or absence of contamination.
SP-SD-08	Sediment	Greenfield Creek downstream of the confluence with the on site drainage ditch.	To determine presence or absence of contamination.
SP-SD-09	Sediment	Greenfield Creek downstream of SP-SD-08.	To determine presence or absence of contamination.
SP-SD-10	Sediment	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-SD-11	Sediment	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-SD-12	Sediment	Northwest property boundary at the Cape Fear River.	To determine presence or absence of contamination.
SP-SD-13	Sediment	In the wetland area of Southeast Wood Storage Area (NTB) near MW-20.	To determine presence or absence of contamination.
SP-SD-14	Sediment	In the wetland area south of the buried creosote ditch area.	To determine presence or absence of contamination.
SP-SD-15	Sediment	West of road in northern portion of east wetland.	To determine presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-SD-16	Sediment	North of road in southern portion of east wetland area.	To determine presence or absence of contamination.
SP-SD-17	Sediment	In the west wetland area north of road.	To determine presence or absence of contamination.
SP-SD-18	Sediment	In the west wetland area north of road.	To determine presence or absence of contamination.
SP-SD-19	Sediment	In the wetland area south of road at western boundary of site.	To determine presence or absence of contamination.
SP-SD-20	Sediment	In the wetland area west of SP-SD-04.	To determine presence or absence of contamination.
SP-SW-01	Surface Water	Same location as SP-SD-01.	To establish background levels.
SP-SW-02	Surface Water	Same location as SP-SD-02.	To establish background levels.
SP-SW-03	Surface Water	Same location as SP-SD-04.	To determine presence or absence of contamination.
SP-SW-04	Surface Water	Same location as SP-SD-07.	To determine presence or absence of contamination.
SP-SW-05	Surface Water	Same location as SP-SD-08.	To determine presence or absence of contamination.
SP-SW-06	Surface Water	Same location as SP-SD-09.	To determine presence or absence of contamination.
SP-SW-07	Surface Water	Same location as SP-SD-10.	To determine presence or absence of contamination.
SP-SW-08	Surface Water	Same location as SP-SD-11.	To determine presence or absence of contamination.
SP-SW-09	Surface Water	Same location as SP-SD-12.	To determine presence or absence of contamination.
SP-MW-08	Groundwater	Southwest of LF-1 and LF-2.	To determine presence or absence of contamination.
SP-MW-08A	Groundwater	West of MW-08.	To determine presence or absence of contamination.
SP-MW-11	Groundwater	Southwest corner of Wood Storage Area (NTB).	To determine presence or absence of contamination.
SP-MW-11A	Groundwater	Northwest of MW-11.	To determine presence or absence of contamination.
SP-MW-11B	Groundwater	Southwest of MW-11.	To determine presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

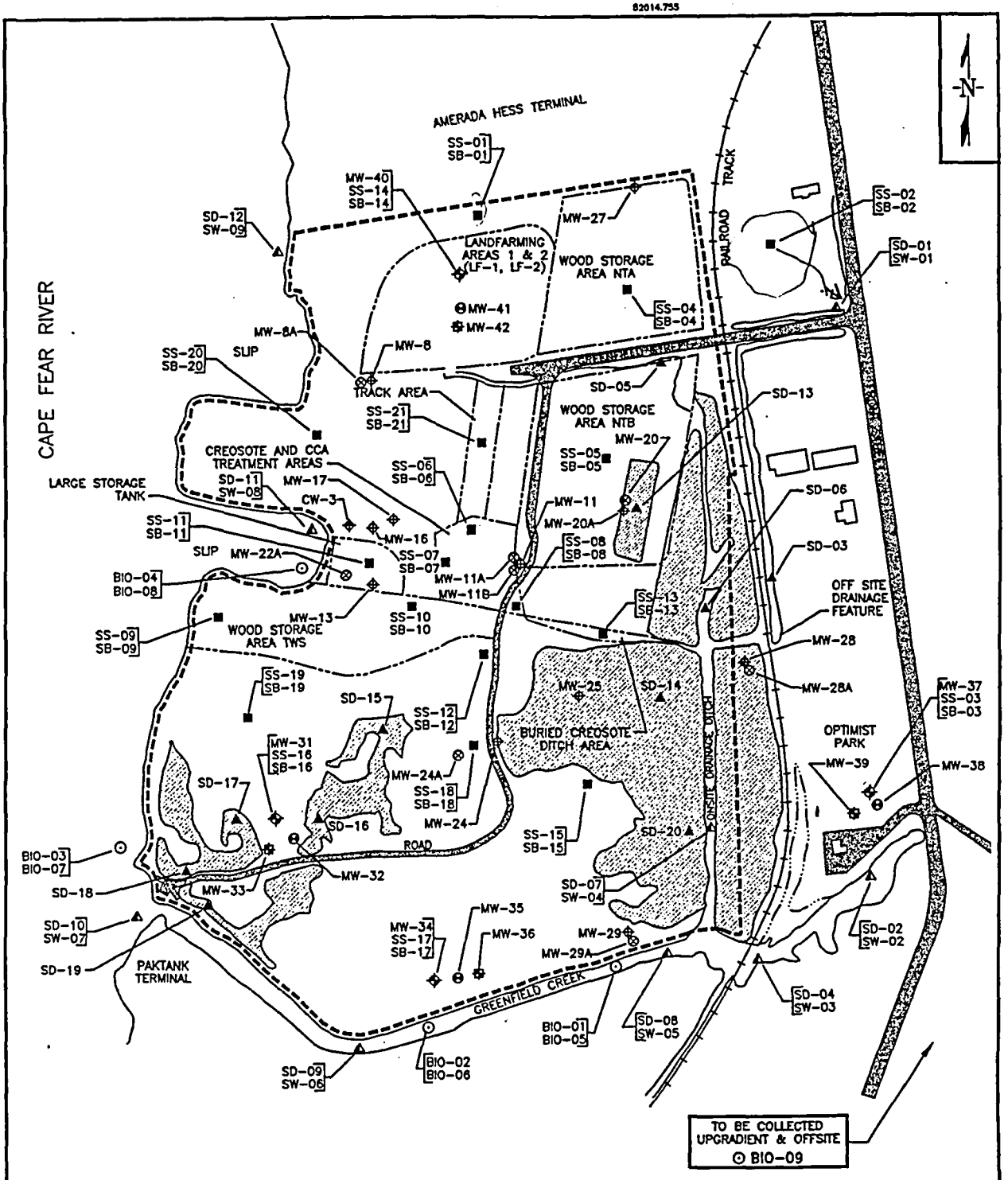
Sample Code	Sample Description	Sample Location	Rationale
SP-MW-13	Groundwater	Southcentral portion of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-MW-16	Groundwater	North of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-MW-17	Groundwater	North between Large Storage Tank Area and Creosote and CCA Treatment Areas.	To determine presence or absence of contamination.
SP-MW-20	Groundwater	In wetland in Wood Storage Area NTB.	To determine presence or absence of contamination.
SP-MW-20A	Groundwater	South of MW-20.	To determine presence or absence of contamination.
SP-MW-22A	Groundwater	East of south slip in Large Storage Area.	To determine presence or absence of contamination.
SP-MW-24	Groundwater	East of road and west of wetland.	To determine presence or absence of contamination.
SP-MW-24A	Groundwater	Southwest of MW-24.	To determine presence or absence of contamination.
SP-MW-25	Groundwater	In wetland south of Buried Creosote Ditch Area.	To determine presence or absence of contamination.
SP-MW-27	Groundwater	Northeast corner of site.	To determine presence or absence of contamination.
SP-MW-28	Groundwater	West of railroad tracks at east central portion of the site.	To determine presence or absence of contamination.
SP-MW-28A	Groundwater	Southeast of MW-28.	To determine presence or absence of contamination.
SP-MW-29	Groundwater	Southeastern portion of site.	To determine presence or absence of contamination.
SP-MW-29A	Groundwater	Southeast of MW-29.	To determine presence or absence of contamination.
SP-MW-31	Groundwater	Between wetlands located north of road.	To determine presence or absence of contamination.
SP-MW-32	Groundwater	Southeast of MW-31.	To determine presence or absence of contamination.
SP-MW-33	Groundwater	Southwest of MW-31.	To determine presence or absence of contamination.
SP-MW-34	Groundwater	Southcentral portion of site.	To determine presence or absence of contamination.

Table 1 (Continued)
Sample Codes, Descriptions, Locations, and Rationale
Southern Wood Piedmont Company
Wilmington, New Hanover County, North Carolina

Sample Code	Sample Description	Sample Location	Rationale
SP-MW-35	Groundwater	East of MW-34.	To determine presence or absence of contamination.
SP-MW-36	Groundwater	East of MW-35.	To determine presence or absence of contamination.
SP-MW-37	Groundwater	Southern portion of Optimist Park.	To establish background levels.
SP-MW-38	Groundwater	Southeast of MW-37.	To establish background levels.
SP-MW-39	Groundwater	Southwest of MW-37.	To establish background levels.
SP-MW-40	Groundwater	In LF-1 and LF-2.	To determine presence or absence of contamination.
SP-MW-41	Groundwater	South of MW-40.	To determine presence or absence of contamination.
SP-MW-42	Groundwater	South of MW-41.	To determine presence or absence of contamination.
SP-BIO-01	Biological, Sessile	Greenfield Creek downstream of the confluence with the onsite drainage ditch.	To determine presence or absence of contamination.
SP-BIO-02	Biological, Sessile	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-BIO-03	Biological, Sessile	In Cape Fear River near southwestern portion of site.	To determine presence or absence of contamination.
SP-BIO-04	Biological, Sessile	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-BIO-05	Biological, Fish Tissue	Greenfield Creek downstream of the confluence with the onsite drainage ditch.	To determine presence or absence of contamination.
SP-BIO-06	Biological, Fish Tissue	Near the outfall of Greenfield Creek into Cape Fear River.	To determine presence or absence of contamination.
SP-BIO-07	Biological, Fish Tissue	In Cape Fear River near southwestern portion of site.	To determine presence or absence of contamination.
SP-BIO-08	Biological, Fish Tissue	In the boat slip west of Large Storage Tank Area.	To determine presence or absence of contamination.
SP-BIO-09	Biological, Sessile	Upgradient of Site.	To establish background levels.

SP - Southern Wood Piedmont
SD - Sediment Sample
SS - Surface Soil Sample
SB - Subsurface Soil Sample
MW - Monitoring Well
SW - Surface Water
BIO - Biological Sample

CAD DWG NO: [illegible] CREATION DATE: [illegible] DRAFTERS INITIALS: [illegible] 82014.755 | ORIGINAL DWG SIZE 8.5 x 11 PLOT SCALE: 1=1 | MOST RECENT REVISION REVISION DATE: 4-10-96 DRAFTERS INITIALS: [illegible]



LEGEND

- NEW SHALLOW MONITORING WELL
- NEW INTERMEDIATE MONITORING WELL
- NEW DEEP MONITORING WELL
- SEDIMENT SAMPLE
- SURFACE SOIL/SUBSURFACE SOIL SAMPLE
- BIOLOGICAL SAMPLE
- SURFACE WATER/SEDIMENT SAMPLE
- EXISTING SHALLOW MONITORING WELL
- EXISTING INTERMEDIATE MONITORING WELL
- CITY WELL
- HESS WELL

300 150 0 300
APPROX. SCALE IN FEET

KEY

- ROAD/STREET/TRAIL
- CONTAMINANT AREAS OF CONCERN
- DRAINAGE FEATURE
- SITE BOUNDARY
- WETLAND

SAMPLE LOCATION MAP
SOUTHERN WOOD PIEDMONT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA

FIGURE 4

with two of these to be located northeast and southeast of the site. An additional background sample will be collected along the north property boundary, between LF-1 & LF-2 and the Amerada Hess Terminal. Sample codes and descriptions are listed in Table 1 and are shown on Figure 4.

2.2 Subsurface Soil Sampling

Twenty-one subsurface soil samples will be collected at the same locations that the surface soil samples are to be collected at including the background locations. The samples will be collected at depths greater than two feet bls, but above the water table. Sample codes and descriptions are listed in Table 1 and are shown on Figure 4.

2.3 Monitoring Well Installation

Twelve monitoring wells are to be installed by a drilling subcontractor. Four shallow wells are to be constructed with their screen sections intersecting the unconfined water table aquifer. Four intermediate wells will be screened in the semi-confined aquifer beneath the peat/clay layer. Four deep wells will be screened in the confined limestone of the upper PeeDee Formation. The wells will provide information required to help characterize the site hydrogeology and assess the nature and extent of groundwater contamination. The monitoring well locations are presented on Figure 4. Details of the monitoring wells construction are shown on Figure 5.

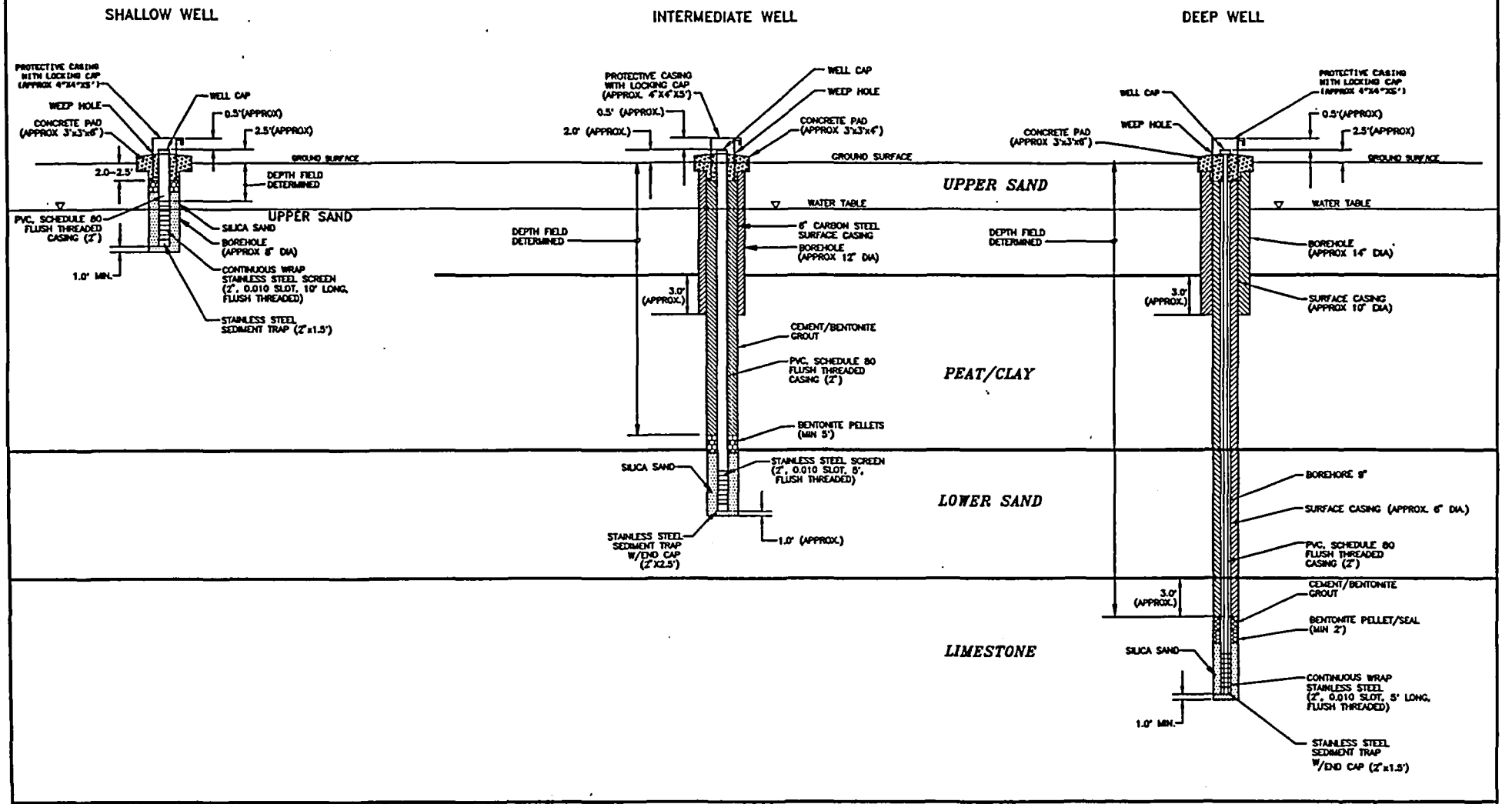
2.4 Groundwater Sampling

To characterize the groundwater at the SWP site, groundwater samples will be collected from 31 permanent monitoring wells. Nineteen of the wells were previously installed and 12 wells are to be installed during the ESI. Sample codes and descriptions are listed in Table 1 and shown on Figure 4.

2.5 Surface Water Sampling

Nine surface water samples will be collected at the same sample locations as nine of the sediment sample locations around the site. The nine sediment sample locations chosen for surface water collection are as follows: SD-01, SD-02, SD-04, SD-07 through SD-12. Background surface water sample locations will be from SD-01 and SD-02 sediment sample locations.

CREATION DATE: 9-13-96
DRAFTERS INITIALS: BB
PLOT SCALE: 1=1
REVISION DATE: 4-16-96
DRAFTERS INITIALS: BB



RV	SOUTHERN WOOD PIEDMONT WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA	MONITORING WELL CONSTRUCTION DIAGRAM	FIGURE 5

2.6 Sediment Sampling

Twenty sediment samples will be collected during the ESI at the SWP site. Two of the sediment samples will be collected as background samples, inland and upgradient of the location where the onsite drainage empties into Greenfield Creek. Three sediment samples will be collected in the Cape Fear River, one at the northwest property boundary, one in the south boat slip, and one at the outfall of Greenfield Creek into the Cape Fear River. Three sediment samples will be taken from Greenfield Creek, downstream of one of the background sediment locations. Two samples will be collected in the onsite drainage feature. One sediment sample will come from an offsite drainage feature which lies parallel to the onsite drainage feature. A total of five sediment samples will be taken in the wetland areas located in the southwestern portion of the site. Two samples will come from the wetland area south of the buried creosote sludge ditch. The last two sediment samples will be taken from wetlands in and around the southeast wood storage area (NTB).

2.7 Biological Sampling

Nine biological tissue samples, consisting of five sessile organism samples and four fish tissue samples, will be collected in the surface waters near to the site. Two of each will be collected in Greenfield Creek, downstream of the confluence with the onsite drainage ditch. One of each sample will be collected in the Cape Fear River, upstream of the Greenfield Creek confluence, and one of each will be collected in the south slip on the western portion of the site. A sessile background sample will be collected upgradient of the site.

2.8 Analytical and Container Requirements

Sample containers used will be in accordance with the requirements specified in the Environmental Compliance Branch's Standard Operating Procedures and Quality Assurance Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, February 1, 1991. The following is a description of the analyses and types of containers required.

Analyses	Container	Preservatives*
Extractable Organics, Water	1 gal. amber glass jug **	None
Volatile Organics, Water	3-40 mL glass vials ***	HCl to pH < 2
Metals, Water	1 L polyethylene bottle	HNO_3 to pH < 2

Cyanide, Water	1 L polyethylene bottle	NaOH to pH > 12
Extractable Organics Soil / Sediment	8 oz. glass jar**	None
Volatile Organics Soil / Sediment	2 oz. (60 mL VOA jar)***	None
Inorganics Soil / Sediment	8 oz. glass jar**	None
SAS Dioxins/Furans Soil Only	8-oz. glass jar**	None
Organic Compounds Biological Tissue	Aluminum foil	Freeze
Metals/Other Inorganics	Zip lock bags	Freeze

* All samples will be iced to 4°C upon collection.
** Sample container lids are lined with teflon.
*** Sample container lids for VOA samples have teflon-lined septum screw caps.

2.9 Methodology

All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in Sections 3 and 4 of the Environmental Compliance Branch's Standard Operating Procedures and Quality Assurance Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, February 1, 1991 (Ref. 19). Soil and water matrix duplicate sample will be collected each week for quality control purposes.

All laboratory analyses and laboratory quality assurance procedures used during this investigation will be in accordance with standard procedures and protocols as specified in the Analytical Support Branch's Laboratory Operations and Quality Control Manual, United States Environmental Protection Agency Region IV, Environmental Services Division, October 1990, or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the Contract Laboratory Program (CLP). Analysis for dioxins will be by EPA SW-846 method 8290 for select soil samples. All samples will be submitted to CLP laboratories, as appropriate, at the time of sampling.

2.9.1 Surface Soil and Sediment Sampling Procedures

Surface soil and sediment samples will be collected using a stainless steel spoon and a 2-quart or equivalent glass or stainless steel bowl. Some sediment samples may be collected using stainless steel open or closed bucket hand augers, and/or Ponar dredge samplers. Samples being analyzed for volatile organic compounds (VOC), will be collected first and placed directly into the appropriate containers. The remainder of the sample will be placed into the bowl, mixed thoroughly, then distributed to the appropriate containers. The surface soil samples will be collected from a depth of no more than two feet bls.

2.9.2 Subsurface Soil Sampling Procedures

Subsurface soil samples will be collected by using a stainless steel spoon or 24" long split spoon constructed of either stainless steel for chemical analyses or carbon steel for stratigraphic interpretation, and a 2-quart or equivalent glass or stainless steel bowl. The sample will be obtained using a hand auger, if possible, from a depth of greater than 2 feet bls but less than water table depth. If a hand auger does not suffice, a drill rig using hollow stem augers of appropriate size will be used. The VOC sample will be collected first and placed directly into the sample container. The remainder of the sample will be thoroughly mixed in the bowl and placed into the appropriate containers.

2.9.3 Monitoring Well Installation Procedures

The borings for the shallow wells will be advanced using nominal 6.25-inch ID hollow-stem augers. The 6.25-inch hollow-stem augers will provide an approximate two-inch annular space between the outside of the well casing and inside wall of the auger to facilitate the placement of well construction materials. Alternate drilling methods, such as rotary wash, may be employed if subsurface conditions are not suitable for hollow-stem augering techniques. The monitoring well borings will provide a minimum two-inch annular space between the well casing and borehole wall. The anticipated total depths of the shallow wells could range from approximately 10 to 15 feet bls, with screens on these wells positioned to intersect the water table. The screen in the shallow wells will be approximately 10 feet in length. The intermediate wells should be placed such that their screen lengths are below the peat/clay layer, with a total depth of possibly 40 to 50 feet bls. The well screen lengths will be five feet for the intermediate wells. It is anticipated that the deep wells will be installed

to total depths of approximately 60 to 70 feet bls. The deep wells will contain screen lengths of five feet. The intermediate wells will likely require one surface casing each to prevent downward migration of contaminants. The deep wells will probably require two surface casings each to avoid creating contaminant pathways between aquifers. Screens in the deep wells will be located at the bottom of the well casing. The surface casings will be installed first to allow adequate time for the grout seals to cure. Following the setting of the surface cuttings, the shallow wells will be installed. The actual depths of the wells will be determined in the field.

During the well installation, subsurface soil samples will be collected for stratigraphic interpretation of the site specific geology. Continuous sampling will be performed down to the top of the water table aquifer. Subsequent to encounter the water table, samples will be collected every 5 feet for interpretation. Each sample will be field logged by a qualified Black & Veatch geotechnical/engineering geologist or geologist for soil classification, color, grain size, moisture, texture, consistency, and geologic characteristics. The information included on the field log will be in keeping with the borehole logging standards provided by USEPA. In addition, each sample will be screened with an HNu photoionization detector (PID) or Foxboro organic vapor analyzer with a flame ionization detector (FID) to detect the presence of volatile organic vapors. PID or FID readings will be recorded on the boring log. Both, nominal two-inch and three-inch diameter split spoon samplers, will be used as appropriate. Construction details for the proposed monitoring wells are described herein and illustrated on Figure 4. Upon completion of the monitoring well borings, appropriately sized, clean, silica sand will be poured through the augers downhole to form an approximate one-foot sand base at the bottom of the borehole. Decontaminated, two-inch diameter well screen and riser pipe will then be installed through the augers. The riser pipe will be constructed of flush threaded, Schedule 80, Polyvinyl Chloride (PVC) and well screen will be constructed of flush threaded, Type 304, Schedule 5 stainless steel, as instructed by USEPA for this site. The well screen will be continuous wire wrap screen with 0.010-inch openings. A 2.5-foot long stainless-steel sediment trap equipped with a stainless-steel end cap will be placed at the bottom of the well pipe for each well. A washed silica sand filter pack, appropriately sized, will be placed around the screen using a tremie pipe to a height of approximately two feet above the top of the screen section. The silica sand will conform to screen gradation requirements of not less than 95 percent of the sand

passing U.S. Standard Sieve size No. 20 and not more than 5 percent passing U.S. Standard Sieve size No. 40. Bentonite pellets will then be placed down the annular space to provide a minimum two-foot seal above the sand pack. Depths to the top of the sand pack and the top of the bentonite pellet seal will be measured using a weighted measuring tape. Subsequent to bentonite pellet hydration (eight hours minimum), the remaining annular space will be grouted to within approximately two feet of the surface with a cement-bentonite slurry (approximately 95 percent cement to 5 percent bentonite) using a tremie pipe. The well will be sealed to the ground surface with concrete and completed with a three-foot by three-foot by four-inch thick concrete surface pad that slopes away from the protective casing. A lockable steel protective casing, approximately four-inches by four-inches by five-feet long with an approximate 2.5 foot stick-up will be installed in the concrete to provide well-head security. The protective casing will include a plaque or label that clearly identifies the well as a monitoring well. A weep hole will be drilled into the protective casing above the level of the concrete pad.

2.9.4 Well Development Procedures

The general procedures described above will apply to the installation of the shallow, intermediate, and deep wells. The monitoring wells installed during the ESI will be developed by the drilling subcontractor prior to initiating groundwater sampling. Development may involve pumping, surging, or bailing to remove fines and stimulate yield. It is anticipated that pumping will be the primary development method. A minimum of three borehole volumes will be removed from each well during the development process; however, development will continue until the water removed from the well exhibits stabilized pH, temperature, conductivity, and turbidity measurements (pH readings within 0.1 units, temperature within 0.5 degrees Celsius, specific conductance within three percent, and turbidity at or below 5 nephelometric units). Development fluids will be containerized in DOT approved 55-gallon drums. Equipment used for well development will be decontaminated.

Specific conductivity, pH, turbidity, and temperature measurements will be recorded in the field logbook during the development process. Water will be withdrawn from the well and poured into a clean glass container. The temperature of the collected water will be taken immediately after the water is collected. The specific conductivity meter will be adjusted for water temperature prior to taking the measurement. The

pH probe will then be placed in the aliquot to measure pH. Field instruments to be used to measure field parameters during well development and during well purging, prior to sampling, will be field calibrated prior to use each day and at the end of each day's use.

2.9.5 Groundwater Sampling Procedures

Groundwater samples from monitoring wells will be collected after the wells have been installed and properly developed. After unlocking the well and removing the well cap, the ambient air and air in the well will be monitored using a PID or FID to detect the presence of organic vapors. Readings on the PID or FID will be recorded in the field logbook. Plastic sheeting will be placed around the well to keep equipment from coming in contact with the ground surface. An electric water level indicator decontaminated will then be placed into the well to measure the depth of the static water level and total depth of the well. Measurements will be measured to the nearest 0.01 foot and will be taken from a reference notch etched at the top of the casing. The volume of the well casing will then be calculated. Depth measurements and volume calculations will be recorded in the field logbook. A decontaminated submersible pump will be used to purge the wells in a way that will minimize turbidity. Care will be exercised in maintaining the location of the pump or teflon hose just below the level of water in the well to assure that the entire static volume is removed. If the recovery of the well is at least as fast as the pumping rate, the intake line may be left at the initial level until adequate volume has been purged. To minimize cross contamination between wells, no more than five feet of hose from the pump will be lowered into the water column. After the pump is removed from the well, all wetted portions of the pump and related tubing will be decontaminated. The pump will be a submersible pump constructed of stainless steel and equipped with Teflon tubing. During well purging, field parameters (pH, temperature, specific conductance, and turbidity) will be measured and recorded. Purging will terminate when a minimum of three casing volumes has been withdrawn and field parameter readings have stabilized (pH readings within 0.1 units, temperature within 0.5 degrees Celsius, specific conductance within three percent, and turbidity at or below 20 nephelometric units) or upon evacuating five casing volumes from each well. Water from well purging activities will be containerized.

Teflon® tubing will be inserted into the well casing, and a peristaltic (low flow) pump will be used to remove groundwater from the well and place it into the appropriate sample container. For wells that are too deep to use a peristaltic pump, the sampling personnel will initiate sampling using a Teflon, closed-top bailer. The time of sampling will be recorded in the field logbook. VOC samples are to be collected first by manually trapping water in the Teflon® tubing, removing the tubing from the well and then filling VOA containers with this water. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each groundwater sample. Each portion of the sample will be properly preserved upon collection.

2.9.6 Surface Water Sampling Procedures

Surface water samples will be obtained from the Cape Fear River and Greenfield Creek by use of a small boat. The most downstream sample will be collected first and obtained by orienting the sampler and sample container upstream. The intent of this sampling method is to obtain the most representative and least disturbed surafe water samples. Due to tidal influence in the Cape Fear River and Greenfield Creek, it may be necessary to select different sample locations based upon conditions in the field. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each surface water sample. Each portion of the sample will be properly preserved upon collection.

2.9.7 Biological Tissue Sampling Procedures

Biological tissue samples will be collected from the Cape Fear River and Greenfield Creek by use of a small boat. Biological tissue samples will consist of fish and sessile benthic organism tissue.

Four fish tissue samples will be collected to determine the human health exposure risk from the site. The target species for this sampling event will be commercial and recreational species. The sampling areas will be the Cape Fear River and Greenfield Creek in areas potentially effected by the site. Two samples will be collected in the Cape Fear River and two samples collected in Greenfield Creek. The fish collection method in the Cape Fear River will be rod and reel. The fish collection method in Greenfield Creek will be conducted using a combination of seining and rod and reel techniques depending upon water depth and available fish habitat.

Upon collection of the desired fish species, the specimen will be rinsed with surface water from the collection point, identified, weighed, measured, catalogued, and visually inspected for any lesions or other physical abnormalities. After recording this information on field data sheets, the fish species will be weighed and collection will occur until the sample weight determined by the analytical laboratory is obtained. The recommended weight for one sample is 500 grams, which often requires the collection of three to ten individuals. One sample will be identified when the weight of the combined target species is achieved. The combined fish sample will then be prepared for shipment to the analytical laboratory. Depending on the laboratory requirements, the fish will either be filleted in the field or by the laboratory. The fish samples will be wrapped in aluminum foil, placed in a waterproof freezer bag, labelled, stored on either dry ice or wet ice, and shipped to the laboratory following laboratory protocols. If the time between field sampling and laboratory preparation is greater than 48 hours, the fish will be frozen until shipped to the laboratory.

Since fish are typically a mobile life form, attempts will also be made to obtain biological samples from sessile benthic organisms which are in the human food chain such as oysters or mussels. These life forms are believed to be less mobile and therefore better indicators of long term exposure. Samples will be obtained using the least intrusive techniques available. Dredge samplers operated from a small boat will be the first equipment used to obtain oysters or mussels. If attempts with the dredge samplers are unsuccessful, it will be necessary to use other equipment such as oyster tongs to retrieve sample organisms. A sufficient quantity of organisms will be collected at each sample location. Upon collection of the organisms, their genus and species will be identified. The organisms will be weighed and their general apparance will be described and recorded in the field book. Each sample will be placed in foil,

wrapped tightly, placed in plastic bags, and stored on ice for the remainder of the sampling day. If the selected laboratory provides sample packaging materials, the sampler will ensure that this provided packing material is kept clean prior to use. Steps will be taken to rinse the organisms in water free from any controllable pollution source, such as the boat engine. All samples collected from one sampling location may be wrapped together in one foil package. Laboratory protocols for sample preservation will be followed. If the laboratory does not specify sample preservation methods, the samples will be frozen as soon as possible, packed into watertight coolers and loaded with dry ice, and shipped overnight to the analytical laboratory. A chain of custody record will be completed by the sampler and included in the shipment of the samples to the laboratory. These chain of custody forms will be provided by the laboratory.

2.10 Decontamination Procedures

Procedures for equipment decontamination will be implemented to avoid cross-contamination of subsurface strata and samples of various media which are to be submitted for chemical analyses. Drill rigs and all drilling and sampling equipment will be thoroughly cleaned and decontaminated before initial use and between sample locations.

Before being mobilized to the site, the drill rig and related sampling equipment will be cleaned. The drill rig will be cleaned with a steam cleaner or hand washed with a brush and detergent to remove oil, grease, and hydraulic fluid. If necessary, downhole drilling and sampling equipment will be sandblasted to remove any paint, dried caked-on mud, or heavy rust accumulation. The drill rig will be inspected prior to initiation of drilling activities.

A decontamination station will be constructed at a suitable onsite location. In general, the station will be covered with plastic sheeting such that decontamination fluids can flow into a lined collection pit, sump, trench, or drum. Fluids generated as a result of decontamination will be placed in drums.

Initial and intermediate decontamination of subsurface drilling equipment, sampling equipment, and well construction materials (riser and screen) will include the following steps:

- Wash equipment thoroughly with laboratory detergent and potable water using a brush to remove any particulate matter or surface film.
- Rinse equipment thoroughly with potable water.
- Rinse equipment thoroughly with deionized water.
- Rinse equipment twice with pesticide-grade isopropanol.
- Rinse thoroughly with organic-free water and allow to air dry as long as possible.
- Wrap with aluminum foil, if appropriate, to prevent contamination of equipment if equipment is going to be stored or transported. Clean plastic can be used to wrap augers, drill rods, casings, etc.

Organic-free water should contain no pesticides, herbicides, extractable organic compounds, and less than 50 ug/l of purgeable organic compounds. In addition, no metals or other organic compounds should be detected at routine detection limits. Deionized water, organic-free water, and isopropanol must be applied using non-interfering containers made of glass, Teflon, or stainless-steel. The drill rig will be steam cleaned before drilling each boring.

The electronic water-level indicator will be decontaminated as follows:

- Wash with laboratory detergent and potable water.
- Rinse with potable water.
- Rinse with deionized water.
- The instrument will be placed in a clean polyethylene bag to prevent contamination during transit or storage.

A final decontamination of all equipment used to complete the drilling, well installation, and sampling effort will be required prior to equipment demobilization from the site. This decontamination step is required to prevent the movement of contaminants from being transported offsite by subcontractors vehicles. Final

decontamination will be performed at the decontamination pad and will be witnessed by field personnel.

For sampling equipment (stainless steel spoons, bowls, knives, split-spoon sampler, etc.), the second phase of initial decontamination will include the following:

(1) Wash equipment with a non-phosphate detergent.
(2) Rinse with tap water.
(3) Rinse with 0.1 N nitric acid (non-metallic utensils).
(4) Rinse with deionized/distilled water.
(5) Rinse with pesticide grade isopropanol.
(6) Rinse twice with deionized/distilled water.
(7) Rinse once with organic free (HPLC-grade) water.
(8) Allow to air dry.
(9) Wrap with aluminum foil and plastic to prevent contamination before use.

Following completion of decontamination, if the decontaminated equipment touches the ground, it will be considered contaminated and will require decontamination before use.

3.0 Investigation Derived Waste

Field investigation activities will result in the production of potentially contaminated waste materials that must be properly managed. Potentially contaminated materials generated during the field investigation will include surface and subsurface soils, decontamination solutions, disposable equipment, drill cuttings, well-development fluids, and well-purge water. The disposable equipment and cuttings will be placed in 55-gallon drums segregated by boring. Liquid wastes will be placed in 55-gallon drums and staged at an onsite accumulation area. The containers will be labeled to indicate contents.

Wastes produced by the field operations are divided into seven categories:

- Surface and subsurface soils collected from the background locations will be returned to the locations from which they were collected provided OVA readings or observations by well installation or sampling personnel do not indicate that they should be placed in 55-gallon drums and staged at a predetermined accumulation area for disposal at a later date.

- Personal Decontamination Station Liquids. These liquids include the wash water from the boot wash and the hand and face wash containers. Contaminants typically found in these liquids result from activities which bring personnel in contact with soil and groundwater. The water will be placed in 55-gallon drums and staged at a predetermined accumulation area on site for disposal at a later date.

- Drill Cuttings. These materials are generated during the drilling of the boreholes. The procedure for handling the drill cuttings will be: containerizing the cuttings separately from each borehole in DOT-approved 55-gallon drums, labeling to indicate contents, and staging of the drums at a predetermined accumulation area onsite. If drilling fluids are used, waste fluids will also be placed in drums and staged at a predetermined area for disposal at a later date.

- Personal Protective Clothing. This category includes the disposable work clothing such as booties, gloves, coveralls, and spent respirator cartridges worn by field personnel during the ESI field investigation. The procedure for handling disposable personal protective clothing will be to collect such articles and remove them from the site for disposal at a later date.

- Decontamination Fluids. These fluids include wash waters used to decontaminate the drilling and sampling equipment. The wash waters will be containerized in DOT-approved 55-gallon drums and staged at a predetermined location on site for disposal at a later date.

- Well development and Purge Water. These fluids include the groundwater obtained from monitoring well development and pre-sampling well purging activities. The development and purge water will be containerized in DOT approved 55-gallon drums, labeled to indicate contents, and staged on site in a predetermined location for disposal at a later date.

Drums containing cuttings and waste fluids will be staged at a designated onsite area at the completion of the field investigation and will be placed on pallets and covered with a protective tarp. The tarp will be secured to the drums with rope. The contents of the drums will be disposed of as determined by U.S. EPA Region IV. All

investigation derived wastes will be disposed of in accordance with the requirements specified in the Management of Investigation Derived Wastes During Site Inspections, Environmental Protection Agency, May, 1991.

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U.S. ENVIRONMENTAL PROTECTION AGENCY

100 ALABAMA STREET, S.W.
ATLANTA, GEORGIA 30303

FACSIMILE COVER SHEET

TO: Raymond Knox
FAX: 8031 957-3845
TELEPHONE: 1-800-786-0654

FROM: Cindy Gurley
FAX: 404/562-8788
TELEPHONE: 404/562-8817

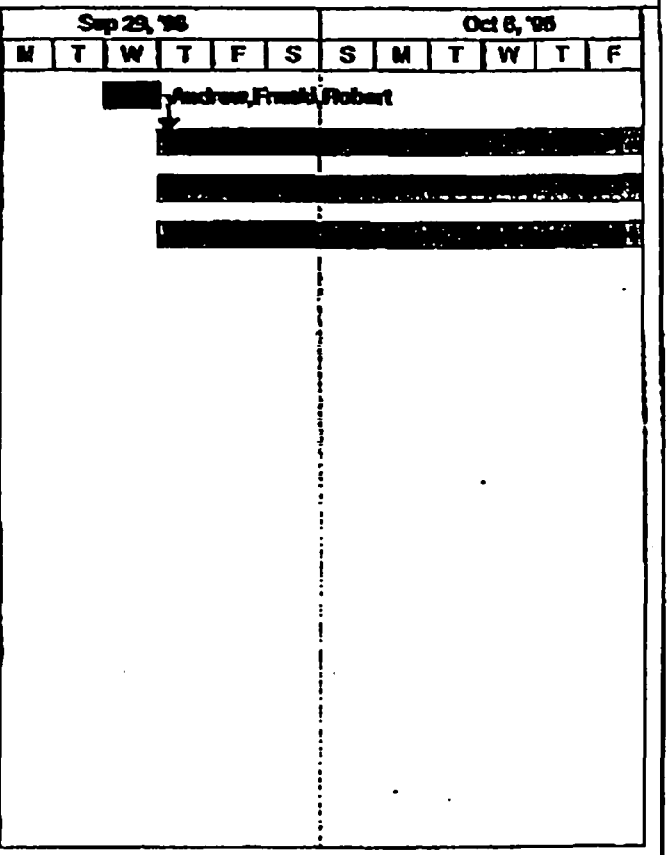
NUMBER OF PAGES (including cover sheet): 5

COMMENTS: The entire study plan is in the mail.

If you have any questions, please call.

Southern Wood Piedmont
Wilmington, New Hanover County, NC

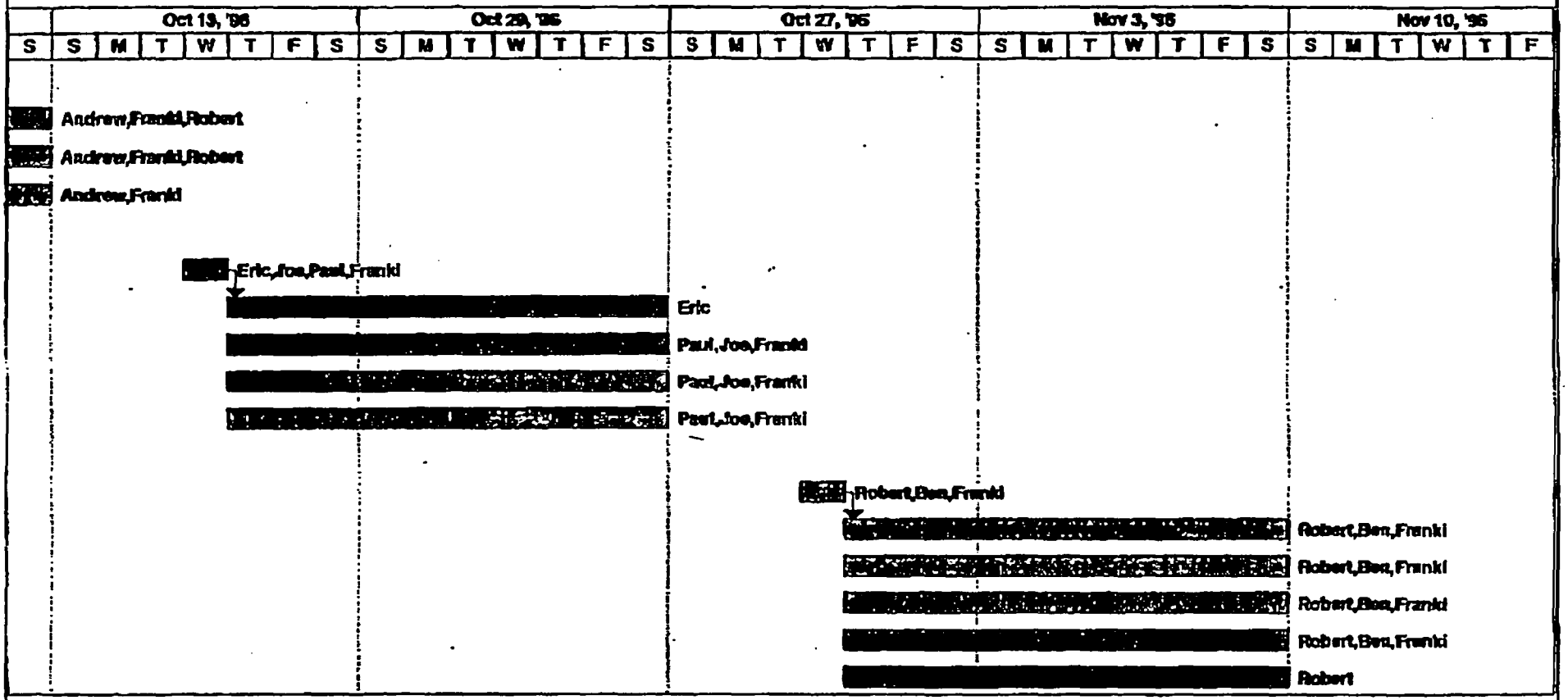
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	First mobilization	1d	10/2/96	10/2/96		Andrew,Franki,Robert
2	Surface, subsurface sampling	8d	10/3/96	10/12/96	1	Andrew,Franki,Robert
3	1st 1/2 sediment sampling.	8d	10/3/96	10/12/96		Andrew,Franki,Robert
4	1st 1/2 Monitoring well installa	8d	10/3/96	10/12/96		Andrew,Franki
5						
6	Second mobilization.	1d	10/16/96	10/16/96		Eric,Joe,Paul,Franki
7	2nd 1/2 Monitoring well install	8d	10/17/96	10/26/96	6	Eric
8	2nd 1/2 sediment sampling.	8d	10/17/96	10/26/96		Paul,Joe,Franki
9	Surface water sampling.	8d	10/17/96	10/26/96		Paul,Joe,Franki
10	1st 1/2 Groundwater sampling	8d	10/17/96	10/26/96		Paul,Joe,Franki
11						
12	Third mobilization.	1d	10/30/96	10/30/96		Robert,Ben,Franki
13	2nd 1/2 Groundwater samplin	6d	10/31/96	11/9/96	12	Robert,Ben,Franki
14	Biological sampling.	6d	10/31/96	11/9/96		Robert,Ben,Franki
15	QA/QC sampling.	6d	10/31/96	11/9/96		Robert,Ben,Franki
16	Target information research.	8d	10/31/96	11/9/96		Robert,Ben,Franki
17	Surveying oversight.	6d	10/31/96	11/9/96		Robert



Project: SWP, Wilmington, NC
Date: 9/25/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

Southern Wood Piedmont
Wilmington, New Hanover County, NC



Project: SWP, Wilmington, NC
Date: 9/25/96

Task		Summary		Rolled Up Progress	
Progress		Rolled Up Task			
Milestone	◆	Rolled Up Milestone	◇		

SITE PROG. SECTION TD.404-202-0100 SEP 20 96 11:07 NO.000 P.03

pH probe will then be placed in the aliquot to measure pH. Field instruments to be used to measure field parameters during well development and during well purging, prior to sampling, will be field calibrated prior to use each day and at the end of each day's use.

2.9.5 Groundwater Sampling Procedures

Groundwater samples from monitoring wells will be collected after the wells have been installed and properly developed. After unlocking the well and removing the well cap, the ambient air and air in the well will be monitored using a PID or FID to detect the presence of organic vapors. Readings on the PID or FID will be recorded in the field logbook. Plastic sheeting will be placed around the well to keep equipment from coming in contact with the ground surface. An electric water level indicator decontaminated will then be placed into the well to measure the depth of the static water level and total depth of the well. Measurements will be measured to the nearest 0.01 foot and will be taken from a reference notch etched at the top of the casing. The volume of the well casing will then be calculated. Depth measurements and volume calculations will be recorded in the field logbook. A decontaminated submersible pump will be used to purge the wells in a way that will minimize turbidity. Care will be exercised in maintaining the location of the pump or teflon hose just below the level of water in the well to assure that the entire static volume is removed. If the recovery of the well is at least as fast as the pumping rate, the intake line may be left at the initial level until adequate volume has been purged. To minimize cross contamination between wells, no more than five feet of hose from the pump will be lowered into the water column. After the pump is removed from the well, all wetted portions of the pump and related tubing will be decontaminated. The pump will be a submersible pump constructed of stainless steel and equipped with Teflon tubing. During well purging, field parameters (pH, temperature, specific conductance, and turbidity) will be measured and recorded. Purging will terminate when a minimum of three casing volumes has been withdrawn and field parameter readings have stabilized (pH readings within 0.1 units, temperature within 0.5 degrees Celsius, specific conductance within three percent, and turbidity at or below 20 nephelometric units) or upon evacuating five casing volumes from each well. Water from well purging activities will be containerized.

Teflon® tubing will be inserted into the well casing, and a peristaltic (low flow) pump will be used to remove groundwater from the well and place it into the appropriate sample container. For wells that are too deep to use a peristaltic pump, the sampling personnel will initiate sampling using a Teflon, closed-top bailer. The time of sampling will be recorded in the field logbook. VOC samples are to be collected first by manually trapping water in the Teflon® tubing, removing the tubing from the well and then filling VOA containers with this water. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each groundwater sample. Each portion of the sample will be properly preserved upon collection.

2.9.6 *Surface Water Sampling Procedures*

Surface water samples will be obtained from the Cape Fear River and Greenfield Creek by use of a small boat. The most downstream sample will be collected first and obtained by orienting the sampler and sample container upstream. The intent of this sampling method is to obtain the most representative and least disturbed surafe water samples. Due to tidal influence in the Cape Fear River and Greenfield Creek, it may be necessary to select different sample locations based upon conditions in the field. The volatile organic fraction of the sample will be collected first and placed directly into prepreserved VOA vials. The vials will be filled such that head space is eliminated and no air bubbles are present. The remainder of the sample will be placed into a one gallon amber glass jug and sequentially transferred into the other containers. Temperature, turbidity, pH, and conductivity measurements will be taken upon collection of each surface water sample. Each portion of the sample will be properly preserved upon collection.

2.9.7 *Biological Tissue Sampling Procedures*

Biological tissue samples will be collected from the Cape Fear River and Greenfield Creek by use of a small boat. Biological tissue samples will consist of fish and sessile benthic organism tissue.

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ChemRisk®
A Division of McLaren/Hart

Stroudwater Crossing
1685 Congress Street
Portland, ME 04102
(207) 774-0012
FAX (207) 774-8263

Date: 8/9/96

Time: 2:30

No. of Pages: 5
(Including this cover page)

Project Code: SWP-WILM 003

Original to follow: Yes ____ (No)

Via: U.S. Mail____ FedEx____

THIS FACSIMILE IS FROM MCLAREN/HART CHEMRISK® OF PORTLAND, MAINE. OUR FAX # IS (207)774-8263.

To: 1. Ray Knox (Please Say for Greg Kuntz)

Fax #: 803-957-3845

To: 2. cc Chuck Davis

Fax #: 864-599-1087

To: 3.

Fax #:

From: Mark Maritato

Re: Comments on Black & Veatch Biological Sampling

Thank you for your time. If you have any questions regarding this fax please call the above number.

Person Transmitting Copy

THIS MESSAGE IS INTENDED ONLY FOR THE USE OF THE INDIVIDUAL OR ENTITY TO WHICH IT IS ADDRESSED AND MAY CONTAIN INFORMATION THAT IS PRIVILEGED, CONFIDENTIAL, AND EXEMPT FROM DISCLOSURE UNDER APPLICABLE LAW. IF THE READER OF THIS MESSAGE IS NOT THE INTENDED RECIPIENT OR THE EMPLOYEE OR AGENT RESPONSIBLE FOR DELIVERING THE MESSAGE TO THE INTENDED RECIPIENT, YOU ARE HEREBY NOTIFIED THAT ANY DISSEMINATION, DISTRIBUTION, OR COPYING OF THIS COMMUNICATION IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS MESSAGE IN ERROR, PLEASE NOTIFY US IMMEDIATELY BY TELEPHONE AND RETURN THE ORIGINAL MESSAGE TO US AT THE ABOVE ADDRESS VIA THE U.S. POSTAL SERVICE. THANK YOU.

McLaren/Hart

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MEMORANDUM

To: Ray Knox

From: Mark Maritato; Steve Truchon

Date: August 9, 1996

Subject: Comments on Black & Veatch's Proposed Biological Sampling for the SWP - Wilmington Site

cc: Chuck Davis
Greg Kuntz
David Crawford

We have reviewed the biological sampling section of the Black & Veatch (B&V) workplan you faxed to us on August 7, 1996. Our assumption is that the pages faxed (12, 14, 15, 17, 21, 27-29, and Figure 4) represent the complete summarization of what B&W plans to do regarding biological sampling.

B&V's proposed sediment and surface water sampling is largely a duplication of the sampling efforts previously completed by ViroGroup during 1994 and 1995, with the exception of some additional chemicals that are not specific to wood preserving operations - e.g. PCBs, pesticides, and cyanide. We presume that SWP will put forth arguments regarding whether or not an expansion of the analyte list is warranted, and that ViroGroup will be commenting extensively on the proposed soil and groundwater sampling.

The recommendation for biological sampling, which goes beyond the scope of the ViroGroup sampling effort, is flawed, in that it has several problems inherent to the selection and sampling of target species. The specific deficiencies are discussed below. From an internal project strategy point of view, should B&V be successful in actually finding certain target organisms (mussels, oysters, and possibly crabs), tissue sampling may indicate elevated PAH concentrations, due to these organisms' ability to accumulate PAHs. While we are doubtful that the collection methods described in the workplan will be successful in actually obtaining enough biota of the various species listed to fulfill the minimum workplan requirement, we are concerned that even an insufficient number of samples will be used to draw conclusions regarding ecological impacts from the SWP site.

Once the issue of appropriate representative species for biological sampling has been resolved, we recommend that a ChemRisk ecotoxicologist, experienced in biological field sampling techniques,

be present in an oversight capacity to ensure that EPA and its contractors are collecting biota in a scientifically-supportable manner.

The remainder of our comments address specific sections in the workplan dealing with proposed biological sampling activities.

General Comments

It should be noted that the biological sampling proposed in this workplan is designed to specifically address human health exposure and risk issues through the selection of fish, oyster, or mussel tissue (Page 28, Paragraphs 1 and 3). This may be an oversight on EPA's part, in that ecological concerns are not addressed in the design and implementation of this workplan. EPA may recognize this oversight at some point, and require reconsideration of ecological receptor impacts.

It is our belief that a representative fish community, as stipulated in the B&V workplan, will not be present in Greenfield Creek where sampling for these organisms has been proposed. Furthermore, and as detailed in our risk assessment submitted to the agencies at the end of May, the current literature on PAH bioaccumulation suggests that fish rapidly metabolize PAHs to metabolites that may be present in the liver and bile of the fish, but are likely absent (or at least at significantly lower concentrations) in the fillets. We have several reservations concerning the selection of oysters and mussels as target species in the study area, as detailed below.

Specific Comments:

(1) Page 21, Section 2.7. The location and number of reference stations are inappropriate for comparing tissue concentrations to background. First, there is no mention of a background station for fish tissue samples. The Cape Fear River is an industrialized estuary, with multiple sources of chemicals entering the ecosystem. Scientifically defensible conclusions cannot be made if background concentrations are not accounted for, as these concentrations may be high enough to exceed target tissue levels for human health. Second, it is inappropriate to have a background station in Greenfield Creek for sessile benthic species (e.g. shellfish) collected in the Cape Fear River. The creek and river are significantly different in physicochemical parameters (e.g. salinity and flow) that would influence the exposure of bivalves to chemicals. Background conditions in the river must be represented if tissue sampling is going to be conducted in this system.

(2) Page 28, Paragraph 1. The rod and reel collection technique is not a generally acceptable scientific method. This method is not only time consuming, but highly selective in the size and species of fish caught. Moreover, the rod and reel technique is a recreational collection method, and the workplan states that it will account for commercial species as well. It is doubtful that commercial species (particularly bottom fish) in the Cape Fear River will be

adequately sampled using this approach.

(3) Page 28, Paragraph 2. B&V does not describe a contingency plan that identifies the collection of alternative species should target organisms not be present, or of sufficient abundance to satisfy laboratory requirements. For example, if the required tissue weight for one sample of oysters is 500 grams (similar to that specified for fish in the workplan), then a 2.5 inch oyster yielding approximately 4 grams of tissue would require the collection of 125 organisms. Furthermore, factoring in QA/QC requirements for matrix spike and matrix spike duplicates (which we did not see accounted for in the workplan), the tissue requirements would triple for at least one station. It is unlikely that enough tissue (e.g. 375 organisms) could be collected anywhere near the Site to satisfy these requirements.

(4) Page 28, Paragraph 3. Although oysters and mussels are undoubtedly in the human food chain, according to Patty Fowler of the North Carolina Division of Marine Fisheries (NCDMF) Shellfish Unit, shellfishing in the Cape Fear River north of the Federal Point Basin (including areas surrounding the City of Wilmington) are closed to commercial and recreational harvesting due to high levels of fecal coliform. Furthermore, according to Jeff French at NCDMF's Resource Enhancement Section, these organisms are probably not abundant in the River or in creeks near Wilmington due to low (< 7.0 ppt) salinity. Finally, a report by NOAA (1991) also indicates that these organisms are not typically present in tidal fresh portions of the Cape Fear River.

(5) Figure 4. The location of stations BIOL - 04 and BIOL - 08 (in the slip area) are in an intertidal zone. Assuming that shellfish are found here, their exposure to chemicals will be influenced by the tide. Moreover, tissue concentrations of organisms found at this location could not directly be compared to those located in subtidal organisms collected at other locations.

(6) Figure 4. The biological stations selected in Greenfield Creek are far too close together to be considered discreet sampling locations (as implied in the workplan). If the proposed sampling techniques are utilized (e.g. rod and reel, grabs, seining, etc.), the areas in which these techniques are deployed will likely overlap the two stations. Furthermore, it is highly unlikely that seining will be an effective means for sampling fish in this area. The sediments are too soft, and the creek banks are too steep to effectively seine this area.

Recommendations

Based on our review of the biological sampling efforts contained in the B&V workplan, a couple of options exist regarding strategic direction. Option #1 would be for SWP to indicate to EPA that a ChemRisk scientist will be present during sampling activities in an oversight role, to implement the existing workplan. While we believe that the proposed target species and sampling methods are

deficient for this site, we can at least monitor what transpires in the field and keep a detailed log. We feel this level of commitment and oversight is important in maintaining the integrity of a sampling program through direct observation of field operations related to sampling techniques, QA/QC procedures, and deviations from the proposed workplan.

For option #2, we recommend that ChemRisk develop a sanitized version of this memorandum for submission to the agencies, as an attachment to ViroGroup's comments on the remainder of the workplan. Through dialogue with the agencies, more appropriate target organisms and sampling methods can be selected to ensure more meaningful results. As with Option #1, ChemRisk oversight of field sampling activities is strongly recommended.

We look forward to you feedback.

ViroGroup
Air • Water • Soil
TECHNOLOGY

ETE Division
ViroGroup, Inc.
1445 Pisgah Church Road
Lexington, SC 29072
Phone 803-957-6270
FAX 803-957-3845

August 7, 1996

Mr. T. M. Davis, Manager
Environmental Affairs
Southern Wood Piedmont Company
P.O. Box 5447
Spartanburg, South Carolina 29304

Re: Black & Veatch Field Study Plan/Expanded Site Inspection (April 26, 1996)
Comments on workplan
Wilmington, NC Facility
ViroGroup Project #12-53019.00

Dear Chuck:

ViroGroup, Inc. is pleased to provide the following comments on the referenced plan. Our comments are limited to the sample type, general locations, and analytical parameters. We are not providing technical comments on the techniques proposed or interpretation of background information. We have included a map that summarizes all the environmental sampling completed to date and the proposed additional sampling. We have also prepared a table of the proposed sampling with our rationale as to the need to collect each sample.

Comments

① The plan does not take into account the most recent work completed at the site as described in the Soil, Sediment, and Surface Water Assessment Report- Southern Wood Piedmont, City of Wilmington, & North Carolina Ports Authority - Wilmington, North Carolina Facility (May 1996). As such there are many duplicate samples proposed. Duplicate samples are noted on the enclosed table.

② All samples are proposed to be analyzed for extractable and purgeable organic compounds, pesticides, PCBs, cyanide, and metals (methods not specified). It is also proposed that selected samples be analyzed for dioxins and furans via Method 8290. Based on the history of the site and our experience with other similar type facilities, this range of analytical parameters is excessive. The site-specific wood-preserving constituent list contained in the above referenced report is more appropriate.

③ Many of the sampling points proposed are in areas of the property where no production, storage, or disposal activities took place, or are proposed in areas already intensively sampled (see enclosed map). Based on our understanding of the distribution of constituents in the subsurface, sediments, and surface water, samples from such areas are superfluous.

④ We concur with the proposed soil/subsoil and surface water samples northeast and southeast of the site. These samples would provide additional background data. We concur with the collection of a sediment sample from the headwaters of the onsite drainage ditch. This sample would determine if the upper part of the ditch contains site specific wood-preserving constituents. We concur with the installation of a monitoring well cluster in the area south of Optimist Park. This cluster would provide upgradient water table data. It would confirm that there has been no offsite migration to Greenfield Lake, and would confirm water table flow direction.

ViroGroup, Inc. appreciates the opportunity to provide these comments. Please call if you have any questions.

Sincerely,
ViroGroup, Inc.

Gregory B. Kuntz, P.G.
Project Manager

Raymond L. Knox, P.G.
Director of Hydrogeological Services

Enclosures

N:\530\19\B&VCOMNT.LTR

Table 1.
SWP - Wilmington, NC
Proposed Black and Veatch Samples - April 26, 1996
ViroGroup Project No. 12-53019.CO

Proposed B&V Soil/Subsoil Sample	Location	Valid (Y/N)	Rationale
SP-SS-01/SP-SB-01	Upgradient of LF-1 & LF-2	N	Duplicates ViroGroup samples TWSB2 collected 2/14/96; TB5 and TB6 screened 2/12/96
SP-SS-02/SP-SB-02	Northeast of site	Y	Background offsite; NTA9 and other samples in NTA &NTB represent background
SP-SS-03/SP-SB-03	Southeast of site	Y	Background offsite
SP-SS-04/SP-SB-04	NTA	N	Duplicates Feb. 1991 Geraghty and Miller samples NTA5 and seven other NTA area samples
SP-SS-05/SP-SB-05	NTB	N	Duplicates Feb. 1991 Geraghty and Miller samples NTB2, 5, 6, 8, and SB15
SP-SS-06/SP-SB-06	CCA / Creosote Trmnt Area	N	Duplicates ViroGroup samples PDA8 and PA17 collected 2/14/96
SP-SS-07/SP-SB-07	CCA / Creosote Trmnt Area	N	Duplicates ViroGroup sample PA23 collected 2/13/96
SP-SS-08/SP-SB-08	CCA / Creosote Trmnt Area	N	Duplicates ViroGroup sample PA28 collected 2/13/96
SP-SS-09/SP-SB-09	TWSA	N	Duplicates Feb. 1991 Geraghty and Miller samples TWS11
SP-SS-010/SP-SB-010	TWSA	N	Duplicates Feb. 1991 Geraghty and Miller samples TWS5 and ST20
SP-SS-011/SP-SB-011	Large Storage Tank Area	N	Duplicates ViroGroup sample PA21 collected 2/13/96
SP-SS-012/SP-SB-012	TWSA	N	Duplicates Feb. 1991 Geraghty and Miller samples ST11 and TWS1
SP-SS-013/SP-SB-013	North of covered creosote ditch	N	Duplicates ViroGroup samples PA31, PA 33, and PDA11 collected 2/13-14/96
SP-SS-014/SP-SB-014	North-central LF-1 & LF-2	N	Duplicates Geraghty and Miller 1985-91 samples and ViroGroup 1996 composite soil samples
SP-SS-015/SP-SB-015	South of covered creosote ditch	N	No activities took place on this portion of the site.
SP-SS-016/SP-SB-016	Between wetlands N of road	N	No activities took place on this portion of the site.
SP-SS-017/SP-SB-017	South-central near Greenfield Crk.	N	No activities took place on this portion of the site.
SP-SS-018/SP-SB-018	West of road & east of east wetland	N	No activities took place on this portion of the site. Duplicates MW24A /24R
SP-SS-019/SP-SB-019	South of TWSA	N	No activities on this portion of the site. Duplicates. Feb. 1991 G and M samples TWS13 and ST5
SP-SS-20/SP-SB-20	TWSB	N	Duplicates ViroGroup samples TWSB11, TB27, and TB28 collected 2/13-14/96
SP-SS-21/SP-SB-21	Production Area	N	Duplicates ViroGroup samples PDA1, PDA3, PA5, and PA8 collected 2/13-14/96

Proposed B&V Sediment Sample	Location	Valid (Y/N)	Rationale
SP-SD-01	East of site Front St. @ Greenfield St.	N	Duplicates ViroGroup sample SS3 collected December 1992
SP-SD-02	Greenfield Ck. south of Optimist Pk.	N	Duplicates SS1 as background
SP-SD-03	Drainage feature east and midway of site	N	Duplicates ViroGroup sample SS2 collected December 1992
SP-SD-04	East of RR on Greenfield Ck.	N	Duplicates ViroGroup sample SS1 collected December 1992
SP-SD-05	Drainage feature S of NTA and Greenfield St.	Y	Headwaters of onsite drainage ditch
SP-SD-06	Onsite drainage ditch SE of NTB	N	Duplicates ViroGroup samples SS4 and SS7 collected December 1992
SP-SD-07	Onsite drainage ditch W of Optimist Pk.	N	Duplicates ViroGroup sample SS8 collected December 1992
SP-SD-08	Greenfield Ck. downstream of onsite d. ditch	N	Duplicates ViroGroup sample SS11 collected December 1992
SP-SD-09	Greenfield Ck. downstream of SP-SD-08	N	Duplicates ViroGroup samples SS10A collected December 1992
SP-SD-10	Cape Fear Rr. @ Greenfield Ck.	N	Duplicates ViroGroup sample SS23 collected February 1996
SP-SD-11	Slip W of Large Storage Tank area	N	Duplicates ViroGroup samples SS19, SS20, and SS21collected February 1996
SP-SD-12	Cape Fear River @ N property boundary	N	Duplicates ViroGroup sample SS15 collected February 1996
SP-SD-13	Wetland area NTB near MW-20	N	Duplicates Feb. 1991 Geraghty and Miller sample NTB5 and soil borings SB9, SB10 and SB13
SP-SD-14	Wetland S of covered creosote ditch	N	No activities took place on this portion of the site.
SP-SD-15	West of road in N portion of E wetland	N	No activities on this portion of the site. Duplicates. Feb. 1991 G and M sample ST2
SP-SD-16	North of road in S portion of E wetland	N	No activities took place on this portion of the site.
SP-SD-17	West wetland N of road	N	No activities took place on this portion of the site.
SP-SD18	West wetland N of road	N	No activities took place on this portion of the site.
SP-SD-19	Wetland S of road at western boundary	N	No activities took place on this portion of the site.
SP-SD-20	Wetland W of SP-SD-07	N	No activities took place on this portion of the site.

Proposed B&V Surface water Sample	Location	Valid (Y/N)	Rationale
SP-SW-01	East of site Front St. @ Greenfield St.	Y	Background
SP-SW-02	Greenfield Ck. south of Optimist Pk.	N	Duplicates ViroGroup samples SW1and SW2 collected February 1996
SP-SW-03	East of RR on Greenfield Ck.	N	Duplicates ViroGroup sample SW2 collected February 1996
SP-SW-04	Onsite drainage ditch W of Optimist Pk.	N	Duplicates ViroGroup sample SW3 collected February 1996
SP-SW-05	Greenfield Ck. downstream of onsite d. ditch	N	Duplicates ViroGroup samples SW1, SW2, SW3, and SW4 collected February 1996
SP-SW-06	Greenfield Ck. downstream of SP-SD-08	N	Duplicates ViroGroup samples SW1, SW2, SW3, and SW4 collected February 1996
SP-SW-07	Cape Fear Rr. @ Greenfield Ck.	N	Duplicates samples collected semi-annually at Mouth of Greenfield Creek
SP-SW-08	Slip W of Large Storage Tank area	N	Duplicates Old Slip samples
SP-SW-09	Cape Fear River @ N property boundary	N	Duplicates upstream background Hwy #74 Bridge sample

Proposed B&V Groundwater Sample	Location	Valid (Y/N)	Rationale
SP-MW-11, -11A, -11B *	SW corner of NTB	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-13*	Large Storage Tank area	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-16*	Large Storage Tank area	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-17*	TWSB and Large Storage Tank area	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-20, -20A*	NTB	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-22A*	Large Storage Tank area	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-24, -24A*	East of road and west of wetland	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-25*	S of buried creosote ditch	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-27*	NE corner of site	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-28, -28A*	W of railroad east of central portion of site	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-29, -29A*	SE portion of site	N	Duplicates ViroGroup samples collected November 16-19, 1993
SP-MW-31, -32, -33	Between wetlands N of road S portion of site	N	No activities took place on this portion of the site.
SP-MW-34, -35, -36	S central portion of site	N	No activities took place on this portion of the site.
SP-MW-37, -38, -39	S portion of Optimist Park	Y	Upgradient background data for water table; confirms no offsite migration to Greenfield Lake
SP-MW-40, -41, -42	In LF-1 and LF-2	N	Duplicates data available from wells MW6, MW7, MW8, MW8A, and MW9

Proposed B&V Biological Sample	Location	Valid (Y/N)	Rationale
SP-BIO-01 (Sessile)	Greenfield Ck. dwnstrm of onsite drnge ditch	N	No sessile organisms observed during March 12-13, 1996 ecological evaluation
SP-BIO-02 (Sessile)	Greenfield Ck. near Cape Fear River	N	No sessile organisms observed during March 12-13, 1996 ecological evaluation
SP-BIO-03 (Sessile)	Cape Fear River near SW portion of site	N	No sessile organisms observed during March 12-13, 1996 ecological evaluation
SP-BIO-04 (Sessile)	Slip W of Large Storage Tank area	N	No sessile organisms observed during March 12-13, 1996 ecological evaluation
SP-BIO-05 (Fish tissue)	Greenfield Ck. dwnstrm of onsite drnge ditch	N	Lack of suitable habitat may make collect of samples difficult
SP-BIO-06 (Fish tissue)	Greenfield Ck. near Cape Fear River	N	Lack of suitable habitat may make collect of samples difficult
SP-BIO-07 (Fish tissue)	Cape Fear River near SW portion of site	N	Fish are mobile; any impact cannot be linked directly to site; numerous potential sources along river
SP-BIO-08 (Fish tissue)	Slip W of Large Storage Tank area	N	Fish are mobile; any impact cannot be linked directly to site; numerous potential sources along river
SP-BIO-09 (Sessile)	Upgradient and offsite	N	Upgradient and offsite. Fresh water organism not appropriate comparison to brackish water in river.

*** = existing monitoring well**

REFERENCE 74

Ref. 74

NCDENR

JAMES B. HUNT JR.
GOVERNOR

WAYNE MCDEVITT
SECRETARY

WILLIAM L. MEYER
DIRECTOR

REGISTERED ENVIRONMENTAL CONSULTANT PROGRAM

15A NCAC 13C .0300 Implementation Guidance

June 1998

Department of Environment and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

401 Oberlin Road - Suite 150
Raleigh, North Carolina 27605
(919) 733-2801

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.0300 VOLUNTARY REMEDIAL ACTION OVERSIGHT BY REGISTERED ENVIRONMENTAL CONSULTANTS

Background

The Inactive Hazardous Sites Response Act was enacted in 1987 to address the hundreds of hazardous substance disposal sites in North Carolina which were not cleanup priorities for the federal Superfund program. Authority for implementing the Inactive Hazardous Sites Response Act has been delegated to the Director of the Division of Waste Management (Division), and is administered by the Division's Inactive Hazardous Sites Branch (Branch). This state statute provides site owners, operators and responsible parties (hereafter referred to as "remediating parties") the opportunity to voluntarily clean up their sites pursuant to consent orders with the Division. Due to limited staff resources however, the Division has been unable to keep up with the demand for voluntary site cleanups. To address this problem, the General Assembly amended the Inactive Hazardous Sites Response Act in 1994 and 1995 to authorize the Division to approve qualified private environmental consulting firms to certify remedial action compliance in place of state oversight. This new program is known as the "Registered Environmental Consultant" (REC) program.

The Registered Environmental Consultant (REC) Program

Voluntary remedial actions conducted under the Registered Environmental Consultant program are governed by the Inactive Hazardous Sites Response Act and the REC implementation rules found at 15A NCAC 13C .0300. The Branch-approved environmental consulting or engineering firms are known here as "Registered Environmental Consultants" (REC's). The REC is hired by the remediating party to implement and oversee the site cleanup in lieu of Branch review and approval. To qualify as an REC, an environmental consulting firm must employ one or more site managers who meet the requirements of section .0304 of the rules. These site managers are known here as "Registered Site Managers." All work performed by REC's must be conducted under the supervision and direction of one or more Branch-approved Registered Site Managers.

Many environmental consultants are familiar with the steps in implementing a site cleanup, including planning and conducting the remedial investigation, preparing the feasibility study and remedial action plan, and designing and installing a final remedy. Under the REC program however, Registered Site Managers must also certify in writing that the site investigation and site remediation were conducted in accordance with the Inactive Hazardous Sites statute and the REC program rules. Only Branch-approved Registered Site Managers may make certifications on behalf of the REC. *It is important to note that this certification is in lieu of Branch review and approval; the Branch will not provide any oversight or approval of the work performed by the REC.* Once the Registered Site Manager certifies that a site cleanup has been completed, the site will be transferred to the "no further action" category of the Inactive Hazardous Sites inventory. Therefore, ensuring that site cleanups are protective of public health and the environment will rely upon the professional qualifications, judgement and integrity of the REC and its Registered Site Manager(s). The REC rules mandate that "a Registered

Environmental Consultant shall at all times recognize its primary obligation is to protect public health, safety, welfare and the environment in the performance of professional services as a Registered Environmental Consultant."

Remediating parties who wish to conduct voluntary remedial actions must first notify the Branch of their interest in writing. The Branch will screen site conditions and will determine, based on the presence of any severe or sensitive site conditions, whether the voluntary cleanup will be managed directly by the Branch or will be managed under the REC program. To expedite this screening process, remediating parties and their consultants will be asked to complete and submit a "Checklist for REC Program Eligibility." A copy of this checklist is shown in Appendix H. Note that answering "yes" to one or more of the questions on the checklist does not mean that the site will automatically be excluded from the REC program. The purpose of the checklist is merely to assist the Branch in identifying and evaluating any severe or sensitive site conditions. If the Branch determines that the site is eligible for the REC program, the remediating party must hire an approved REC and enter into a limited consent order with the Division. A flow chart showing the major steps in the voluntary cleanup program is provided in Figure 1.

Note: In order to receive Branch approval, all voluntary site cleanups, whether managed under the REC program or managed directly by the Branch, must be conducted pursuant to a consent order with the Division. "Independent cleanups" conducted outside consent orders are no longer an option, and will not be acknowledged by the Branch.

In order to ensure the quality of work performed by REC's, the Branch will conduct detailed audits of selected sites. Audit results will be used to track the performance of REC's and Registered Site Managers. Violations of the program rules or a pattern of poor performance may result in temporary or permanent disqualification from the REC program and/or prosecution under N.C.G.S. 130A-26.2 and other applicable laws.

Purpose of the Implementation Guidance

The purpose of this implementation guidance is to assist remediating parties, REC's and Registered Site Managers in interpreting, applying and complying with the rules for the REC program. This guidance outlines the minimum technical and administrative standards for site cleanups conducted under the REC program.

Due to the wide range of conditions encountered at hazardous substance disposal sites, the guidance will not address every conceivable situation. ***Therefore, use of the guidance does not guarantee Branch concurrence on the method or completeness of a remedial action, nor does it guarantee that a remedial action is in compliance with the REC program rules. Before beginning any site work, remediating parties, REC's and Registered Site Managers should read the REC program rules and this guidance carefully.***

This implementation guidance will be updated annually. Questions or comments should be directed to the Inactive Hazardous Sites Branch at (919) 733-2801.

Note: This document provides guidance on *selected portions* of the REC program rules only, and should be used in conjunction with the complete text of the rules. Copies of the rules are available from the Branch.

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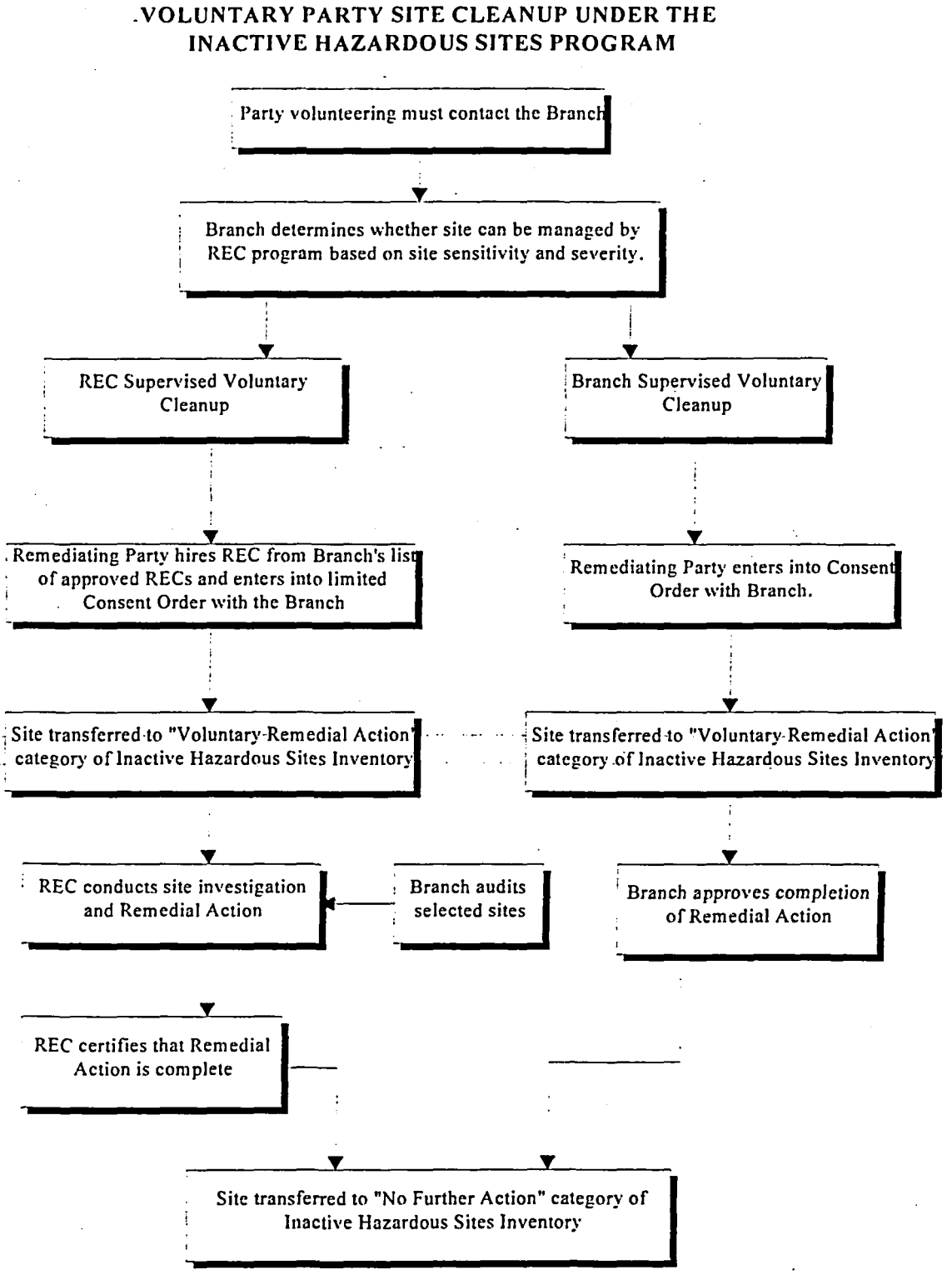
Figure 1: Voluntary Cleanups Under the Inactive Hazardous Sites Program



.0301 Definitions

(1)-(8): Self-explanatory.

.0302 General Provisions

(a) Purpose of Rules

Self-explanatory.

(b) Compliance with Other Laws

Self-explanatory.

(c) Enforcement Provisions

The Branch will conduct detailed audits of selected sites in order to track the performance of REC's and Registered Site Managers. Violations of the REC program rules or a pattern of poor performance may result in temporary or permanent disqualification from the REC program and/or prosecution under N.C.G.S. 130A-26.2 or other applicable laws.

(d) Consent Orders

Remediating parties who wish to participate in the REC program must first enter into an Administrative Order on Consent (consent order) with the Division.

Copies of the model consent order are available from the Branch. The model consent order consists of a short agreement with standard provisions that apply to all sites; only the site identification and site description will be project-specific.

(e) Authority for Site Access/Response Actions

Self-explanatory.

(f) Requirement for REC/Registered Site Manager Oversight

Self-explanatory. Please note that *only* Branch-approved Registered Site Managers may manage site cleanups and make certifications on behalf of the REC.

(g) Sites Requiring Branch Oversight

The Branch expects that the majority of voluntary site cleanups will be eligible for the REC program. However, the Branch reserves the right to supervise and/or direct site cleanups at its discretion, particularly in the following cases:

(i) sites posing an imminent hazard to public health or the environment;
(ii) sites with significant public interest;
(iii) sites at which the Branch has initiated an enforcement action;
(iv) sites where the remediating party has made material misrepresentations or is failing to comply with federal, state or local environmental regulations;
(v) sites where hazardous substances have migrated off site;
(vi) sites with sensitive environments; and
(vii) sites with mixed chemical and radioactive wastes.

(h) Deadlines for Completing Remedial Investigations and Remedial Actions

The purpose of this section is to ensure that site investigations and site cleanups are completed within a reasonable period of time. For sites which fail to meet these deadlines, the consent order between the remediating party and the Division will be dissolved, and the site will be transferred from the "Responsible Party Voluntary Remedial Action" category to the "Sites Priority List" category of the Inactive Hazardous Sites inventory. Remediating parties at these sites may also be subject to enforcement action.

The "effective date of the agreement to conduct a voluntary remedial action" refers to the date that the consent order between the remediating party and the Division is signed by the Division Director.

(i-j) Business Confidentiality

Self-explanatory.

(k) Disclosure of Information

Self-explanatory.

(l) Maintenance and Submittal of Documents

The REC is responsible for ensuring that all site-related documents are maintained in one location in an orderly fashion and are made available to the Branch in a timely manner. All work plans and reports must be submitted to the Branch within thirty days of completion. All other miscellaneous records must be submitted to the Branch at the completion of the work phases shown in sections .0302(l)(1) through (5).

(m) Requirement to Maintain Documents

Unless otherwise directed by the Branch, REC's must preserve and maintain all documents related to voluntary site cleanups for six years after termination of the site-specific consent order.

(n) Branch Requests for Information/Replacement REC's

Section (n) has two parts: (i) failure to comply with Branch requests for information will result in revocation of a consulting firm's REC status; (ii) in the event that an REC is terminated by the remediating party or disqualified from the program by the Branch, the remediating party must propose a replacement REC within sixty days. Failure to propose a replacement REC within sixty days will be grounds for revoking the remediating party's voluntary remedial action status.

(o) Authority of Branch to Compel Response Actions

Self-explanatory.

(p) Requests for Site Access

Self-explanatory.

.0303 Approval of Registered Environmental Consultants

(a) REC Application Package

Self-explanatory. Copies of the current REC application package (September 1997) are available from the Branch. The April 1997 application package is obsolete and should not be used.

(b) Requirement to Supply References

Self-explanatory. For further information, see the Branch's REC application package.

(c-d) Requirement to Notify Branch of Change in Nature of Business or Registered Site Managers

Self-explanatory. When an REC learns that a Registered Site Manager intends to change employment, the REC must notify the Branch within the time frames specified in .0303(d). If the sole Registered Site Manager changes employment, the REC must also propose a replacement Registered Site Manager within the time frames specified in .0303(d). **Failure to notify the Branch and/or to propose a replacement Registered Site Manager is a violation of the REC program rules, and may result in the REC**

being disqualified. Therefore, the Branch recommends that REC's employ at least two Registered Site Managers.

The person responsible for notifying the Branch is the "principal contact" shown on Part 1 of the REC application. To avoid problems caused by personnel changes, Registered Site Managers should not be listed as the principal contact.

(e-f) Branch Approval of REC's

Self-explanatory. Any firm that represents itself as an REC without Branch approval is subject to prosecution under N.C.G.S. 130A-26.2 and other applicable laws.

(g) List of Branch-approved REC's

A list of Branch-approved REC's is accessible through the Superfund Section Home Page at:

http://wastenot.ehnr.state.nc.us/sfhome/sfhome.htm

.0304 Minimum Qualifications for Registered Environmental Consultants

Self-explanatory. An REC applicant must demonstrate that it has an established environmental consulting practice, and that one or more employees of the firm meet the professional qualifications for Registered Site Managers shown in section .0304. For further information, see the Branch's REC application package.

.0305 Standards of Conduct for Registered Environmental Consultants

(a) Standards of Professional Competence

All documents and completion statements must be certified by the Registered Site Manager. The Registered Site Manager shall certify documents only when he/she has directly reviewed the work in question. The Registered Site Manager's certification indicates that the document meets the requirements of the statute, the REC program rules, this implementation guidance and accepted standards of practice for hazardous substance site investigation and remediation. Note that the REC program rules do not authorize a Registered Site Manager to practice outside his/her area of professional expertise. If a document contains work outside the Registered Site Manager's area of expertise, he/she must rely on the advice of other professionals with relevant expertise. Before certifying any document, the Registered Site Manager must ensure that the document has been signed and sealed by the appropriate professionals (e.g., licensed geologist, registered professional engineer, etc.). A single document may require the signature and seal of more than one professional. Registered Site Managers that violate these provisions may be disqualified from the REC program and are subject to prosecution under N.C.G.S. 130A-26.2 and other applicable laws.

(b) Standards of Professional Responsibility

Section .0305(b) states that REC's and Registered Site Managers are subject to the following standards of professional responsibility. Registered Site Managers that violate these provisions may be disqualified from the REC program and are subject to prosecution under N.C.G.S. 130A-26.2 and other applicable laws.

(1) REC's shall at all times recognize that their primary obligation in the performance of professional services is to protect public health, safety, welfare and the environment.

(2) REC's must report the existence of imminent hazards to the Branch in writing within 24 hours of discovery, unless the remediating party has already provided such notice in writing.

(3) REC's must report the presence of sensitive environments, mixed chemical and radioactive wastes, or off-site migration of hazardous substances to the Branch in writing within 24 hours of discovery, unless the remediating party has already provided such notice in writing. The Branch may elect to supervise and/or direct the cleanup of sites with these site conditions, as provided by .0302(g).

(4) Registered Site Managers must follow the requirements and procedures set forth in the rules, must act with reasonable care and diligence, and must exercise independent professional judgement. "Independent professional judgement" refers to the Registered Site Manager's judgement with respect to interpretation of the REC program rules and accepted standards of practice for hazardous substance site investigation and remediation.

(5) If an REC becomes aware of new information that would modify its previous opinion on a site cleanup, the REC must promptly notify the remediating party and the Branch in writing.

(6) If an REC becomes aware of relevant information that was not disclosed by a previous REC on the project, the REC must promptly notify the remediating party and the Branch in writing.

(7) REC's shall not allow the use of their names or the names of their Registered Site Managers by, or associate in a business venture with, any firm that is engaging in fraudulent or dishonest business practices.

(8) REC's must ensure that their professional reports, public statements and testimony are objective and truthful and include all relevant and pertinent information, when the results of an omission could lead to an incorrect conclusion.

(9) REC's shall not misrepresent a Registered Site Manager's academic or professional qualifications or degree of responsibility for prior site cleanups.

(10) REC's must comply with the provisions of the REC program regulations and all applicable federal and state law and local ordinances.

(11) REC's and Registered Site Managers are required to read and understand the REC program rules, this implementation guidance and the site-specific consent order.

.0306 Technical Standards for Registered Environmental Consultants

Section .0306 of the rule outlines the minimum technical and administrative requirements for conducting site investigations and remedial actions.

(a) Compliance with Consent Order, Statute, Rules and Guidance

Self-explanatory. The REC program rules are state law; therefore, violations of the program rules are violations of state law. The REC guidance is not state law, but it is Branch policy. The purpose of the REC guidance is to assist remediating parties, REC's and Registered Site Managers in interpreting, applying and complying with the REC program rules. Also see pages 1-2 of this guidance for an explanation of the responsibilities of the REC and the Registered Site Manager(s).

(b) REC Certification of Documents and Completion of Work Phases

Section .0305(b) requires two separate certifications: certification of documents, and certification of work phase completion. Both certifications are sworn statements subject to penalty of law.

Certification of documents: All work plans, reports and project schedules submitted to the Branch must be certified by a representative of the remediating party, and subsequently by the Registered Site Manager. The "certification of documents" statements are shown in Appendix G, section G.1. The language in the certification statements is specified in the rules and may not be modified under any circumstances.

Certification of work phase completion: The Registered Site Manager must also certify the completion of the work phases shown in section .0306(b)(5). The "certification of work phase completion" forms are provided in Appendix G, section G.2. The language in the work phase completion forms is specified in the rules and may not be modified under any circumstances.

(1) REC Certification of Documents

In this statement, the REC is certifying that the content of the submittal complies with the REC program rules and the Inactive Hazardous Sites Response Act. It is the responsibility of the REC and its Registered Site Managers to read, understand and ensure compliance with the REC program rules, the site-specific consent order, and this implementation guidance. Copies of the REC program rules and this implementation guidance are available from the Branch. This certification statement is a sworn statement subject to penalty of law. Note that the Registered Site Manager may sign this certification statement only after completion of the certification statements required by .0306(b)(2) and (b)(3).

(2) Remediating Party Certification of Documents

All work plans, reports and project schedules must also be certified by a representative of the remediating party. The remediating party is certifying that the information is true, accurate and complete. This certification is required to ensure that the REC has been supplied with all site data needed to make a competent professional decision. This certification statement is a sworn statement subject to penalty of law.

(3) Other Professional Certification

The Registered Site Manager may approve work products by relying in part upon the advice of one or more professionals having relevant expertise (see section .0305(a)). It is the responsibility of the Registered Site Manager to determine when documents must be sealed by a licensed professional (i.e., a professional licensed by the state). If a portion of the site investigation or site cleanup requires the seal of a licensed professional, that portion must be sealed prior to certification of the document by the remediating party and the Registered Site Manager. Work that is not properly prepared under the supervision of, and sealed by, a licensed professional will be reported to the appropriate professional licensing board.

(4) Documents to be Certified

The following documents must be certified by the remediating party and by the Registered Site Manager *prior to implementation*, and must be submitted to the Branch within thirty days of completion (i.e., within 30 days of certification by the Registered Site Manager):

(A) remedial investigation work plans;
(B) remedial action plans;

(C) remedial action preconstruction reports; and
(D) any major modifications of project schedules.

The "certification of documents" statement is shown in Appendix G, section G.1.

(5) Submittal of Work Phase Completion Statements

The Registered Site Manager must submit work phase completion statements as follows:

(A) at the completion of the Phase I remedial investigation;
(B) at the completion of the remedial investigation;
(C) following the Registered Site Manager's approval of the proposed remedial action plan;
(D) at the completion of remedial design and construction; and
(E) at the completion of all remedial action activities.

The "certification of work phase completion" forms are provided in Appendix G, section G.2.

(6) Content of Completion Statements

The language in the work phase completion forms is specified in the rules and may not be modified under any circumstances. Note that the Registered Site Manager is certifying compliance with two requirements: (i) that the work has been completed in accordance with the statute and the REC program rules; and (ii) that the REC is in compliance with section .0305(b)(2) and (b)(3) of the REC program rules.

(c) Quality Assurance for Sampling and Analysis

(1) Data Quality Objectives

The Branch requires a level of data quality that is commensurate with its intended use. For most purposes, this means data quality comparable to "Level III" analytical data, as defined by the U.S. EPA Contract Laboratory Program (CLP). Please note that full CLP documentation packages are not required.

(2) Methods for Sample Collection and Analysis

Self-explanatory. Registered Site Managers should follow generally accepted standards of practice for hazardous substance site investigations. The Registered Site Manager must ensure that sample collection and analysis complies with the

May 1996 U.S. EPA Region IV "Environmental Investigations Standard Operating Procedures and Quality Assurance Manual" (EPA SOP Manual), and the standard field protocols, analytical methods and data reporting requirements shown in Appendix A, sections A.6, A.7 and A.8.

(3-4) Requirements for Analytical Laboratories

Self-explanatory. Note that analytical data from unapproved laboratories will be rejected, and the associated sampling event will have to be repeated.

(5) Minimum Qualifications for Field Staff

Self-explanatory. The Registered Site Manager is responsible for ensuring that field staff are qualified by education, training and experience.

(6) Reporting Analytical Results

(A) The individual collecting the sample and the date and time of sample collection may be reported on the chain-of-custody form(s).

(B) Requirements for sample filtration are explained in Appendix A, section A.6.

(C-K) This information must be reported either in the text of the sampling report or in the standard laboratory report (see also Appendix A, section A.8, "Data Reporting Requirements"). The Registered Site Manager should ensure that field staff are trained in completing chain-of-custody forms properly. Improperly completed chain-of-custody forms can render the analytical results invalid, and the associated sampling event may have to be repeated.

(d) Health and Safety Plans

Self-explanatory. The Registered Site Manager is also responsible for ensuring that project health and safety plans include measures to protect the surrounding community from exposure to site contaminants.

(e-f) Requirement to Investigate and Delineate All Areas of Concern

The Branch's minimum requirements for investigating all potential areas of concern are outlined in Appendix A. Registered Site Managers should use their professional judgement to determine what additional sampling and analysis is required based on site conditions.

(g) Remedial Investigation Plans

The purpose of the remedial investigation plan is to assemble all available information on disposal history and site characteristics, and to use this information to formally plan the scope of the remedial investigation. The purposes of the remedial investigation are: (i) to identify all releases of hazardous substances to the environment; (ii) to identify potential exposure pathways; (iii) to characterize the chemical nature of such releases and collect sufficient sampling data to support a cleanup-level determination; (iv) to delineate the areal and vertical extent of contamination; and (v) to characterize site conditions sufficiently to conduct a feasibility study of remedial alternatives and to support a proposed remedy.

Many sites under the REC program will not be audited until after the site cleanup has been completed. However, a remedial investigation work plan is still required for the following reasons: (i) the Branch wants to ensure that the Registered Site Manager has a formal plan for a remedial investigation that will meet the Branch's minimum requirements; (ii) if the site is audited, the Branch will need to review the information contained in the workplan; and (iii) the workplan needs to be available for the public record.

Note: At some sites, part or all of the remedial investigation has already been completed by the time the consent order is signed. The Registered Site Manager does not need to prepare a remedial investigation plan for work that has already been completed. However, all previously completed remedial investigation work must be certified in accordance with .0306(b) to ensure that it complies with the REC program rules. In addition, the background information required by .0306(g)(1)-(13) must be incorporated into the final remedial investigation report.

Example: A Registered Site Manager "inherits" a site where previous consultants have conducted several phases of site assessment work over the past five years. The Registered Site Manager then completes the remedial investigation by performing one additional phase of work. Rather than attempting to certify various individual site assessment reports prepared by other consultants, the Registered Site Manager should assemble all of the reports (including his/her own report) into one package which will constitute the final remedial investigation report. To this entire package, the Registered Site Manager should attach: (i) the remediating party "certification of documents" statement shown in Appendix G, section G.1; (ii) the Registered Site Manager "certification of documents" statement shown in Appendix G, section G.1; and (iii) the remedial investigation "certification of work phase completion" form provided in Appendix G, section G.2.

(1) Site Background Information

Self-explanatory.

(2) Waste Management Information

Self-explanatory.

(3) Topographic Maps

Self-explanatory. Topographic maps must be the most recent available original USGS quadrangle series maps, *not photocopies*.

(4) Survey Plats

Self-explanatory. Survey plats must also meet the requirements of N.C.G.S. 47-30.

(5) Site Geologic and Hydrogeologic Conditions

Self-explanatory.

(6) Sources of Potable Water

Self-explanatory. Note that the Registered Site Manager must conduct a thorough survey of private and municipal water-supply wells and surface water intakes.

(7) Environmentally Sensitive Areas

The site and all adjacent property must be evaluated for the existence of the environmentally sensitive areas listed below. Appendix B provides the eight telephone contacts that must be made in order to identify these areas. The information received through these contacts must be outlined in this section of the work plan. In most cases, none of these areas will be present. Knowledge of the presence of these sensitive environments is necessary to determine if any special sampling (such as aquatic toxicity testing) is required and whether site remediation may do more harm than good (for example, excavation and destruction of a wetland vs. leaving in place residual contamination which will not significantly impact the wetland environment). If any of these areas are found on or adjacent to the site, the REC must contact the Branch pursuant to .0302(b)(5) and .0302(g).

Marine Sanctuaries
National and State Parks
Designated and proposed Federal and State Wilderness and Natural Areas
Areas identified under the Coastal Zone Management Act
Sensitive areas identified under the National Estuary Program or the Near Coastal Waters Program
Critical areas identified under the Clean Lakes Program
National Monuments
National and State Historical Sites
National and State Seashore, Lakeshore, and River Recreational Areas
Critical habitats and habitats known to be used by State or Federally designated or proposed endangered or threatened species or species under review as to their endangered or threatened status
National and State Preserves and Forests
National and State Wildlife Refuges
Coastal Barriers and Units of a Coastal Barrier Resources System
Federal land designated for protection of natural ecosystems
Spawning areas critical for the maintenance of fish/shellfish species within river, lake or coastal tidal waters
Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which such fish spend extended periods of time.
Terrestrial areas utilized for breeding by large or dense aggregations of animals
Rivers State or Federally designated Scenic or Wild
State lands designated for wildlife or game management
Areas important to maintenance of unique biotic communities
State-designated areas for protection or maintenance of aquatic life
Wetlands

(8) Property Deeds

Self-explanatory.

(9) Property Ownership

Self-explanatory.

(10) Operational History

Self-explanatory.

(11) Historical Use of Hazardous Substances

Self-explanatory.

(12) Environmental Permit History

Self-explanatory.

(13) Regulatory History

Self-explanatory. Note that the Registered Site Manager must provide copies of reports of all previous site investigations, whether prepared by the REC firm or other environmental consultants.

(14-18) Site Characterization Procedures

Self-explanatory.

(19) Health and Safety Plans

Self-explanatory. The Registered Site Manager is also responsible for ensuring that project health and safety plans include measures to protect the surrounding community from exposure to site contaminants.

(h) Remedial Investigation Reports

Remedial investigation reports should document the findings of the site investigation in sufficient detail to support the cleanup-level determination, to conduct the feasibility study of remedial alternatives, and to support the proposed remedy. Remedial investigation reports should be written in a style that is understandable to the general public.

Note that a clearly written and well-organized remedial investigation report is critical during a Branch audit. If the Branch cannot understand it, the report will have to be revised, and the work may have to be repeated.

(1) Narrative Description

Self-explanatory.

(2) Monitoring Well Construction

Self-explanatory.

(3) Sampling Locations

Self-explanatory.

(4) Quality Assurance Procedures

Self-explanatory. Minimum requirements for standard field protocols are shown in Appendix A, section A.6.

(5) Procedures for Managing Remedial Investigation-Derived Wastes

Self-explanatory.

(6-7) Geologic and Hydrogeologic Conditions

Self-explanatory.

(8-11) Data Reporting Requirements

Additional data reporting requirements are shown in Appendix A, section A.8. Note that rigorous documentation of analytical data is critical during a Branch audit. If analytical data is not properly documented, the remedial investigation report will have to be revised, and the sampling event may have to be repeated.

(i) Remedies Requiring Branch Approval

Self-explanatory. The three conditions outlined in this section require the Branch's *prior approval of the proposed remedy.* Note that the definition of "on-site containment or capping" at .0306(i)(2) includes any remedy which leaves in place contaminated soils or sediments above Branch unrestricted use cleanup levels (e.g., remedies which rely on property-use restrictions). Guidance on property-use restrictions is provided in Appendix F.

(j) Public Notice of Remedial Action Plans

Self-explanatory. The Branch will draft the public notice and will provide a copy of the notice and a copy of the facility mailing list to the Registered Site Manger. The Registered Site Manager is responsible for adding to the facility mailing list any additional parties that have expressed an interest in the site. The Registered Site

Manager will then distribute the public notice to the facility mailing list via certified mail, and will provide proof of the mailing (certified mail receipts) to the Branch. If the Branch receives significant public comment, the Branch may elect to supervise the site cleanup as provided by .0302(g).

(k) Discharge of Remediation Waste Streams

Self-explanatory.

(l) Remedial Action Plans

Many sites under the REC program will not be audited until after the site cleanup has been completed. However, a remedial action plan is still required for the following reasons: (i) the Branch wants to ensure that the Registered Site Manager prepares a feasibility study to formally evaluate remedial alternatives; (ii) if the site is audited, the Branch will need to confirm that the selected remedy is supported by the results of the feasibility study; and (iii) the remedial action plan provides an opportunity for public comment on the proposed remedy, as required by the statute.

The remedial action plan must include the sections outlined below and must be written in a style that is understandable to the general public.

(1) Remedial Investigation Results

This section should summarize and reference the remedial investigation reports submitted pursuant to section .0306(h).

(2) Remedial Action Objectives

This section should summarize the areas of the site to be remediated, the affected media and contaminants of concern, and the remedial design goals (including preliminary remediation goals).

(3) Feasibility Study

This section should include a screening of all potentially applicable technologies, resulting in at least three technologies or combinations of technologies to be evaluated in the feasibility study. The feasibility study must present a detailed analysis of remedial alternatives against each of the eight evaluation criteria shown in section .0306(l)(3)(A) through (H). The feasibility study must also include a comparative analysis of remedial alternatives; i.e., comparing the alternatives to each other and then ranking them in order of preference.

(4) Proposed Remedy

This section should provide a preliminary design of the proposed remedy, including a description of the principle of operation of the technology or combination of technologies, and pre-design schematic drawings of all major components of the remedy. *Note:* The final design plans and specifications are submitted later as part of the preconstruction report (see .0306(m)).

(5) Justification for Selection of Proposed Remedy

The proposed remedy must be supported by the results of the feasibility study; i.e., the proposed remedy must be the remedial alternative that best satisfies the eight feasibility study criteria shown in section .0306(l)(3)(A) through (H).

Note 1: All proposed remedies must include removal and/or treatment of source areas. The Branch will consider exceptions to this requirement only under the following circumstances: (i) the REC can demonstrate that on-site containment or capping is supported by the results of the feasibility study and that it is the preferred remedy; or (ii) the REC can demonstrate that source removal is technically impracticable from an engineering perspective.

Note 2: The Branch considers "monitored natural attenuation" to be a potential remedial alternative for attaining the remediation goals established pursuant to .0308, *not* a waiver of the remediation goals. If natural attenuation of any contaminated medium is proposed, the REC must demonstrate that it is supported by the results of the feasibility study and that it is the preferred remedy. For guidance on evaluating a site's potential for monitored natural attenuation, see the technical literature and U.S. EPA guidance documents on the subject, e.g.:

Symposium on Natural Attenuation of Chlorinated Organics in Groundwater, U.S. EPA, September 1996.

Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, Air Force Center for Environmental Excellence, November 1996.

Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action and Underground Storage Tank Sites, U.S. EPA OSWER Directive 9200.4-17, November 1997.

Draft Region 4 Suggested Practices for Evaluation of a Site for Natural Attenuation of Chlorinated Solvents, U.S. EPA, November 1997.

(6-8) Procedures and Schedule for Implementing Remedial Action

Self-explanatory.

(9) Proposed Criteria for Remedial Action Completion

The remedial action plan must include a workplan for monitoring and evaluating the performance of the remedy (to be submitted in remedial action progress reports pursuant to .0306 (o)) and post-remediation confirmation sampling (to be submitted in remedial action completion reports pursuant to .0306 (p)). Branch guidance on confirmation sampling and analysis is provided in Appendix C.

(10) Health and Safety Plans

Self-explanatory. The Registered Site Manager is also responsible for ensuring that project health and safety plans include measures to protect the surrounding community from exposure to site contaminants.

(11) Decontamination Procedures

Self-explanatory.

(m) Preconstruction Reports

Many sites under the REC program will not be audited until after the site cleanup has been completed. However, a preconstruction report is still required for the following reasons: (i) the Branch wants to ensure that prior to remedial construction, the Registered Site Manager conducts the treatability studies and additional site characterization needed to support the final remedy, prepares a final design report and obtains the necessary permits and approvals; (ii) if the site is audited, the Branch will need to review the information contained in the preconstruction report; and (iii) the preconstruction report documents the final design for the public record.

(1) Treatability Studies and Site Characterization

All treatability study reports and additional site characterization reports should be provided in an appendix and summarized in the text. The Branch strongly recommends the use of pilot-scale treatability studies for evaluating the suitability of proposed technologies for site-specific conditions and for optimizing the remedial design.

(2) Final Engineering Design Report

The engineering design report should include the final plans and equipment specifications for construction of the remedy. The report should include a narrative description of the final design written in a style that is understandable to the general public. The report should also include an updated schedule for construction, operation and maintenance, performance monitoring and evaluation, and progress reporting.

(3) Permits and Approvals

Copies of all registrations, permits and approvals should be incorporated into the preconstruction report as an appendix. Examples of registrations and permits that might be required for groundwater remediation sites include: non-discharge permits for discharge of treated groundwater to re-injection wells or infiltration galleries; pretreatment permits for discharge of treated groundwater to publicly owned treatment works; NPDES permits for discharge of treated groundwater to surface waters; well installation permits for monitoring, extraction and injection wells; air quality registrations/permits for discharge of air streams; etc.

(n) Construction Completion Reports

Self-explanatory.

(o) Progress Reports

Remedial action progress reports must be submitted in accordance with section .0306(o). Monitoring data collected for use in progress reports must meet the quality assurance requirements of section .0306(c).

(p) Remedial Action Completion Reports

A clearly written and well-organized remedial action completion report is critical during a Branch audit. If the report does not clearly demonstrate that the site cleanup has been completed and cleanup levels have been achieved, the Branch will return the site to the Inactive Hazardous Sites inventory and require additional work.

(1-2) Progress Reports

Self-explanatory.

(3) Remedial Action Completion

This section should present the results of the remediation and confirmation sampling conducted pursuant to section .0306(l)(9), and should demonstrate that final remediation goals established in accordance with section .0308 have been met.

(4) Project Costs

This section should report the present worth of the total capital and operation and maintenance costs of implementing the remedial action plan.

(q) Investigation-Derived Wastes

The generation, treatment, handling and ultimate disposition of investigation-derived and remedial action-derived wastes should be described in the remedial investigation reports and remedial action completion report, respectively. See also Appendix A, section A.6 (g).

.0307 Branch Audits and Inspections

(a) Audits-General

The purpose of Branch audits is to ensure that voluntary site cleanups under the REC program are conducted in accordance with the REC program rules, this implementation guidance, the site-specific consent order and applicable federal and state statutes and regulations. Audits will focus on violations of the REC program rules (state law) and this implementation guidance (Branch policy).

(b) Content of Audits

Self-explanatory.

(c) Financial Assurance

In order to participate in the REC program, remediating parties must pay an annual administration cost to offset the cost of the Branch's audit program. The annual administration cost will initially be set at $2000 per site, and will be adjusted annually to reflect the actual costs of the audit program. Calculation of the administration cost will be based on the number of months remaining in the state fiscal year (July 1-June 30). Any unused funds remaining at the end of the year will be prorated towards the following year's payment.

(d) Disciplinary Actions

The Branch will use the results of the audit program to track the performance of REC's and Registered Site Managers. Violations of the program rules or a pattern of poor performance may result in temporary or permanent disqualification from the REC program or prosecution under N.C.G.S. 130A-26.2 or other applicable laws.

.0308 Cleanup Levels

(a) The REC is responsible for ensuring compliance with the remediation goals established in accordance with Appendices D, E, and F.

(b) Self explanatory. Branch guidance on establishing natural background levels is provided in Appendix A, Section A.5.

Appendix A: Minimum Sampling and Analytical Requirements for the Remedial Investigation

A.1. Introduction

This appendix provides general guidance on minimum sampling and analytical requirements. At most sites, the REC will need to prescribe additional sampling and analysis based on site-specific conditions.

The remedial investigation must include collection of the minimum number of samples described below, from each area of concern (minimum analytical requirements are addressed in section A.7 of this appendix). Once the first phase of sampling is completed, the REC must review the sampling data and establish preliminary remediation goals in accordance with Appendices D and E. The second phase of the remedial investigation must be structured to define the extent of each contaminant in each area of concern for each medium that is contaminated. The extent of contamination must be delineated to the preliminary remediation goals established for the site.

A.2. Minimum Soil Sample Collection

A.2.1. Phase I Sampling

The purpose of the Phase I soil investigation is to identify all releases of hazardous substances to site soils, to characterize the chemical nature of such releases, and to collect sufficient sampling data to establish remediation goals.

Known or suspected spills and disposal areas must be investigated using historical research, such as waste management records, employee interviews and vintage maps and aerial photographs. Samples must be collected from *each* known or suspected area of concern, e.g., in the vicinity of any vessels used to store chemical product or waste streams, any units used to manage hazardous substances, disposal areas, spill areas, areas of stressed vegetation, etc. The required sampling strategy depends on whether or not there is visible evidence of contamination.

A.2.1.1. Visible Evidence of Contamination

At least one grab soil sample must be collected centrally from the most visibly contaminated location and horizon in each area of hazardous substance release or possible release.

A.2.1.2 No Visible Evidence of Contamination

A.2.1.2.1. Surface Release:

a. If no visible evidence exists in an area of a suspected *surface* release of contaminants, sampling must be conducted by first establishing a grid with grid line intersections (nodes) spaced no farther than 50 feet apart. Samples must be collected from each grid node. Compositing to reduce the total number of samples may be conducted as follows:

≤ 62,500 square feet: (250 ft. X 250 ft.)	No more than 4 grid node samples may be composited.
> 62,500 square feet:	A greater number of grid node samples may be composited but a minimum of 5 resulting composite samples must be submitted for laboratory analyses.

Surface samples for volatile organic contaminants must be collected 6 to 18 inches below ground surface. For samples for volatiles analysis, at least 25% of the samples must be collected as unmixed grab samples, and must be evenly distributed across the area of contamination.

b. In addition, if actual contaminants released are (1) unknown, (2) mobile contaminants, or (3) contaminants that have been detected in groundwater at the site, a soil boring must be advanced to the water table. The boring must be centrally located in the area of concern and sampled at intervals from ground surface to the water table, e.g., (1) 6 - 18 inches below ground surface; (2) at least every 5 feet from 6 inches to the water table; and (3) at the water table. Additional sampling depths should also be chosen based on visual and field-screening evidence. Samples collected for volatile organic analysis must be collected as unmixed grab samples.

A.2.1.2.2. Subsurface Release:

a. The results of the historical research must be used to conduct geophysical surveys and test trenching. Geophysical surveys must be conducted by scanning areas of concern on parallel and perpendicular traverses spaced no further than 30 feet apart (closer spacing may be required when using a metal detector). Grids must be established in all areas which yield anomalous readings during the scanning phase. Grid nodes must be spaced no greater than 10 feet apart. Readings must be recorded at each grid node and mapped. If areas are excluded from the survey due to instrument interferences, a written justification for exclusion along with a map delineating the features causing the interferences must be provided with the remedial investigation report.

b. Once the subsurface disposal area has been identified, it must be sampled in accordance with sections A.2.1.1, A.2.1.2(1b) and A.5.1(1). If the suspected subsurface disposal area cannot be located using the methods above, a soil boring should be advanced through the suspected disposal area in accordance with section .2.1.2(1b).

A.2.2 Phase II Sampling

The purpose of the Phase II soil investigation is to delineate the lateral and vertical extent of contamination in each area of concern, to concentrations less than or equal to the remediation goals established pursuant to Appendices D and E. Delineating the extent of soil contamination requires sampling all ditches, culverts or other drainage features which may have received runoff from known-contaminated areas. Field screening methods, such as soil gas testing and immunoassay test kits, may be used to help define the extent of contamination. If these methods are used, soil samples must also be collected at the expected vertical and lateral boundaries of each contaminated area and sent to the laboratory for confirmation.

A.3. Minimum Groundwater Sample Collection

A.3.1. Phase I Sampling

The purpose of the Phase I groundwater investigation is to identify all releases of hazardous substances to groundwater, to characterize the chemical nature of the contaminant plume(s), and to collect sufficient sampling data to establish remediation goals.

The need for groundwater assessment at a site with known soil contamination will be determined on a case-by-case basis. If (1) the water table is within five feet of the land surface, (2) the contaminants are known to extend to within a five foot depth of the water table, or (3) the contaminants are somewhat mobile (such as VOCs, leachable metals) the uppermost groundwater aquifer must be sampled. At least one well must be installed centrally *within each area of release* meeting one or more of the three criteria. Where contaminants are believed to be "floaters" due to density and solubility in water, well screens must be positioned across the water table. Where contaminants are believed to be "sinkers," the well screen must be positioned just above the bedrock surface. In many cases, insufficient information on the nature of hazardous substance releases at the site will make it necessary to perform the Phase I groundwater field work after the Phase I soil work is completed.

If the remediating party decides not to install a well within an area due to grossly contaminated conditions or concern for rupturing buried vessels, a minimum of three wells must then be installed immediately surrounding the suspect area. Once groundwater flow patterns are clearly defined, a well will be required on the hydraulically down gradient perimeter of the area of concern. A previously installed well may be appropriately located. Depending on the size of the area and nature of the release, additional monitoring wells may be necessary once the source is removed or remediated.

Groundwater elevation data must be collected during each sampling event and at least every six months during the remedial investigation. If subsequent water table elevation data indicate a significant change in the direction of groundwater flow, additional wells will be necessary to adequately evaluate groundwater contamination. Groundwater elevations must be measured from a datum established by a registered land surveyor.

A minimum of one sample must be collected from each monitoring well.

A.3.2. Phase II Sampling

If Phase I sampling indicates hazardous substances are present in groundwater, additional groundwater assessment will be required. The purpose of the Phase II groundwater investigation is to delineate the lateral and vertical extent of all contaminant plumes, on site and off-site. The lateral and vertical extent of the groundwater contaminant plumes must be defined by wells free from hazardous substance concentrations exceeding Branch remediation goals.

Note: Site-specific conditions may require more than two phases to complete the groundwater investigation. Examples include complex hydrogeology, such as fractured bedrock aquifers, and complex contaminant behavior, such as the migration of dense non-aqueous phase liquids (DNAPL).

A.4. Minimum Surface Water and Sediment Sample Collection

A.4.1. Phase I Sampling

The purpose of the Phase I surface water/sediment investigation is to identify all releases of hazardous substances to surface water or sediments, to characterize the chemical nature of such releases, and to collect sufficient sampling data to establish remediation goals. Surface water assessment will be necessary if there is a potential for contaminants to migrate to surface water via surface runoff or through a discharge of contaminated groundwater to a surface water body. If surface water assessment is required, at least one water and one sediment sample must be collected immediately upstream of the site and one water and one sediment sample collected immediately downstream of the site. These samples need only be analyzed for contaminants previously detected in other media at the site unless a non-permitted direct discharge of a hazardous substance from the site to surface water has occurred. If such a discharge has occurred, samples must be analyzed for the analytical scan shown in section A.7.1.

A.4.2. Phase II Sampling

If contamination is detected in any downstream sample, additional surface water/sediment assessment will be required. The purpose of the Phase II surface water/sediment investigation is to define the downstream extent of contamination to concentrations less than or equal to the remediation goals established pursuant to Appendices D and E.

A.5. Other Sample Collection

A.5.1. Phase I Sampling

1. Any abandoned or buried vessels containing unknown materials or hazardous substances must be excavated and the contents sampled and analyzed for parameters sufficient to meet disposal or treatment facility requirements. A full scan composite soil sample(s) in the vessel area must be collected as described in section A.2.1. Soil samples will also be required at the time of vessel excavation in the immediate vicinity of all joints and junctures of subsurface pipe associated with any underground vessels known or suspected to contain or have contained hazardous substances.

2. Site-specific background soil samples must be collected to establish natural metals concentrations. Samples should be located away from roadways, railways, parking areas and other potential sources of contamination. Because natural metals concentrations are highly variable, the Branch recommends collecting a minimum of five background soil samples. Background soil samples should be collected from depths and soil types that are representative of contaminated soils, but should not be collected from topsoils (0-6 inches). Statistical methods for establishing representative background concentrations may be used at the discretion of the Registered Site Manager. Sample concentrations that are obvious outliers should not be used to establish background concentrations.

3. If groundwater assessment is required, background groundwater samples should be collected to established natural background conditions. Samples should be collected upgradient of any on-site sources of contamination.

4. If surface water assessment is required, background surface water and sediment samples should be collected to establish natural or anthropogenic background conditions. Samples should be collected upstream of any on-site sources of contamination.

A.5.2. Phase II Sampling

Areas determined to have hazardous substance contamination resulting from a release from a vessel must be characterized according to section A.2.2.

A.6. Standard Field Protocols

1. Unless otherwise noted below, field procedures must be in compliance with the May 1996 US Environmental Protection Agency Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (SOP). This manual is available from US EPA Region IV, Science and Ecosystems Support Division.

2. In addition to the standard protocols contained in EPA's SOP Manual, please observe the following:

   a. Field QC samples: (i) minimum of one duplicate sample per medium per container type per field day; (ii) equipment rinsate blanks and VOA trip blanks are strongly recommended.

   b. Soil, sediment and waste samples for volatiles analysis should be collected directly into sample containers without mixing.

   c. All soil sampling and boring locations must be staked and flagged (or surveyed) until the completion of the remedial investigation.

   d. The location of all monitoring wells must be surveyed by a land surveyor registered in North Carolina.

   e. All groundwater samples for metals analysis must not be filtered prior to analysis. Data from field-filtered samples will not be accepted. If excess turbidity is a problem, groundwater samples should be collected using a low-flow purging and sampling technique, and should be prepared using standard method 3030C. Turbidity readings should be collected while purging the well.

   f. For surface waters that are very shallow (less than 6 inches deep), turbulent or highly turbid, samples may be collected in a separate collection container and then decanted into the sample container. Samples for organic analysis must be decanted into the sample container immediately. Samples for metals analysis may be allowed to settle for a few minutes prior to decanting. All collection containers must be made of the same materials as the sample container and must be precleaned and handled in the same manner.

   g. Drill cuttings and well development, purge and decontamination water must be containerized until laboratory data is available to make a determination as to how the material may be disposed or treated.

Materials exceeding Branch remediation goals may not be replaced on the site. Listed or characteristic hazardous wastes must be managed in accordance with RCRA requirements.

A.7. Minimum Sample Analyses

A.7.1. Phase I Analyses

A.7.1.1 Analytical Parameters

Each Phase I sample must be analyzed for:

1. Hazardous substance list metals including antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

2. All of the USEPA Target Compound List hazardous substances (excluding pesticides and PCB's) with a library search (using the National Institute of Standards and Technology mass spectral library) to produce a list of tentatively identified compounds (TICs). The library search must identify TICs for the largest 10 peaks in each analytical fraction having reasonable agreement with reference spectra (i.e., relative intensities of major ions agree within ± 20%). The list of TICs identified must not include laboratory control sample compounds, surrogates, matrix spike compounds, internal standards, system monitoring compounds, or target compounds. Any TICs having reasonable agreement with reference spectra, and that are detected in more than one sample, must be included in all subsequent analytical work unless the compound can be proven to be a laboratory contaminant. Quantification of these specific TICs must be performed before cleanup levels can be determined.

3. Pesticides, PCBs, dioxins, cyanide, formaldehyde and any other CERCLA hazardous substances, if suspected to have been used at the site (based on chemical usage history).

A.7.1.2. Analytical Methods

Soil and sediment samples:

Volatile Organic Compounds:	Method 8260B
Semi-volatile Organic Compounds:	Method 8270C
Pesticides	Method 8081
PCB's	Method 8082
Metals	SW-846 Methods
Dioxins, cyanide, formaldehyde and any other analytes not covered by above methods	USEPA method having the lowest method detection limit

Water samples (including groundwater, surface water and TCLP leachate):

Volatile Organic Compounds:	Method 8260B
Semi-volatile Organic Compounds:	Method 8270C
Pesticides	Method 8081
PCB's	Method 8082
Metals, dioxins, cyanide, formaldehyde and any other analytes not covered by above methods	USEPA method capable of achieving method detection limits less than or equal to the applicable 2L standard.

Note 1: Standard Method 3030C "Preliminary Treatment for Acid-Extractable Metals," Standard Methods for the Examination of Water and Wastewater, latest edition, may be used in metals analyses of water samples. Filtration of groundwater and surface water samples before acid digestion is not permitted. Highly turbid water samples for metals analysis should be collected in accordance with Appendix A, section A.6 (2)(e) and (f).

Note 2: In order to demonstrate compliance with the Branch's soil remediation goals for the protection of groundwater, the laboratory must achieve sample quantitation limits less than or equal to the Subchapter 2L groundwater standards, or must state in the case narrative that the sample quantitation limits are the lowest that can be achieved using EPA-approved methods.

A.7.2. Phase II Analyses

A.7.2.1 Analytical Parameters

After the first phase of sampling is conducted as specified in sections A.2. through A.5. above, any samples subsequently collected need only be analyzed for the following:

1. TICs meeting the criteria in Section A.7.1.1(2) above, and that are CERCLA hazardous substances, must be quantified in Phase II analyses using USEPA methods having the lowest method detection limit. If no USEPA method exists for a particular compound, the best available analytical method should be used.

2. All CERCLA hazardous substances present above method detection limits, unless the contaminant concentration is proven through sampling to be the result of a naturally-occurring condition, or the contaminant is a common laboratory contaminant detected in concentrations below that detected in the method blank. If a compound that is not a common laboratory contaminant is detected in both the blank and a sample, another phase of sampling will be necessary to demonstrate the absence or presence of the contaminant.

3. Potential degradation compounds (which are also CERCLA hazardous substances) of those CERCLA hazardous substances detected at the site.

4. If chromium is detected in any environmental medium above background, sampling for Cr +6 will be necessary. The Remedial Investigation Work Plan must include an outline of the proposed method of Cr +6 analysis. This data will be used to determine whether Cr +3, Cr +6 or a ratio of the two will be used to establish remediation goals.

5. If laboratory sample dilutions were performed on Phase I samples, Phase II samples must be analyzed for the entire analytical fraction previously diluted in addition to the above items. Sample dilutions raise analytical detection limits and therefore can mask the presence of other constituents at lower concentrations.

A.7.2.2 Analytical Methods

Phase II (and subsequent) samples should be analyzed using the methods specified above for Phase I samples. Other USEPA methods may be substituted, provided that the substitute methods achieve equal or lower method detection limits.

A.8. Data Reporting Requirements

The laboratory reports submitted with remedial investigation reports must include at least the items listed below. Full CLP documentation packages are not required.

1. The laboratory report must include a statement certifying that the laboratory is either certified for applicable parameters under 15A NCAC Subchapter 2H .0800, or that it is a contract laboratory under EPA's Contract Laboratory Program.

2. A signed statement from the laboratory that the samples were received in good condition and at the required temperature and that analysis of the samples complied with all procedures outlined in USEPA methodology, unless otherwise specified. Any deviation from the methods, additional sample preparation, sample dilution and analytical problems not rectified, must be justified in a narrative with the laboratory report.

3. Laboratory sheets for all analytical results, including sample identification, sampling dates, date samples were received by laboratory, extraction dates, analysis dates, analytical methods used, dilution factors and sample quantitation limits.

   Note: Sample quantitation limits must meet the USEPA method detection limits unless the laboratory provides a written justification as to why the method detection limits could not be achieved.

4. Laboratory sheets for all laboratory quality control samples, including results for bias and precision and control limits used. The following minimum laboratory quality control sample reporting is required: (a) at least one matrix spike and one matrix spike duplicate per sample delivery group or 14-day period, whichever is more frequent (control limits must be specified); (b) at least one method blank per sample delivery group or 12-hour period, whichever is less; and (c) system monitoring compounds, surrogate recovery required by the method and laboratory control sample analysis (acceptance criteria must be specified). All samples which exceed control limits/acceptance criteria must be flagged in the laboratory report.

5. The results of any library searches performed for "tentatively identified compounds." The library search must identify TICs for the largest 10 peaks in each analytical fraction having reasonable agreement with reference spectra (i.e., relative intensities of major ions agree within ± 20%) and providing percent probabilities of match. TICs must not include compounds which are laboratory control sample compounds, internal standards, surrogates, matrix spike compounds, system monitoring compounds, and target compounds.

6. Completed chain-of-custody with associated air bill (if applicable) attached.

7. The laboratory report must include the names and qualifications of the individuals performing each analysis, the quality assurance officer reviewing the data, and the laboratory manager.

Appendix B: Sensitive Environment Contacts

SENSITIVE ENVIRONMENT	SOURCE OF INFORMATION	TELEPHONE #
National Parks and State Parks Designated and Proposed Federal and State Wilderness and Natural Areas Sensitive Areas Identified Under the National Estuary Program or the Near Coastal Waters Program Critical Areas Identified Under the Clean Lakes Program National and State Seashore, Lakeshore and River Recreational Areas Critical Habitats or Habitats Known to be Used by State or Federally Designated or Proposed Endangered or Threatened Species or Species Under Review as to Their Endangered or Threatened Status National and State Preserves and Forests National or State Wildlife Refuges Federal Land Designated for Protection of Natural Ecosystems Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals Areas Important to Maintenance of Unique Biotic Communities State-Designated Areas for Protection or Maintenance of Aquatic Life	NC Division of Parks and Recreation - Natural Heritage Program	(919) 733-4181 Susan Giles and/or Linda Pearsall
Marine Sanctuaries	NOAA	(301) 713-3125, ext. 153 Justin Kenny
National and State Historical Sites	NC Department of Cultural Resources	(919) 733-4763 Renee Gledhill-Early
National and State Seashore, Lakeshore and River Recreational Areas State or Federal Designated Scenic or Wild Rivers	NC Division of Parks and Recreation - Planning and Development Section	(919) 733-4181 Sue Regeir and/or Cherri Smith

SENSITIVE ENVIRONMENT	SOURCE OF INFORMATION	TELEPHONE #
Areas Identified Under Coastal Protection Legislation	NC Division of Coastal Management	(919) 733-2293
Coastal Barriers or Units of a Coastal Barrier Resources System		
Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters	NC Wildlife Resources Commission	(919) 733-3633 Fred Harris, ext. 275 or Bob Amy, ext. 280
Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time		
State Lands Designated for Wildlife or Game Management		
State-Designated Areas for Protection or Maintenance of Aquatic Life		
Wetlands - (On site or adjacent to site)	US Army Corps of Engineers	(919) 876-8441, ext. 28

Appendix C: Minimum Requirements for Confirmation Sampling and Analysis

C.1. Introduction

This appendix provides general guidance on the minimum "post-remediation" sampling and analyses required to demonstrate compliance with Branch remediation goals. At most sites, the REC will need to prescribe additional sampling and analysis based on site-specific conditions.

C.2. Soil Sampling

C.2.1. Post In-Situ Remediation

For in-situ soil remedies, such as soil vapor extraction, confirmation sampling must be designed to verify that the entire soil column has been remediated to below Branch remediation goals. The remediating party must design a three-dimensional sampling grid as follows:

1. Design a surface sampling grid over the area(s) of concern. Grid nodes should be no more than 50 feet apart.

2. At each grid node, specify "candidate" sampling locations at the surface, at 6 - 18 inches below ground surface, and at at least 5-foot intervals down to the vertical limit of contamination. The result is a three-dimensional grid of "candidate" sampling locations encompassing the area of concern.

3. Select at least two candidate locations at each grid node for sample collection, using a combination of random and biased selection. Biased samples should be collected from known "hot spots" and from soil zones that are known to be resistant to in-situ methods (e.g., clay lenses).

4. Same-depth samples from up to four adjacent grid nodes may be composited. Samples at different depths may not be composited. For samples for volatiles analysis, at least 25% must be collected as unmixed grab samples, and must be evenly distributed across the area of contamination.

C.2.2. Post Ex-Situ Remediation

C.2.2.1 Post-Excavation Sampling

Post-excavation sampling must be designed to verify that all soils/wastes above Branch remediation goals have been removed. Excavations should be sampled as follows:

1. Design a sampling grid over the base and sidewalls of the excavation. Grid nodes must be no more than 50 feet apart. At each grid node, collect a sample from 0-3 inches into the base or sidewall.

2. For very small excavations, collect at least one composite sample from the base and one composite sample from each sidewall. Composite samples must consist of at least four aliquots each.

3. Biased samples should also be collected from areas of residual contamination, based on visible or field-screening evidence.

4. For excavations <62,500 square feet, samples from up to four adjacent grid nodes may be composited. For excavations > 62,500 square feet, a greater number of grid nodes may be composited but a minimum of 5 resulting composite samples must be submitted for laboratory analyses. For all excavations, samples from different sidewalls may not be composited. For samples for volatiles analysis, at least 25% must be collected as unmixed grab samples.

C.2.2.2 Treated Soil Stockpiles

Treated soils/wastes must meet Branch remediation goals before they can be replaced on site. Treated soil stockpiles should be sampled as follows:

1. Stockpiles should be gridded into equal segments of approximately 100 cubic yards each.

2. Within each segment, locate at least three hand-auger borings, using either random or biased selection. Samples should be collected from two depths within each boring (minimum 6 samples per segment).

3. Additional biased samples should also be collected from areas of residual contamination, based on visible or field-screening evidence.

4. Samples may be composited only within each segment. For samples for volatiles analysis, at least 25% must be collected as unmixed grab samples.

C.3. Groundwater Sampling

Confirmation sampling must demonstrate that site groundwater has been remediated to below Branch remediation goals. This must be demonstrated as follows:

1. Groundwater remediation systems may be shut down when two consecutive biannual (twice a year) sampling events demonstrate that all monitoring wells (on-site and off-site) are free of contamination above Branch remediation goals.

2. Following system shutdown, at least six consecutive biannual sampling events must demonstrate that all monitoring wells are free of contamination above Branch remediation goals.

3. To account for the effects of seasonal fluctuations in the water table, biannual sampling events should be conducted in winter and summer.

C.4. Surface Water/Sediment Sampling

1. Confirmation sampling must demonstrate that site surface water and sediment have been remediated to below Branch remediation goals. Six consecutive biannual sampling events must demonstrate that: (1) concentrations in downstream samples are less than or equal to concentrations in upstream samples; or (2) concentrations in downstream samples are less than or equal to Branch remediation goals.

2. To account for the effects of seasonal fluctuations in stream flow, biannual sampling events should be conducted in winter and summer.

C.5. Minimum Sample Analyses

All confirmation samples must be analyzed for the list of constituents developed during the Phase II Remedial Investigation (see Appendix A, section A.7.2.). Confirmation samples must be analyzed using USEPA methods with detection limits less than or equal to Branch remediation goals, or USEPA methods with the lowest available detection limits for each contaminant of concern.

Appendix D: Establishing Remediation Goals

D.1. Introduction

Registered Environmental Consultants (REC's) must use the procedures outlined below to establish site-specific remediation goals. The Branch's policy for establishing remediation goals is consistent with the intent of CERCLA/SARA and the National Contingency Plan (NCP), as required by N.C.G.S. 130A-310.3.

Note: The Department is currently evaluating the draft North Carolina Risk Analysis Framework (RAF) for use as Department-wide guidance for the determination of remediation goals. Use of the RAF to determine Branch remediation goals will only be allowed after the document is finalized and officially adopted by the Department. Revision of existing Department groundwater quality rules will also be necessary prior to use of the RAF.

D.2. Remediation Goals for Unrestricted Land Use

This section describes the procedures for establishing remediation goals for unrestricted land use for each environmental medium. Remediation goals for restricted land use are described in section D.3.

D.2.1 Remediation Goals for Soils

The Branch has two soil remediation goals: a "health-based" remediation goal for total concentrations of contaminants (section D.2.1.1); and a "protection of groundwater" remediation goal for residual contamination (section D.2.1.2). ***The REC is responsible for demonstrating compliance with both soil remediation goals.***

D.2.1.1 Health-Based Soil Remediation Goals

D.2.1.1.1 Preliminary Health-Based Soil Remediation Goals

The purpose of this section is to establish preliminary health-based remediation goals to be used as "target" cleanup levels, and to be used to delineate the extent of contamination during the remedial investigation. Final health-based remediation goals are described in section D.2.1.1.2.

The Branch's preliminary health-based remediation goals are shown in Table D-1. These remediation goals have been established using current USEPA risk assessment guidance and are based on a lifetime excess cancer risk of 1×10^{-6} (carcinogens) and a hazard quotient of 0.2 (non-carcinogens). The hazard quotient of 0.2 is used to account for multiple (average of 5) non-carcinogens in the same critical effect group. For contaminants that are not

listed in Table D-1, the REC must calculate a health-based remediation goal using the procedures outlined in Appendix E, section E.1. Carcinogenic PAH's not listed in Table D-1 can be screened using the remediation goal for benzo(a)pyrene. Similarly non-carcinogenic PAH's not listed in Table D-1 can be screened using the remediation goal for pyrene.

Note 1: Remediation goals for PCB's are established in accordance with U.S. EPA policy for PCB's at Superfund sites. The preliminary remediation goal is 1 ppm from 0 to 10 inches and 10 ppm below 10 inches.

Note 2: Some of the remediation goals shown in Table D-1 may be more stringent than natural background concentrations or method detection limits. Cleanup to below site-specific natural background concentrations (metals only) or method detection limits (using the analytical methods specified in section A.7.1.2) is not required.

D.2.1.1.2 Final Health-Based Soil Remediation Goals

The preliminary soil remediation goals established pursuant to section D.2.1.1.1 should be used as final health-based remediation goals in most cases. Under certain site conditions, the preliminary remediation goals may be adjusted, as explained below:

Carcinogens

The health-based remediation goals for carcinogens in Table D-1 are based on a lifetime excess cancer risk of 1×10^{-6}. At some sites, the remedy capable of achieving the health-based remediation goals may not be the preferred remedy. For example, incineration may be the only remedial technology capable of meeting the health-based remediation goals, but it may not be the preferred remedy if incineration is strongly opposed by the local community. At these sites, the REC may approve an alternate remedy provided that the alternate remedy can achieve final soil remediation goals within the acceptable cancer risk range (i.e., a cumulative excess cancer risk for all contaminants of 10^{-4} to 10^{-6}). *Please note that remedy selection is governed by the results of the feasibility study conducted pursuant to section .0306(l)(3) of the rules, and is not based on cost alone (refer to .0306(l)(3) of the rules and this guidance document).* Any adjustment of the health-

based remediation goals for carcinogens, including PCBs, must be conducted in accordance with the procedures outlined in Appendix E, section E.2.1.

Note: In some cases, site-specific natural background metals concentrations may exceed the acceptable risk range. As explained in section D.2.1.1.1, cleanup to below site-specific natural background metals concentrations is not required.

Non-Carcinogens

The health-based remediation goals for non-carcinogens shown in Table D-1 are based on a hazard quotient of 0.2. The hazard quotient of 0.2 is used to account for multiple (average of 5) non-carcinogens in the same critical effect group. For sites with less than five non-carcinogens, REC's may adjust the remediation goals using the procedures outlined in Appendix E, section E.2.2, item 1. REC's may also adjust the remediation goals based on the number of contaminants per critical effect group, using the procedures outlined in Appendix E, section E.1.1.

Note: **At sites with surface water contamination, REC's may need to plan the remedial action to address continuing source areas first. For example, surface water contamination may result from continuing releases from soils. In this case, soils must be remediated to whatever levels will ensure attainment of the surface water remediation goals.**

D.2.1.2 "Protection of Groundwater" Soil Remediation Goals

Procedure

In addition to meeting health-based remediation goals, soils must meet a protection of groundwater remediation goal. The REC may use a laboratory leachate analysis model to determine the potential for soils to leach residual contamination to groundwater. The Branch recommends the use of TCLP analysis to determine the leachability of contaminants. If another laboratory model is used, the REC must demonstrate its scientific validity, and that its precision and accuracy are commensurate with its stated use. Soils which leach organic contaminants in excess of the groundwater remediation goals will require further remediation. Soils which leach metals in excess of the groundwater remediation goals (or natural leachable background concentrations, whichever are less stringent) will also require further remediation.

Alternatively the REC can use simple scientifically-valid mathematical equations, employing site-specific field data for all parameters, to calculate protection of groundwater remediation goals. The use of generic values for these parameters is not allowed.

Exceptions

At sites that meet any of the following three conditions, the "protection of groundwater" soil remediation goals do not apply :

1. Residual soil contaminant concentrations (mg/kg) for metals only, do not exceed the site-specific natural background concentrations;

2. Residual soil contaminant concentrations (in mg/kg) for both metals and organics, do not exceed values of twenty times the corresponding groundwater remediation goals (in mg/l);

3. Residual soil contaminant concentrations (in mg/kg) for metals and organics, do not exceed the health-based soil remediation goals (in mg/kg) described in section D.2.1.1, and either (a) or (b) applies:

   (a) the REC has determined that all on-site disposal and releases of hazardous substances occurred prior to 1980, and sampling demonstrates that groundwater is free of hazardous substances;

   (b) the REC-approved remedial action plan for the site includes active groundwater remediation and demonstrates that the final remedy for groundwater will address any future leaching of contaminants from soil to groundwater.

D.2.2 Remediation Goals for Sediments

D.2.2.1 Preliminary Remediation Goals for Sediments

The purpose of this section is to establish preliminary remediation goals for sediments to be used as "target" cleanup levels, and to be used to delineate the extent of sediment contamination during the remedial investigation. Final remediation goals for sediments are described in section D.2.2.2 below.

REC's must establish preliminary remediation goals for sediment based on the *most stringent* of: (i) the health-based soil remediation goals listed in Table D-1 (or the upstream "background" concentrations if less stringent); and (ii) remediation goals sufficient to ensure that contaminated sediment will not cause exceedances of the remediation goals for groundwater and surface water.

D.2.2.2 Final Remediation Goals for Sediments

The preliminary sediment remediation goals established pursuant to section D.2.2.1 should be used as final remediation goals in most cases. Under certain site conditions, the preliminary remediation goals may be adjusted using the procedure explained in section D.2.1.1.2.

Note 1: If contaminated sediments are located in a wetland or other sensitive environment, the REC must contact the Branch for sediment remediation goals.

Note 2: At sites with surface water contamination, REC's may need to plan the remedial action to address continuing source areas first. For example, surface water contamination may result from continuing releases from sediments. In this case, sediments must be remediated to whatever levels will ensure attainment of the surface water remediation goals.

D.2.3 Remediation Goals for Surface Water

For surface water remediation goals, REC's must submit a written request to the Branch. Requests should be mailed to:

North Carolina Superfund Section
Inactive Hazardous Sites Branch
401 Oberlin Road - Suite 150
Raleigh, North Carolina 27605
Attn: Ms. Hanna Assefa, Branch Toxicologist

D.2.4 Remediation Goals for Groundwater

The Branch's remediation goals for groundwater consist of the *least stringent* of: (i) the health-based remediation goals shown in Table D-2; (ii) the method detection limits (using the analytical methods specified in section A.7.1.2); or (iii) natural background concentrations (metals only).

The health-based remediation goals shown in Table D-2 are based on the lower of: (i) State groundwater standards (15A NCAC 2L .0202); (ii) federal Maximum Contaminant Levels (MCL's); or (iii) non-zero Maximum Contaminant Level Goals (MCLG's). For contaminants that are not listed in Table D-2, the REC must calculate a health-based remediation goal using the procedures outlined in Appendix E, section E.3.

D.3. Remediation Goals for Restricted Land Use (Soils and Sediments Only)

Under certain site conditions, it may not be appropriate or feasible to meet the soil or sediment remediation goals described in section D.2. The REC may propose (for Branch review and approval) alternate soil or sediment remediation goals based on a restricted land-use exposure scenario. The process and requirements for proposing restricted land use as a remedy are described in detail in Appendix F of these guidelines. At a minimum, the following will be required at sites using remediation goals based on restricted use:

1. The remediating party must prepare a "Notice of Inactive Hazardous Substance or Waste Disposal Site" and have the notice approved and certified by the Branch and recorded with the county register of deeds office, in accordance with N.C.G.S. 130A-310.8.

2. The remediating party must prepare and submit for Branch approval proposed "restrictive covenants " which will be recorded in the county register of deeds office in the county where the site is located. Owner approval of the "restrictive covenants" is required.

D.4. Additional Provisions

The Branch considers "monitored natural attenuation" to be a potential remedial alternative for attaining the remediation goals established pursuant to Appendices D and E, *not* a waiver of the remediation goals. If natural attenuation of any contaminated medium is proposed, the REC must demonstrate that it is supported by the results of the feasibility study and that it is the preferred remedy.

Table D-1: Soil Remediation Goals (RG's)[1]

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Acetone	67641	1560	N
Acetone cyanohydrin	75865	1100	N
Acetonitrile	75078	94	N
Acetophenone	98862	1560	N
Acrolein	107028	320	N
Acrylamide *	79061	0.14	C
Acrylic acid	79107	7800	N
Acrylonitrile *	107131	1.2	C
Aldicarb	116063	15.6	N
Aldrin *	309002	0.038	C
Allyl alcohol	107186	78	N
Allyl chloride	107051	780	N
4-Aminopyridine	504245	0.32	N
Ammonium sulfamate	7773060	3200	N
Aniline	62533	110	C
Antimony and compounds (not listed below)	7440360	6.2	N
Antimony pentoxide	1314609	7.8	N
Antimony potassium tartrate	304610	14	N
Antimony tetroxide	1332316	6.2	N
Antimony trioxide	1309644	6.2	N
Arsenic	7440382	4.6	N
Benzene	71432	22	C
Benzenethiol	108985	0.156	N
Benzidine *	92875	0.0028	C
Benzoic acid	65850	62000	N
Benzotrichloride	98077	0.049	C
Benzyl chloride	100447	3.8	C
Beryllium and compounds *	7440417	0.15	C
alpha BHC	319846	0.1	C
beta BHC	319857	0.35	C
gamma BHC (Lindane)*	58899	0.49	C

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
technical BHC (hexachlorocyclohexane, all isomers)	608731	0.35	C
Bis(2-chloroethyl)ether	111444	0.58	C
Bis(2-ethylhexyl)phthalate (DEHP)*	117817	46	C
Bis(chloromethyl)ether	542881	0.0029	C
Bromodichloromethane *	75274	10	C
Bromoform (tribromomethane)*	75252	81	C
Bromomethane	74839	22	N
4-Bromophenyl phenyl ether	101553	900	N
1-Butanol	71363	1560	N
Butyl benzyl phthalate	85687	3200	N
Cacodylic acid	75605	46	N
Cadmium and compounds	7440439	7.8	N
Captan*	133062	180	C
Carbaryl	63252	1560	N
Carbon disulfide	75150	1560	N
Carbon tetrachloride *	56235	4.9	C
Chloral	75876	32	N
Chlordane *	57749	1.8	C
Chlorine	7782505	1560	N
2-Chloro-1,3-butadiene	126998	320	N
4-Chloro-2,2-methylaniline hydrochloride	3165933	1.4	C
4-Chloro-2-methylaniline	95692	1.1	C
Chloroacetaldehyde	107200	108	N
4-Chloroaniline	106478	62	N
Chlorobenzene	108907	320	N
Chlorobenzilate *	510156	2.4	C
4-Chlorobenzotrifluoride	98566	320	N
1-Chlorobutane	109693	6200	N
Chlorodibromomethane *	124481	7.6	C
Chloroethane	75003	220	C
2-Chloroethyl vinyl ether	110758	400	N

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
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C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Chloroform *	67663	100	C
Chloromethane	74873	49	C
beta-Chloronaphthalene	91587	1260	N
o-Chloronitrobenzene	88733	26	C
p-Chloronitrobenzene	100005	35	C
2-Chlorophenol	95578	78	N
o-Chlorotoluene	95498	320	N
Chlorpyrifos	2921882	46	N
Chromium III and compounds	16065831	15600	N
Chromium VI and compounds	18540299	78	N
Copper and compounds	7440508	620	N
Crotonaldehyde *	123739	0.34	C
Cumene	98828	1560	N
Cyanide	57125	320	N
Cyclohexanone	108941	78000	N
2-Cyclohexyl-4,6-dinitrophenol (4,6-Dinitro-o-cyclohexyl phenol)	131895	32	N
Dalapon	75990	460	N
DDD	72548	2.7	C
DDE	72559	1.9	C
DDT*	50293	1.9	C
Diallate	2303164	10	C
Diazinon	333415	14	N
Dibenzofuran	132649	62	N
1,2-Dibromo-3-chloropropane	96128	0.46	C
1,2-Dibromoethane	106934	0.0075	C
Di-n-butyl phthalate	84742	1560	N
Dicamba	1918009	460	N
1,2-Dichlorobenzene	95501	1400	N
1,3-Dichlorobenzene	541731	1400	N
1,4-Dichlorobenzene	106467	27	C
3,3'-Dichlorobenzidine	91941	1.4	C

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Dichlorodifluoromethane	75718	3200	N
1,1-Dichloroethane	75343	1560	N
1,2-Dichloroethane (EDC)	107062	7	C
1,1-Dichloroethylene*	75354	1.1	C
1,2-Dichloroethylene (cis)	156592	156	N
1,2-Dichloroethylene (mixture)	540590	140	N
1,2-Dichloroethylene (trans)	156605	320	N
2,4-Dichlorophenol	120832	46	N
2,4-Dichlorophenoxyacetic acid (2,4-D)	94757	156	N
1,2-Dichloropropane	78875	9.4	C
2,3-Dichloropropanol	616239	46	N
1,3-Dichloropropene *	542756	3.7	C
Dichlorvos *	62737	2.2	C
Dicofol	115322	1.5	C
Dieldrin *	60571	0.04	C
Diethyl phthalate	84662	12600	N
Diethylstilbestrol	56531	0.00014	C
Dimethoate	60515	3.2	N
3,3'-Dimethoxybenzidine	119904	46	C
3,3'-Dimethylbenzidine	119937	0.069	C
1,1-Dimethylhydrazine	57147	0.25	C
1,2-Dimethylhydrazine	540738	0.017	C
2,4-Dimethylphenol	105679	320	N
Dimethyl phthalate	131113	156000	N
1,2-Dinitrobenzene (o-Dinitrobenzene)	528290	6.2	N
1,3-Dinitrobenzene (m-Dinitrobenzene)	99650	1.56	N
1,4-Dinitrobenzene (p-Dinitrobenzene)	100254	6.2	N
2,4-Dinitrophenol	51285	32	N
2,4-Dinitrotoluene	121142	32	N
2,6-Dinitrotoluene	606202	15.6	N
Dinitrotoluene mixture	NA	0.94	C

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Dinoseb	88857	15.6	N
1,4-Dioxane (p-Dioxane)	123911	58	C
Dioxins and Furans			
2,3,7,8-Heptachlorodibenzo-p-dioxin (2,3,7,8-HPeCDD)	NA	0.0004	C
2,3,7,8-Hexachlorodibenzo-p-dioxin (2,3,7,8-HxCDD)	NA	0.00004	C
Octachlorodibenzo-p-dioxin (OCDD)	NA	0.004	C
2,3,7,8-Pentachlorodibenzo-p-dioxin (2,3,7,8-PeCDD)	NA	0.000008	C
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746016	0.000004	C
2,3,7,8-Heptachlorodibenzofuran (2,3,7,8-HPCDF)	NA	0.0004	C
2,3,7,8-Hexachlorodibenzofuran (2,3,7,8-HxCDF)	NA	0.00004	C
Octochlorodibenzofuran (OCDF)	NA	0.004	C
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	NA	0.00008	C
2,3,7,8-Pentachlorodibenzofuran (2,3,7,8-PeCDF)	NA	0.000008	C
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	NA	0.00004	C
Diphenylamine	122394	400	N
1,2-Diphenylhydrazine	122667	0.8	C
Diquat	85007	34	N
Disulfoton	298044	0.62	N
Diuron	330541	32	N
Endosulfan	115297	94	N
Endothall	145733	320	N
Endrin	72208	4.6	N
Epichlorohydrin *	106898	65	C
Ethion	563122	7.8	N
2-Ethoxyethanol	110805	6200	N
Ethyl acetate	141786	14000	N
Ethyl acrylate	140885	13	C
Ethylbenzene	100414	1560	N
Ethylene diamine	107153	320	N
Ethylene oxide	75218	0.63	C
Ethylenethiourea (ETU)*	96457	5.4	C

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Ethyl ether	60297	3200	N
Ethyl methacrylate	97632	1400	N
Formaldehyde	50000	3200	N
Formic acid	64186	32000	N
Furfural	98011	46	N
Glycidaldehyde	765344	6.2	N
Heptachlor *	76448	0.14	C
Heptachlor epoxide *	1024573	0.07	C
Hexachlorobenzene*	118741	0.4	C
Hexachlorobutadiene *	87683	8.2	C
Hexachlorocyclopentadiene	77474	110	N
Hexachloroethane *	67721	46	C
Hexachlorophene	70304	4.6	N
Hydrazine	302012	0.21	C
Hydrogen sulfide	7783064	46	N
Isophorone *	78591	670	C
Kepone	143500	0.035	C
Lead	7439921	400	L
Malathion	121755	320	N
Maleic anhydride	108316	1560	N
Maleic hydrazide	123331	7800	N
Malononitrile	109773	0.32	N
Mercury (inorganic)	7439976	4.6	N
Methacrylonitrile	126987	1.56	N
Methanol	67561	7800	N
Methomyl	16752775	400	N
Methoxychlor	72435	78	N
2-Methyl benzenamine (2-methylaniline)	95534	2.7	C
2-Methyl benzenamine hydrochloride (2-methylaniline hydrochloride)	636215	3.5	C
Methyl chlorocarbonate	79221	15600	N
4,4'-Methylene bis(2 chloroaniline)*	101144	4.9	C

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Methylene bromide	74953	156	N
Methylene chloride *	75092	85	C
Methyl ethyl ketone (MEK)	78933	9400	N
Methyl hydrazine	60344	0.58	C
Methyl isobutyl ketone (4-methyl-2-pentanone)	108101	1260	N
Methyl methacrylate	80626	1260	N
Methyl parathion	298000	4	N
3-Methylphenol (m-cresol)	108394	780	N
2-Methylphenol (o-cresol)	95487	780	N
4-Methylphenol (p-cresol)	106445	78	N
2-Methly -1-propanol (isobutanol, isobutyl alcohol)	78831	4600	N
Naled	300765	32	N
2-Naphthylamine	91598	0.0049	C
Nickel and compounds	7440020	320	N
Nitric oxide	10102439	1560	N
4-Nitroaniline	100016	46	N
Nitrobenzene	98953	7.8	N
Nitrogen dioxide	10102440	15600	N
4-Nitrophenol	100027	126	N
N-Nitrosodiethanolamine	1116547	0.23	C
N-Nitrosodiethylamine	55185	0.0043	C
N-Nitrosodimethylamine	62759	0.013	C
N-Nitrosodi-n-butylamine	924163	0.12	C
N-Nitroso di-n-propylamine	621647	0.091	C
N-Nitrosodiphenylamine	86306	130	C
N-Nitroso-N-ethylurea (ethylnitrosourea)	759739	0.0046	C
N-Nitrosopyrrolidine	930552	0.3	C
Nitrotoluene (mixed)		156	N
Octamethylpyrophosphoramide	152169	32	N
di-n-Octyl phthalate	117840	320	N
Paraquat	1910425	70	N

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Parathion	56382	94	N
Pentachlorobenzene	608935	12.6	N
Pentachloronitrobenzene *	82688	2.5	C
Pentachlorophenol *	87865	5.3	C
Phenol	108952	9400	N
p-Phenylenediamine	106503	3000	N
Phenylmercuric acetate	62384	1.26	N
Phorate	298022	3.2	N
Phosphine	7803512	4.6	N
Phosphorus (white)	7723140	0.32	N
Phthalic anhydride	85449	32000	N
Polychlorinated biphenyls (PCBs)[2]	1336363	1/10	P
Polynuclear aromatic hydrocarbons			
Acenaphthene	83329	940	N
Anthracene	120127	4600	N
Benzo[a]pyrene	50328	0.088	C
Benzo[b]fluoranthene	205992	0.88	C
Benzo[k]fluoranthene	207089	8.8	C
Benz[a]anthracene	56553	0.88	C
Carbofuran	1563662	78	N
Chrysene	218019	88	C
Dibenz[a,h]anthracene	53703	0.088	C
Fluoranthene	206440	620	N
Fluorene	86737	620	N
Indeno(1,2,3-cd)pyrene	193395	0.88	C
Naphthalene	91203	620	N
2-methyl Naphthalene	91576	460	N
Pyrene	129000	460	N
Pronamide	23950585	1180	N
Propargite	2312358	320	N
Propargyl alcohol	107197	32	N

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the $1.0E^{-6}$ risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Propazine	139402	320	N
Propylene oxide	75569	2.7	C
Pyridine	110861	15.6	N
Quinoline	91225	0.053	C
Selenious acid	7783008	78	N
Selenium	7782492	78	N
Selenourea	630104	78	N
Silver and compounds	7440224	78	N
Sodium azide	26628228	62	N
Sodium fluoroacetate	62748	0.32	N
Strychnine	57249	4.6	N
Styrene	100425	3200	N
1,2,4,5-Tetrachlorobenzene	95943	4.6	N
1,1,2,2-Tetrachloroethane	79345	3.2	C
1,1,1,2-Tetrachloroethane *	630206	25	C
Tetrachloroethylene (PCE)*	127184	12	C
2,3,4,6-Tetrachlorophenol	58902	460	N
p,a,a,a-Tetrachlorotoluene	5216251	0.032	C
Tetraethyldithiopyrophosphate	3689245	7.8	N
Tetraethyl lead	78002	0.00156	N
Thallic oxide	1314325	1.1	N
Thallium	NA	1.26	N
Thallium acetate	563688	1.4	N
Thallium carbonate	6533739	1.26	N
Thallium chloride	7791120	1.26	N
Thallium nitrate	10102451	1.4	N
Thallium selenite	12039520	1.4	N
Thallium sulfate	7446186	1.26	N
Thiofanox	39196184	4.6	N
Thiram	137268	78	N
Toluene	108883	3200	N

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-1: Soil Remediation Goals (RG's)[1] - (Cont.)

**Hazardous substances identified with an asterisk exhibit both carcinogenic and non-carcinogenic effects. The carcinogenic remediation goal is listed because it is more stringent at the 1.0E-6 risk concentration than the remediation goal for non-carcinogenic effects. See Appendix E for procedures to calculate remediation goals for chemicals not listed on the table. Cleanup below method detection limits, using analytical methods prescribed in the guidelines, is not required.*

Chemical	*CASRN*	*RG (ppm)*	
Toluene-2,4-diamine	95807	0.2	C
Toluene-2,6-diamine	823405	3200	N
p-Toluidine	106490	3.4	C
Toxaphene	8001352	0.58	C
1,1,2-Trichloro-1,2,2-trifluoroethane	76131	200000	N
1,2,4-Trichlorobenzene	120821	156	N
1,1,1-Trichloroethane	71556	320	N
1,1,2-Trichloroethane *	79005	11	C
Trichloroethylene (TCE)*	79016	58	C
Trichlorofluoromethane	75694	4600	N
2,4,6-Trichlorophenol	88062	58	C
2,4,5-Trichlorophenol	95954	1560	N
2-(2,4,5-Trichlorophenoxy)propionic acid	93721	126	N
2,4,5-Trichlorophenoxyacetic acid	93765	156	N
1,1,2-Trichloropropane	598776	78	N
1,2,3-Trichloropropane *	96184	0.091	C
1,3,5-Trinitrobenzene	99354	0.78	N
Vanadium pentoxide	1314621	140	N
Vinyl acetate	108054	15600	N
Vinyl chloride	75014	0.34	C
Xylene (mixed)	1330207	32000	N
Zinc	7440666	4600	N
Zinc phosphide	1314847	4.6	N

1 - Adapted from USEPA Region III Risk Based Concentration Table, except as noted.
2 - The RG is 1 ppm from 0-10 inches and 10 ppm below 10 inches.
C - The RG is based on the carcinogenic endpoint and corresponds to an excess lifetime cancer risk of 1 in 1,000,000.
L - The RG is based on USEPA guidance on lead cleanup levels.
N - The RG is based on the non-carcinogenic endpoint and corresponds to a hazard quotient of 0.2.
NA - Not Available.
P - The RG is based on USEPA PCB spill policy.

Table D-2: Groundwater Remediation Goals (RG's)

For each contaminant the lower of the 15A NCAC 2L standard or interim standard, the USEPA non -zero MCLG, or the USEPA MCL was retained as the remediation goal. All RG's unless otherwise specified by footnotes are the 15A NCAC 2L standard or interim standard. Cleanup below method detection limits, using analytical methods prescribed in these guidelines, is not required. See Appendix E.3 for procedures to calculate remediation goals for chemicals not listed on the table.

Chemical	*CASRN*	*RG (ppb)*
Acenaphthene	83329	80
Acenaphthylene	208968	210
Acetone	67641	700
Acrylamide	79061	0.01
Aldicarb[2]	116063	7
Anthracene	120127	2100
Antimony[2]	7440360	6
Arsenic	7440382	50
Barium	7440393	2000
Benzene	71432	1
Benzo(a)anthracene	56553	0.0479
Beryllium[1]	7440417	4
Bis(2-ethylhexyl)phthalate	117817	3
Bromodichloromethane	75274	0.56
Bromoform	75252	0.19
Butyl benzyl phthalate	85687	100
Cadmium	7440439	5
Caprolactam	105602	3500
Carbon disulfide	75150	700
Carbofuran	1563662	36
Carbon tetrachloride	56235	0.3
Chlordane	57749	0.027
Chlorobenzene	108907	50
Chlorodibromomethane[2]	124481	80
Chloroform	67663	0.19
2-Chlorophenol	95578	0.1
Chromium	744073	50
Chrysene	218019	4.79
Copper	7440508	1000

1 USEPA MCL.
2 USEPA MCLG.

Table D-2: Groundwater Remediation Goals (Cont.)

Chemical	*CASRN*	*RG (ppb)*
Cyanide	57125	154
1,2-Dibromo-3-chloropropane	96128	0.025
ortho-Dichlorobenzene (1,2-Dichlorobenzene)	95501	620
meta-Dichlorobenzene (1,3-Dichlorobenzene)	541731	620
para-Dichlorobenzene (1,4-Dichlorobenzene)	106467	75
Dichlorodifluoromethane (Freon-12)	75718	1400
1,1-Dichloroethane	75343	700
1,2-Dichloroethane	107062	0.38
1,1-Dichloroethylene	75354	7
cis-1,2-Dichloroethylene	156902	70
trans-1,2-Dichloroethylene	156605	70
2,4-Dichlorophenoxy-acetic-acid (2,4-D)	94757	70
1,2-Dichloropropane	78875	0.56
1,3-Dichloropropene	542756	0.19
Diethyl phthalate	84662	5000
Di-n-butyl phthalate	84742	700
Diquat[2]	85007	20
para-Dioxane	123911	7
2,3,7,8-tetrachlorodibenzo-p-Dioxin (2,3,7,8-TCDD)	1746016	2.2×10^{-7}
Endrin	72208	2
Ethlylbenzene	100414	29
Ethylene dibromide	106934	0.0004
Fluoranthene	206440	280
Heptachlor	76448	0.008
Heptachlor epoxide	1024573	0.004
Hexachlorobenzene	118741	0.02
Hexachlorobutadiene[2]	87683	1
Hexachlorocyclopentadiene[2]	608731	50
Lead	7439921	15
Lindane	58899	0.2
Mercury	7439976	1.1
Methanol	67561	3500
Methoxychlor	72435	35

1 USEPA MCL.
2 USEPA MCLG.

Table D-2: Groundwater Remediation Goals (Cont.)

Chemical	*CASRN*	*RG (ppb)*
Methyl ethyl ketone	78933	170
Methylene chloride	75092	5
Napthalene	91203	21
Nickel	7440020	100
Pentachlorophenol	87865	0.3
Phenol	108952	300
PCB's[1]	1336363	0.5
Pyrene	129000	210
Selenium	7782492	50
Silver	7440224	18
Styrene	100425	100
2,4,5-TP[2]	93765	50
Tetrachloroethylene	127184	0.7
Thallium[2]	7440280	0.5
Toluene	108883	1000
Toxaphene	8001352	0.031
1,2,4-Trichlorobenzene[1]	120821	70
1,1,1-Trichloroethane	71556	200
1,1,2-Trichloroethane[2]	79005	3
Trichloroethylene	79016	2.8
Trichlorofluoromethane	75694	2100
Vinyl chloride	75014	0.015
Xylenes	1320000	530
Zinc	1310000	2100

1 USEPA MCL.
2 USEPA MCLG.

Appendix E: Remediation Goal Calculations

E.1. Calculating Health-Based Soil Remediation Goals

REC's should use this section to calculate health-based soil preliminary remediation goals for contaminants (CERCLA hazardous substances only) that are not listed in Table D-1. The procedures for calculating remediation goals for non-carcinogens and carcinogens are outlined in sections E.1.1 and E.1.2, respectively. *For contaminants that have both non-carcinogenic and carcinogenic effects, the REC must calculate remediation goals for both and use the lower (more stringent) concentration.*

Note: Data evaluation and calculation of remediation goals must be conducted by qualified risk assessment staff.

E.1.1 Calculating Health-Based Remediation Goals for Non-Carcinogens

REC's should use Equation E.1.1 below to calculate health-based remediation goals for non-carcinogens. Non-carcinogens are grouped by critical-effect group. The target hazard index term (THI/n) is set equal to 1/n, where n is the number of non-carcinogens in the same critical effect group. The REC should use Equation E.1.1 to calculate a remediation goal for each critical effect group. The lowest (most stringent) resulting concentration is used as the remediation goal. Note that a contaminant can have more than one critical effect.

$$\text{Remediation goal } \frac{(mg)}{(kg)} = \frac{THI/n \cdot RfDo \cdot BWc \cdot ATnc}{EFr \cdot EDc \cdot \frac{IRSc}{10^6\ {}^{mg}/_{kg}}} \quad \text{(Equation E.1.1)}$$

where:

THI	Target hazard index:	1
n	Number of non-carcinogens in same critical-effect group:	*
RfDo	Reference dose oral (mg/kg/day):	*
BWc	Body weight, child, age 1-6 (kg):	15
ATnc	Averaging time, non-carcinogens (days):	EDcx365
EFr	Exposure frequency (days/yr.):	350
EDc	Exposure duration, child, age 1-6 (yrs.):	6
IRSc	Soil ingestion, child, age 1-6 (mg/day):	200

* The sources for non-carcinogenic reference doses (RfDo), in order of priority, are: (1) most current USEPA Integrated Risk Information System (IRIS); (2) most current Health Effects Assessment Summary Tables (HEAST); (3) HEAST alternative method; or (4) data that has been withdrawn from IRIS or HEAST. Each source is to be used only if numbers from higher priority sources are not available. Documentation of the source of reference dose data (e.g., dated IRIS printouts) must be provided in the remedial action plan.

E.1.2 Calculating Health-Based Remediation Goals for Carcinogens

REC's should use Equation E.1.2 below to calculate health-based remediation goals for carcinogens.

$$\text{Remediation goal} \quad \frac{(mg)}{(kg)} = \frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6\ mg/kg} \cdot CPSo} \qquad \text{(Equation E.1.2)}$$

Where:

$$IFSadj = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

TR	Total risk:	1.0E-06
ATc	Averaging time, carcinogens (days):	25550
EFr	Exposure frequency (days/yr.):	350
IFSadj	Soil ingestion factor, age adjusted (mg-yr./kg-day):	114.29
CPSo	Carcinogenic potency slope, oral (risk per mg/kg/day):	*
EDc	Exposure duration, child, age 1-6 (yrs.):	6
IRSc	Soil ingestion, child, age 1-6 (mg/day):	200
BWc	Body weight, child, age 1-6 (kg):	15
EDtot	Exposure duration, total (yrs.):	30
IRSa	Soil ingestion, adult (mg/day):	100
BWa	Bodyweight, adult (kg):	70

* The sources for carcinogenic potency slope (CPSo), in order of priority, are: (1) most current USEPA Integrated Risk Information System (IRIS); (2) most current Health Effects Assessment Summary Tables (HEAST); (3) HEAST alternative method; or (4) data withdrawn from IRIS or HEAST. Each source is to be used only if numbers from higher priority sources are not available.

E.2. Calculating Final Health-Based Soil Remediation Goals

If adjustment of the preliminary health-based soil remediation goals is warranted by section D.2.1.1.2 and the remedy selection process, the REC should make adjustments using the procedures outlined below. **If a contaminant has both non-carcinogenic and carcinogenic effects (identified with an asterisk in Table D-1), health-based remediation goals must be calculated for both health effects. The final remediation goal is set at the lower (more stringent) of: (a) the lowest concentration the selected remedy (selected based on the**

feasibility evaluation conducted pursuant to 15A NCAC 13C .0306(l)(3) and (5)) can achieve in the concentration range established for carcinogens under E.2.1, and (b) the concentration established for non-carcinogens under E.2.2.

E.2.1 Carcinogens

Sites Without PCB Contamination

At sites where no PCB's are present, REC's should use the following procedure when calculating a concentration corresponding to the upper limit of the acceptable risk range (i.e., 1×10^{-4}). Note that final remediation goals for carcinogens are determined during the remedy selection process by the lowest numbers the selected remedy can achieve and must fall within the acceptable cancer risk range (i.e., 10^{-4} to 10^{-6}). The values for carcinogens presented on Table D-1 correspond each to 1×10^{-6} risk. To determine 1×10^{-4} values:

Multiply the health-based remediation goal in Table D-1 by 100/n, where n is the number of carcinogens present (carcinogens are denoted by a (C) in Table D-1).

Sites with PCBs and No Other Carcinogens

$1 \times 10^{-4} = 32$ ppm.

Sites With PCBs and Other Carcinogens

At sites where PCBs and other carcinogens are present, RECs should use the following procedures to calculate concentrations corresponding to the upper limit of the acceptable risk range (i.e., 1×10^{-4}). Note that final remediation goals for carcinogens are determined during the remedy selection process by the lowest numbers the selected remedy can achieve and must fall within the acceptable cancer risk range (i.e., 10^{-4} to 10^{-6}). Again, values corresponding to the lower end of the risk range are provided in Table D-1. The numbers of 1 (above 10 inches of depth) and 10 (at below 10 inches of depth) ppm are preliminary remediation goals for PCBs (see Note 1 in D.2.1.1.1.). These concentrations correspond to 3.1×10^{-6} and 3.1×10^{-5} risk, respectively. To determine 1×10^{-4} values:

PCBs: Divide 32 ppm by the number of carcinogens present (including PCBs).

Non-PCB Carcinogens: Multiply the health-based remediation goal in Table D-1 by 100/n, where n is the number of carcinogens present (including PCBs).

E.2.2 Non-Carcinogens

1. If the REC elects to adjust the preliminary remediation goals for sites with less than five non-carcinogens, the following equation must be used:

   Final remediation goal = health-based remediation goal x 5/n; where n= the number of non-carcinogens present.

2. If the REC elects to adjust the remediation goals based on the number of contaminants per critical effect group, the procedures shown in section E.1.1 must be used.

E.3. Calculating Health-Based Groundwater Remediation Goals

REC's should use this section to calculate health-based groundwater remediation goals for contaminants (CERCLA hazardous substances only) that are not listed in Table D-2.

1. The USEPA Region III Risk-Based Concentration (RBC) table should be used as a screening tool to determine if further action is required. If the RBC tap water concentration is based on non-carcinogenicity, it should be adjusted by multiplying by 0.1. If the RBC tap water concentration is based on carcinogenicity, no adjustment is required.

   The RBC table is available at the following Internet address:

   http://www.epa.gov/reg3hwmd/risk/riskmenu.htm

2. If site groundwater concentrations for any one contaminant exceed the RBC tap water concentrations, the REC must propose an interim groundwater standard to the NC Division of Water Quality (DWQ) in accordance with 15A NCAC 2L for all contaminants that do not have a standard. The DWQ Groundwater Section can provide examples of how to calculate proposed 2L standards. Once the Groundwater Section has reviewed and approved the REC's proposal and issued an interim 2L standard, the interim standard can be used as the health-based remediation goal. For additional information on interim 2L standards, please contact Mr. David Hance of the NC Groundwater Section at (919) 715-6189.

Appendix F: Land Use Restrictions

F.1. Approval Process for Use of Land Use Restrictions as the Remedy

Pursuant to N.C.G.S. 130A-310.3(f) an owner, operator or other responsible party may seek approval for the use of land use restrictions in place of, or in conjunction with, active remediation of contaminated soils and sediments where the feasibility evaluation of potential remedies supports selecting such a remedial approach. Leaving contaminants in place above unrestricted use remediation goals with appropriate land use restrictions is a form of on-site containment. Therefore, as required for all on-site containment remedies pursuant to Rule .0306(i), the REC must obtain written Branch concurrence prior to implementing any remedy involving land use restrictions.

Approved land use restrictions must be recorded and indexed to the property deed in the grantor index in the appropriate Register of Deeds office(s). A "Notice of an Inactive Hazardous Substance or Waste Disposal Site" must also be prepared and recorded in accordance with N.C.G.S. 130A-310.8 for sites where land use restrictions are to be used in place of remediation to unrestricted use remediation goals.

The REC must follow the steps below for approval of remedies and remediation goals involving land use restrictions:

1. The REC submits a land use restriction proposal to the Branch containing:

    a. A brief summary of available remedies (including the proposed remedy) outlining projected costs and why each remedy was accepted or rejected.

    b. A proposal as to what activities and uses should be restricted at the site. Examples of possibly precluded activities are:

        (i) Construction of buildings and other man-made structures.

        (ii) Excavating, dredging or otherwise removing soils and sediments at all, or below specified depths.

        (iii) Planting or removal of vegetation including edible varieties, trees and shrubs.

        (iv) Limitations on site use, (e.g., preclusion of all uses other than industrial/commercial).

    c. The deed book and page numbers for the property or properties where the restrictions will apply if approved and the plat book and page numbers for any "Notice of an Inactive Hazardous Substance or Waste Disposal Site" already recorded in relation to the site.

d. A summary of the proposed remedy including any proposed active remediation and engineering controls to be applied in conjunction with the proposed restrictive covenants.

e. Proposed alternate use remediation goals. ***The REC may contact the Branch for standard industrial/commercial remediation goals. If, however, a site specific exposure scenario and remediation goals are being proposed, supporting risk and exposure assessment calculations must be provided.***

f. Written consent by the owner(s) of the site to the imposition of land use restrictions using the form provided in section F.2.

g. A summary of the plan for annual inspection of the site and verification of maintenance of land use restrictions. ***The owner or responsible party shall conduct an inspection of the site no less than annually and submit a signed and notarized statement that the land use restrictions are still in effect and that conditions at the site are not in violation of the land use restrictions. The Branch may later supply a form for such purposes. Owners, operators and other responsible parties are required under N.C.G.S. 130A-310.3(f) to enforce the land use restrictions and expected to take action immediately upon discovery of a violation of the land use restrictions. Failure to do so will cause automatic revocation of Branch concurrence on the remedial action.***

2. The Branch approves the proposal as to what activities and uses should be restricted, rejects it or communicates with the REC regarding changes. If agreement is reached on the proposal, the Branch transmits to the REC the land use restriction document as it is to be recorded. If the document is acceptable to the responsible party the REC shall, within the time period specified by the Branch, proceed with public notice of the remedial action plan (including the land use restrictions document) in accordance with Rule .0306(j). After the Branch issues written concurrence on the remedial action plan, the REC shall record the land use restrictions document within the time period specified by the Branch. The Branch will not issue approval until the 30-day public notice period has ended and all Branch and public concerns have been addressed to the Branch's satisfaction.

3. The REC submits to the Branch for approval a draft "Notice of an Inactive Hazardous Substance or Waste Disposal Site" (Notice) if such a Notice has not already been recorded for the site. The Notice takes the form of a site survey plat prepared in accordance with N.C.G.S. 130A-310.8 and Branch guidance. The REC may prepare and submit the Notice plat to the Branch during the public notice period.

4. Once the public notice period concludes and the Branch gives written approval to proceed, the REC must, within the time period specified by the Branch, deliver their land use restrictions document to the appropriate Register of Deeds office(s) for recordation and indexing in the grantor index under the names of the owners of all affected property. The Branch will not issue approval to proceed with recordation of the land use restrictions until the Branch has received a draft Notice the Branch concludes is complete (with the exception of the land use restrictions book and page number reference, which is not assigned until the time of recordation of the restrictions).

5. The REC submits to the Branch a copy of the land use restrictions document, certified by the appropriate Register of Deeds as having been recorded, a copy of the relevant grantor index page(s), and the finalized copy of the "Notice of an Inactive Hazardous Substance or Waste Disposal Site." The book and page number of the land use restrictions document must be referenced on the Notice.

6. Once the Notice is approved by the Branch, the REC must, within the time period specified by the Branch, deliver the Notice to the Register of Deeds office in the county where the property is located for recordation. The Register of Deeds must record the Notice and index it in the grantor index under the names of the owners of the properties.

7. The responsible party must, within the time period specified by the Branch, submit to the Branch a copy of the Notice, certified by the appropriate Register of Deeds as having been recorded, along with a copy of the relevant grantor index pages.

Note: ***Failure of the responsible party and the REC to comply with deadlines issued by the Branch for submittal of various documents will cause automatic revocation of Branch concurrence on the remedial action plan.***

F.2. Land Use Restrictions Consent Form

The following is the form required to be submitted (see 1.f. in section F.1) indicating provisional consent of the site's owner to the imposition of land use restrictions, subject to later withdrawal when the owner reviews the land use restrictions document.

VOLUNTARY CONSENT TO IMPOSITION OF LAND USE RESTRICTIONS

_____ Superfund Site, _____ County, North Carolina

I, _____, owner in fee simple of real property located at ____[street address]____, ___[town or city]_, _____ County, North Carolina which includes the _____ Superfund site (the "Site"), am agreeable to the imposition of Land Use Restrictions ("Restrictions") partially or completely in lieu of actual remediation of hazardous substances at the Site. I understand that I will be required to document any agreement to the actual Restrictions approved for the Site by the North Carolina Department of Environment and Natural Resources, and that I may refuse to consent upon review of the actual Restrictions.

IN WITNESS WHEREOF, _____ has caused these presents to be executed in its name by __[name of atty. or other agent if the is one]_, its _____[title]_____, this _____ day of _____, _____.

_____[name of owner if agent is signing]_____

By: _____[signature of atty. or other agent if there is one]_____

Signatory's name typed or printed: _____

STATE OF NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public, do hereby certify that _____ personally appeared before me this day and acknowledged that he/she is the _____[title]_____ of _____[owner]_____ and that by authority duly given, and as the act of _____[owner]_____, the foregoing instrument was signed in its name by such ____[title]_____.

WITNESS my had and official seal this _____ day of _____, _____.

_____
Notary Public

My commission expires _____.

F.3. Cancellation of Land Use Restrictions

At a subsequent date, should the owner believe that all hazards have been removed and that hazardous substances are no longer present at the site above unrestricted use remediation goals, the owner may request Branch approval to cancel the land use restrictions. Canceling land use restrictions without prior Branch approval will cause automatic revocation of approval of the remedial action plan and will subject the party taking such action to enforcement.

Appendix G: Certification Statements

G.1. Certification of Documents

All work plans, reports and project schedules submitted to the Branch must be certified by a representative of the remediating party, and subsequently by the Registered Site Manager. The "certification of documents" statements are shown below. The language in the certification statements is specified in the rules and may not be modified under any circumstances.

Remediating Party Certification Statement (.0306(b)(2)):

> "I certify under penalty of law that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this certification, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

Registered Site Manager Certification Statement (.0306(b)(1)):

> "I certify under penalty of law that I am personally familiar with the information contained in this submittal, including any and all supporting documents accompanying this certification, and that the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete and complies with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq, and the voluntary remedial action program Rules 15A NCAC 13C .0300. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information."

G.2 Certification of Work Phase Completion

The attached Completion Certification forms must be used to certify the completion of work phases in accordance with .0306(b)(5) and (b)(6). The Registered Site Manager must use the attached forms or photocopies of these forms only (i.e., retyped or computer-generated forms are unacceptable). All information on the forms must be typed or neatly printed. The forms must include the notarized signature of the Registered Site Manager.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

PHASE I REMEDIAL INVESTIGATION COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(A)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The Phase I remedial investigation which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____ _____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

REMEDIAL INVESTIGATION COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(B)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The remedial investigation which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

PROPOSED REMEDIAL ACTION PLAN COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(C)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The proposed remedial action plan which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____ _____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

REMEDIAL DESIGN COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(D)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The remedial design which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____ _____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

CONSTRUCTION COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(D)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The construction of the final remedy which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____ _____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

North Carolina Department of Environment
and Natural Resources
Division of Waste Management
Superfund Section
Inactive Hazardous Sites Branch

REMEDIAL ACTION COMPLETION CERTIFICATION
15A NCAC 13C.0306(b)(5)(E)

Site Name: _____ Street Address: _____

County: _____ _____

Site ID No.: _____ _____

The approved and certified site remedial action plan has been implemented, and to the best of my knowledge and belief, cleanup levels determined pursuant to Rule .0308 of this Section have been achieved, and no significant or otherwise unacceptable risk or harm to human health or the environment remains at the site.

The remedial action which is the subject of this certification has, to the best of my knowledge, been completed in compliance with the Inactive Hazardous Sites Response Act G.S. 130A-310, et seq. and the voluntary remedial action program Rules 15A NCAC 13C .0300, and _____ is in compliance with Rules .0305(b)(2) and .0305(b)(3), of this Section. I am aware that there are significant penalties for willfully submitting false , inaccurate or incomplete information.

_____ _____
RSM Signature Date

_____
RSM Name

_____ _____
REC Name Mailing Address

_____ _____
REC No. City, State, ZIP

NORTH CAROLINA
_____ COUNTY

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, _____.

_____
Notary Public (signature) (OFFICIAL SEAL)

My commission expires: _____.

Appendix H: Checklist for Registered Environmental Consultant (REC) Program Eligibility

Note: An affirmative response to any of these questions does not automatically preclude a site from an REC-supervised remedial action. However, the state has the complete discretion to oversee site remedial actions directly. If the state elects to directly oversee a remedial action, the volunteer is not required to hire an REC.

		Circle One	
1.	Are contaminated soils, wastes, surface water or sediments readily accessible to the public?	Y	N
2.	Can site access be easily controlled?	Y	N
3.	Are hazardous vapors, air emissions or contaminated dust migrating into occupied residential, commercial or industrial areas?	Y	N
4.	Have hazardous substances migrated off-site at concentrations in excess of Branch unrestricted-use remediation goals (see section D.2 of REC implementation guidance)?	Y	N
5.	Has groundwater contamination affected any drinking-water wells?	Y	N
6.	Has the local community expressed concerns about contamination at the site?	Y	N
7.	Are there any sensitive environments located on the property (sensitive environments are identified in section .0306(g)(7) of the REC implementation guidance)?	Y	N
	If yes, please explain on a separate page.		
8.	Has contamination from the site migrated into any sensitive environments?	Y	N
	If yes, please explain on a separate page.		
9.	Do site contaminants include radioactive or mixed radioactive and chemical wastes?	Y	N
10.	Is the site located on or immediately adjacent to residential property, schools, day-care centers or other sensitive populations?	Y	N

_____ Check here if attachments for items 7 and 8 are included.

Remediating Party Certification Statement

I hereby certify that the responses provided above are, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ _____

(Signature of Remediating Party Representative) (date)

_____

(Printed Name and Title of Remediating Party Representative)

_____

(Printed Name of Company)

_____

(State in which signature is witnessed)

_____ **County**

I, _____, a Notary Public of said County and State, do hereby certify that

_____ did personally appear and sign before me this the _____ day of _____, ____.

_____

Notary Public (signature)

(OFFICIAL SEAL)

My commission expires: _____

Environmental Consultant Certification Statement

I hereby certify that the responses provided above are, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for willfully submitting false, inaccurate or incomplete information.

_____ (Signature)

_____ (date)

_____ (Printed Name)

_____ (Printed Name of Environmental Consultant)

_____ *(State in which signature is witnessed)*

_____ **County**

I, _____, a Notary Public of said County and State, do hereby certify that _____ did personally appear and sign before me this the _____ day of _____, ____.

_____ Notary Public (signature)

(OFFICIAL SEAL)

My commission expires: _____

REFERENCE 75

download 6/17/98

EPA REGION III RISK-BASED CONCENTRATION TABLE
TECHNICAL BACKGROUND INFORMATION

(Originally developed by Roy L. Smith, Ph.D.)

Development of Risk-Based Concentrations

General

Separate carcinogenic and non-carcinogenic risk-based concentrations were calculated for each compound for each pathway. The concentration in the table is the lower of the two, rounded to two significant figures. The following terms and values were used in the calculations:

Exposure variables	Value	Symbol
General:		
Carcinogenic potency slope oral (risk per mg/kg/d):	*	CPSo
Carcinogenic potency slope inhaled (risk per mg/kg/d):	*	CPSi
Reference dose oral (mg/kg/d):	*	RfDo
Reference dose inhaled (mg/kg/d):	*	RfDi
Target cancer risk:	1e-06	TR
Target hazard quotient:	1	THQ
Body weight, adult (kg):	70	BWa
Body weight, age 1-6 (kg):	15	BWc
Averaging time carcinogens (d):	25550	ATc
Averaging time non-carcinogens (d):	ED*365	ATn
Inhalation, adult (m3/d):	20	IRAa
Inhalation, child (m3/d):	12	IRAc
Inhalation factor, age-adjusted (m3-y/kg-d):	11.66	IFAadj
Tap water ingestion, adult (L/d):	2	IRWa
Tap water ingestion, age 1-6 (L/d):	1	IRWc
Tap water ingestion factor, age-adjusted (L-y/kg-d):	1.09	IFWadj
Fish ingestion (g/d):	54	IRF
Soil ingestion, adult (mg/d):	100	IRSa
Soil ingestion, age 1-6 (mg/d):	200	IRSc
Soil ingestion factor, age adjusted (mg-y/kg-d):	114.29	IFSadj
Residential:		
Exposure frequency (d/y):	350	EFr
Exposure duration, total (y):	30	EDtot
Exposure duration, age 1-6 (y):	6	EDc
Volatilization factor (L/m3):	0.5	K
Occupational:		
Exposure frequency (d/y):	250	EFo
Exposure duration (y):	25	EDo
Fraction of contaminated soil ingested (unitless)	0.5	FC

*: Contaminant-specific toxicological constants. The priority among sources of toxicological constants was as follows: (1) IRIS, (2) HEAST, (3) HEAST alternative method, (4) EPA-NCEA Superfund Health Risk Technical Support Center, (5) withdrawn from IRIS or HEAST, and (6) other EPA documents. Each source was used only if numbers from higher-priority sources were unavailable. The EPA Superfund Health Risk Technical Support Center, part of the EPA National Center for Environmental Assessment in Cincinnati, develops provisional RfDs and CPSs on request for contaminants not in IRIS or HEAST. These provisional values are labeled "E = EPA-NCEA provisional" in the table. It is possible they may be obsolete. If one of the "E" constants is important to a Superfund risk assessment, consider requesting, through a Regional risk assessor, a new provisional value.

Age-adjusted factors

Because contact rates with tap water, ambient air, and residential soil are different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors. These factors approximated the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure durations for two age groups - small children and adults. The age-adjusted factor for soil was obtained from RAGS IB; the others were developed by analogy.

(1) Air inhalation

$$IFAadj \ \frac{m^3 \cdot y}{kg \cdot d} = \frac{EDc \cdot IRAc}{BWc} + \frac{(EDtot - EDc) \cdot IRAa}{BWa}$$

(2) Tap water ingestion

$$IFWadj \ \frac{L \cdot y}{kg \cdot d} = \frac{EDc \cdot IRWc}{BWc} + \frac{(EDtot - EDc) \cdot IRWa}{BWa}$$

(3) Soil ingestion

$$IFSadj \ \frac{mg \cdot y}{kg \cdot d} = \frac{EDc \cdot IRSc}{BWc} + \frac{(EDtot - EDc) \cdot IRSa}{BWa}$$

Residential water

Volatilization terms were calculated only for compounds with a mark in the "VOC" column. Compounds having a Henry's Law constant greater than 10^{-5} were considered volatile. The list may be incomplete, but is unlikely to include false positives. The equations and the volatilization factor (K, above) were obtained from RAGS IB. Oral potency slopes and reference doses were used for both oral and inhaled exposures for volatile compounds lacking inhalation values. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

(4) Carcinogens

$$RBC \ \frac{\mu g}{L} = \frac{TR \cdot ATc \cdot 1000 \frac{\mu g}{mg}}{EFr \cdot ([K \cdot IFAadj \cdot CPSi] + [IFWadj \cdot CPSo])}$$

(5) Non-carcinogens

$$RBC\ \frac{\mu g}{L} = \frac{THQ \cdot BWa \cdot ATn \cdot 1000\frac{\mu g}{mg}}{EFr \cdot EDtot \cdot \left(\frac{K \cdot IRAa}{RfDi} + \frac{IRWa}{RfDo}\right)}$$

Ambient air

Oral potency slopes and references were used where inhalation values were not available. RBCs for carcinogens were based on combined childhood and adult exposure; for non-carcinogens RBCs were based on adult exposure.

(6) Carcinogens

$$RBC\ \frac{\mu g}{m^3} = \frac{TR \cdot ATc \cdot 1000\frac{\mu g}{mg}}{EFr \cdot IFAadj \cdot CPSi}$$

(7) Non-carcinogens

$$RBC\ \frac{\mu g}{m^3} = \frac{THQ \cdot RfDi \cdot BWa \cdot ATn \cdot 1000\frac{\mu g}{mg}}{EFr \cdot EDtot \cdot IRAa}$$

Edible fish

All RBCs were based on adult exposure.

(8) Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR \cdot BWa \cdot ATc}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}} \cdot CPSo}$$

(9) Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFr \cdot EDtot \cdot \frac{IRF}{1000\frac{g}{kg}}}$$

Commercial/industrial soil ingestion

RBCs were based on adult occupational exposure, including an assumption that only 50% of total soil ingestion is work-related.

(10) Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR \cdot BWa \cdot ATc}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC \cdot CPSo}$$

(11) Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWa \cdot ATn}{EFo \cdot EDo \cdot \frac{IRSa}{10^6\ \frac{mg}{kg}} \cdot FC}$$

Residential soil ingestion

RBCs for carcinogens were based on combined childhood and adult exposure; RBCs for non-carcinogens were based on childhood exposure only.

(12) Carcinogens

$$RBC\ \frac{mg}{kg} = \frac{TR \cdot ATc}{EFr \cdot \frac{IFSadj}{10^6\ \frac{mg}{kg}} \cdot CPSo}$$

(13) Non-carcinogens

$$RBC\ \frac{mg}{kg} = \frac{THQ \cdot RfDo \cdot BWc \cdot ATn}{EFr \cdot EDc \cdot \frac{IRSc}{10^6\ \frac{mg}{kg}}}$$

Sources: EPA Region III RBC Table 4/15/98 Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
ACETALDEHYDE	75070			2.57E-03 I	7.7E-03 I			8.1E-01 C			
ACETOCHLOR	34256821	2E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
ACETONE	67641	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
ACETONITRILE	75058	6.00E-03 I		1.40E-02 A			2.2E+02 N	5.1E+01 N	8.1E+00 N	1.2E+04 N	4.7E+02 N
ACETOPHENONE	98862	1.00E-01 I		5.70E-06 W		y	4.2E-02 N	2.1E-02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
ACROLEIN	107028	2.00E-02 H		5.70E-06 I		y	4.2E-02 N	2.1E-02 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
ACRYLAMIDE	79061	2.00E-04 I	4.50E+00 I		4.50E+00 I		1.5E-02 C	1.4E-03 C	7.0E-04 C	1.3E+00 C	1.4E-01 C
ACRYLONITRILE	107131	1.00E-03 H	5.40E-01 I	5.70E-04 I	2.40E-01 I		1.2E-01 C	2.6E-02 C	5.8E-03 C	1.1E+01 C	1.2E+00 C
ALACHLOR	15972608	1.00E-02 I	8.00E-02 H				8.4E-01 C	7.8E-02 C	3.9E-02 C	7.2E+01 C	8.0E+00 C
ALAR	1596845	1.50E-01 I					5.5E+03 N	5.5E+02 N	2.0E+02 N	3.1E+05 N	1.2E+04 N
ALDICARB	116063	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
ALDICARB SULFONE	1646884	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
ALDRIN	309002	3.00E-05 I	1.70E+01 I		1.70E+01 I		3.9E-03 C	3.7E-04 C	1.9E-04 C	3.4E-01 C	3.8E-02 C
ALUMINUM	7429905	1.00E+00 E		1.00E-03 E			3.7E+04 N	3.7E+00 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
AMINODINITROTOLUENES		6.00E-05 E					2.2E+00 N	2.2E-01 N	8.1E-02 N	1.2E+02 N	4.7E+00 N
4-AMINOPYRIDINE	504245	2.00E-05 H					7.3E-01 N	7.3E-02 N	2.7E-02 N	4.1E+01 N	1.6E+00 N
AMMONIA	7664417			2.86E-02 I		y	2.1E+02 N	1.0E+02 N			
ANILINE	62533		5.70E-03 I	2.90E-04 I		y	1.9E+00 C I	1.1E+00 N	5.5E-01 C	1.0E+03 C	1.1E+02 C
ANTIMONY	7440360	4.00E-04 I					1.5E+01 N	1.5E+00 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
ANTIMONY PENTOXIDE	1314609	5.00E-04 H					1.8E+01 N	1.8E+00 N	6.8E-01 N	1.0E+03 N	3.9E+01 N
ANTIMONY TETROXIDE	1332816	4.00E-04 H					1.5E+01 N	1.5E+00 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
ANTIMONY TRIOXIDE	1309644	4.00E-04 H		5.70E-05 I			1.5E+01 N	2.1E-01 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
ARSENIC	7440382	3.00E-04 I	1.50E+00 I		1.51E+01 I		4.5E-02 C	4.1E-04 C	2.1E-03 C	3.8E+00 C	4.3E-01 C
ARSINE	7784421			1.40E-05 I		y	1.0E-01 N	5.1E-02 N			
ASSURE	76578148	9.00E-03 I					3.3E+02 N	3.3E+01 N	1.2E+01 N	1.8E+04 N	7.0E+02 N
ATRAZINE	1912249	3.50E-02 I	2.20E-01 H				3.0E-01 C	2.8E-02 C	1.4E-02 C	2.6E+01 C	2.9E+00 C
AZOBENZENE	103333		1.10E-01 I		1.10E-01 I		6.1E-01 C	5.7E-02 C	2.9E-02 C	5.2E+01 C	5.8E+00 C
BARIUM	7440393	7.00E-02 I		1.40E-04 A			2.6E+03 N	5.1E-01 N	9.5E+01 N	1.4E+05 N	5.5E+03 N
BAYGON	114261	4.00E-03 I					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
BAYTHROID	68359375	2.50E-02 I					9.1E+02 N	9.1E+01 N	3.4E+01 N	5.1E+04 N	2.0E+03 N
BENTAZON	25057890	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
BENZALDEHYDE	100527	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
BENZENE	71432	3.00E-03 E	2.90E-02 I	1.70E-03 E	2.90E-02 I	y	3.6E-01 C	2.2E-01 C	1.1E-01 C	2.0E+02 C	2.2E+01 C
BENZENETHIOL	108985	1.00E-05 H				y	6.1E-02 N	3.7E-02 N	1.4E-02 N	2.0E+01 N	7.8E-01 N
BENZIDINE	92875	3.00E-03 I	2.30E+02 I		2.30E+02 I		2.9E-04 C	2.7E-05 C	1.4E-05 C	2.5E-02 C	2.8E-03 C
BENZOIC ACID	65850	4.00E+00 I					1.5E+05 N	1.5E+04 N	5.4E+03 N	8.2E+06 N	3.1E+05 N
BENZYL ALCOHOL	100516	3.00E-01 H					1.1E+04 N	1.1E+03 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
BENZYL CHLORIDE	100447		0.17 I			y	6.2E-02 C	3.7E-02 C	1.9E-02 C	3.4E+01 C	3.8E+00 C
BERYLLIUM	7440417	2.00E-03 I		5.7E-06 I	8.40E+00 I		7.3E+01 N	7.5E-04 C	2.7E+00 N	4.1E+03 N	1.6E+02 N
BIPHENYL	92524	5.00E-02 I				y	3.0E+02 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
BIS(2-CHLOROETHYL)ETHER	111444		1.10E+00 I		1.10E+00 I		6.1E-02 C	5.7E-03 C	2.9E-03 C	5.2E+00 C	5.8E-01 C
BIS(2-CHLOROISOPROPYL)ETHER	108601	4.00E-02 I	7.00E-02 H		3.50E-02 H	y	2.6E-01 C	1.8E-01 C	4.5E-02 C	8.2E+01 C	9.1E+00 C
BIS(CHLOROMETHYL)ETHER	92524		2.20E+02 I		2.20E+02 I	y	4.8E-05 C	2.8E-05 C	1.4E-05 C	2.6E-02 C	2.9E-03 C
BIS(2-ETHYLHEXYL)PHTHALATE	111444	2.00E-02 I	1.40E-02 I		1.40E-02 E		4.8E+00 C	4.5E-01 C	2.3E-01 C	4.1E+02 C	4.6E+01 C
BORON	108601	9.00E-02 I		5.70E-03 H			3.3E+03 N	2.1E+01 N	1.2E+02 N	1.8E+05 N	7.0E+03 N

Sources: EPA Region III RBC Table 4/15/98 - Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
BROMODICHLOROMETHANE	75274	2.00E-02 I	6.20E-02 I			y	1.7E-01 C	1.0E-01 C	5.1E-02 C	9.2E+01 C	1.0E+01 C
BROMOETHENE	593602				1.10E-01 H	y	1.1E-01 C	5.7E-02 C			
BROMOFORM	75252	2.00E-02 I	7.90E-03 I		3.90E-03 I	y	2.3E+00 C	1.6E+00 C	4.0E-01 C	7.2E+02 C	8.1E+01 C
BROMOMETHANE	74839	1.40E-03 I		1.40E-03 I		y	8.5E+00 N	5.1E+00 N	1.9E+00 N	2.9E+03 N	1.1E+02 N
BROMOPHOS	2104963	5.00E-03 H				y	3.0E+01 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
1,3-BUTADIENE	106990				1.80E+00 H	y	7.0E-03 C	3.5E-03 C			
1-BUTANOL	71363	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
BUTYLBENZYLPHTHALATE	85687	2.00E-01 I					7.3E+03 N	7.3E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
BUTYLATE	2008415	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
N-BUTYLBENZENE	104518	1.00E-02 E				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
SEC-BUTYLBENZENE	135988	1.00E-02 E				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
TERT-BUTYLBENZENE	98066	1.00E-02 E				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
CADMIUM-WATER	7440439	5.00E-04 I			6.30E+00 I		1.8E+01 N	9.9E-04 C	6.8E-01 N	1.0E+03 N	3.9E+01 N
CADMIUM-FOOD	7440439	1.00E-03 I			6.30E+00 I		3.7E+01 N	9.9E-04 C	1.4E+00 N	2.0E+03 N	7.8E+01 N
CAPROLACTAM	105602	5.00E-01 I					1.8E+04 N	1.8E+03 N	6.8E+02 N	1.0E+06 N	3.9E+04 N
CARBARYL	63252	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
CARBON DISULFIDE	75150	1.00E-01 I		2.00E-01 I		y	1.0E+03 N	7.3E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
CARBON TETRACHLORIDE	56235	7.00E-04 I	1.30E-01 I	5.71E-04 E	5.30E-02 I	y	1.6E-01 C	1.2E-01 C	2.4E-02 C	4.4E+01 C	4.9E+00 C
CARBOSULFAN	55285148	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
CHLORAL	75876	2.00E-03 I				y	1.2E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
CHLORANIL	118752		4.00E-01 H				1.7E-01 C	1.6E-02 C	7.9E-03 C	1.4E+01 C	1.6E+00 C
CHLORDANE	57749	5.00E-04 I	3.5E-01 I	2.00E-04	3.5E-01 I		1.9E-01 C	1.8E-02 C	9.0E-03 C	1.6E+01 C	1.8E+00 C
CHLORINE	7782505	1.00E-01 I				y	6.1E+02 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
CHLORINE DIOXIDE	10049044			5.70E-05 I		y	4.2E-01 N	2.1E-01 N			
CHLOROACETIC ACID	79118	2.00E-03 H					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
4-CHLOROANILINE	106478	4.00E-03 I					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
CHLOROBENZENE	108907	2.00E-02 I		5.00E-03 A		y	3.5E+01 N	1.8E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
CHLOROBENZILATE	510156	2.00E-02 I	2.70E-01 H		2.70E-01 H		2.5E-01 C	2.3E-02 C	1.2E-02 C	2.1E+01 C	2.4E+00 C
P-CHLOROBENZOIC ACID	74113	2.00E-01 H					7.3E+03 N	7.3E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
2-CHLORO-1,3-BUTADIENE	126998	2.00E-02 A		2.00E-03 H		y	1.4E+01 N	7.3E+00 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
1-CHLOROBUTANE	109693	4.00E-01 H				y	2.4E+03 N	1.5E+03 N	5.4E+02 N	8.2E+05 N	3.1E+04 N
1-CHLORO-1,1-DIFLUOROETHANE	75683			1.40E+01 I		y	1.0E+05 N	5.1E+04 N			
CHLORODIFLUOROMETHANE	75456			1.40E+01 I		y	1.0E+05 N	5.1E+04 N			
CHLOROETHANE	75003	4.00E-01 E	2.90E-03 E	2.90E+00 I		y	3.6E+00 C	2.2E+00 C	1.1E+00 C	2.0E+03 C	2.2E+02 C
CHLOROFORM	67663	1.00E-02 I	6.10E-03 I	8.6E-05 E	8.10E-02 I	y	1.5E-01 C !	7.7E-02 C !	5.2E-01 C	9.4E+02 C	1.0E+02 C !
CHLOROMETHANE	74873		1.30E-02 H		6.00E-03 H	y	1.5E+00 C	1.0E+00 C	2.4E-01 C	4.4E+02 C	4.9E+01 C
4-CHLORO-2-METHYLANILINE	95692		5.80E-01 H				1.2E-01 C	1.1E-02 C	5.4E-03 C	9.9E+00 C	1.1E+00 C
BETA-CHLORONAPHTHALENE	91587	8.00E-02 I				y	4.9E+02 N	2.9E+02 N	1.1E+02 N	1.6E+05 N	6.3E+03 N
O-CHLORONITROBENZENE	88733		2.50E-02 H			y	4.2E-01 C	2.5E-01 C	1.3E-01 C	2.3E+02 C	2.6E+01 C
P-CHLORONITROBENZENE	100005		1.80E-02 H			y	5.9E-01 C	3.5E-01 C	1.8E-01 C	3.2E+02 C	3.5E+01 C
2-CHLOROPHENOL	95578	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
2-CHLOROPROPANE	75296			2.90E-02 H		y	2.1E+02 N	1.1E+02 N			
O-CHLOROTOLUENE	95498	2.00E-02 I				y	1.2E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
CHLORPYRIFOS	2921882	3.00E-03 I					1.1E+02 N	1.1E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
CHLORPYRIFOS-METHYL	5598130	1.00E-02 H					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
CHROMIUM III	16065831	1.00E+00 I					3.7E+04 N	3.7E+03 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
CHROMIUM VI	18540299	5.00E-03 I		1.00E-07 E	4.10E+01 H		1.8E+02 N	1.5E-04 C !	6.8E+00 N	1.0E+04 N	3.9E+02 N
COBALT	7440484	6.00E-02 E					2.2E+03 N	2.2E+02 N	8.1E+01 N	1.2E+05 N	4.7E+03 N
COKE OVEN EMISSIONS (COAL TAR)	8007452				2.2 I	y	5.7E-03 C	2.8E-03 C			
COPPER	7440508	4.00E-02 H					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
CROTONALDEHYDE	123739		1.90E+00 H				3.5E-02 C	3.3E-03 C	1.7E-03 C	3.0E+00 C	3.4E-01 C
CUMENE	98828	1.00E-01 I		1.10E-01 I		y	6.6E+02 N	4.0E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
CYANIDE (FREE)	57125	2.00E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
CALCIUM CYANIDE	592018	4E-02 I					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
COPPER CYANIDE	544923	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
CYANAZINE	21725462	2.00E-03 H	8.40E-01 H				8.0E-02 C	7.5E-03 C	3.8E-03 C	6.8E+00 C	7.6E-01 C
CYANOGEN	460195	4.00E-02 I				y	2.4E+02 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N

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E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
CYANOGEN BROMIDE	506683	9.00E-02 I					3.3E+03 N	3.3E+02 N	1.2E+02 N	1.8E+05 N	7.0E+03 N
CYANOGEN CHLORIDE	506774	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
HYDROGEN CYANIDE	74908	2.00E-02 I		8.60E-04 I		y	6.2E+00 N	3.1E+00 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
POTASSIUM CYANIDE	151508	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
POTASSIUM SILVER CYANIDE	506616	2.00E-01 I					7.3E+03 N	7.3E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
SILVER CYANIDE	506649	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
SODIUM CYANIDE	143339	4.00E-02 I					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
THIOCYANATE		1.00E-01 E					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
ZINC CYANIDE	557211	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
CYCLOHEXANONE	108941	5.00E+00 I					1.8E+05 N	1.8E+04 N	6.8E+03 N	1.0E+07 N	3.9E+05 N
CYHALOTHRIN/KARATE	68085858	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
CYPERMETHRIN	52315078	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
DACTHAL	1861321	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
DALAPON	75990	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
DDD	72548		2.40E-01 I				2.8E-01 C	2.6E-02 C	1.3E-02 C	2.4E+01 C	2.7E+00 C
DDE	72559		3.40E-01 I				2.0E-01 C	1.8E-02 C	9.3E-03 C	1.7E+01 C	1.9E+00 C
DDT	50293	5.00E-04 I	3.40E-01 I		3.40E-01 I		2.0E-01 C	1.8E-02 C	9.3E-03 C	1.7E+01 C	1.9E+00 C
DIAZINON	333415	9.00E-04 H					3.3E+01 N	3.3E+00 N	1.2E+00 N	1.8E+03 N	7.0E+01 N
DIBENZOFURAN	132649	4.00E-03 E				y	2.4E+01 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
1,4-DIBROMOBENZENE	106376	1.00E-02 I				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
DIBROMOCHLOROMETHANE	124481	2.00E-02 I	8.40E-02 I			y	1.3E-01 C	7.5E-02 C	3.8E-02 C	6.8E+01 C	7.6E+00 C
1,2-DIBROMO-3-CHLOROPROPANE	96128		1.40E+00 H	5.70E-05 I	2.40E-03 H	y	4.7E-02 C I	2.1E-01 N	2.3E-03 C	4.1E+00 C	4.6E-01 C
1,2-DIBROMOETHANE	106934		8.50E+01 I	5.70E-05 H	7.60E-01 I	y	7.5E-04 C	8.2E-03 C	3.7E-05 C	6.7E-02 C	7.5E-03 C
DIBUTYLPHTHALATE	84742	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
DICAMBA	1918009	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
1,2-DICHLOROBENZENE	95501	9.00E-02 I		9.00E-03 E		y	6.4E+01 N	3.3E+01 N	1.2E+02 N	1.8E+05 N	7.0E+03 N
1,3-DICHLOROBENZENE	541731	3.00E-02 E		2.00E-03 E		y	1.4E+01 N	7.3E+00 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
1,4-DICHLOROBENZENE	106467	3.00E-02 E	2.40E-02 H	2.29E-01 I	2.2E-02 E	y	4.7E-01 C	2.8E-01 C	1.3E-01 C	2.4E+02 C	2.7E+01 C
3,3'-DICHLOROBENZIDINE	91941		4.50E-01 I				1.5E-01 C	1.4E-02 C	7.0E-03 C	1.3E+01 C	1.4E+00 C
1,4-DICHLORO-2-BUTENE	764410				9.30E+00 H	y	1.3E-03 C	6.7E-04 C			
DICHLORODIFLUOROMETHANE	75718	2.00E-01 I		5.00E-02 A		y	3.5E+02 N	1.8E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
1,1-DICHLOROETHANE	75343	1.00E-01 H		1.40E-01 A		y	8.0E+02 N	5.1E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
1,2-DICHLOROETHANE	107062	3.00E-02 E	9.10E-02 I	1.40E-03 E	9.10E-02 I	y	1.2E-01 C	6.9E-02 C	3.5E-02 C	6.3E+01 C	7.0E+00 C

Sources: EPA Region III RBC Table 4/15/98 W=Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
1,1-DICHLOROETHENE	75354	9.00E-03 I	6.00E-01 I		1.75E-01 I	y	4.4E-02 C	3.6E-02 C	5.3E-03 C	9.5E+00 C	1.1E+00 C
CIS-1,2-DICHLOROETHENE	156592	1.00E-02 H				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
TRANS-1,2-DICHLOROETHENE	156605	2.00E-02 I				y	1.2E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
TOTAL 1,2-DICHLOROETHENE	540590	9.00E-03 H				y	5.5E+01 N	3.3E+01 N	1.2E+01 N	1.8E+04 N	7.0E+02 N
2,4-DICHLOROPHENOL	120832	3.00E-03 I					1.1E+02 N	1.1E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
2,4-D	94757	1.00E-02 I				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94826	8E-03 I					2.9E+02 N	2.9E+01 N	1.1E+01 N	1.6E+04 N	6.3E+02 N
1,2-DICHLOROPROPANE	78875		6.80E-02 H	1.14E-03 I		y	1.6E-01 C	9.2E-02 C	4.6E-02 C	8.4E+01 C	9.4E+00 C
2,3-DICHLOROPROPANOL	616239	3.00E-03 I					1.1E+02 N	1.1E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
1,3-DICHLOROPROPENE	542756	3.00E-04 I	1.80E-01 H	5.71E-03 I	1.30E-01 H	y	7.7E-02 C	4.8E-02 C	1.8E-02 C	3.2E+01 C	3.5E+00 C I
DICHLORVOS	62737	5E-04 I	0.29 I	1.43E-04 I			2.3E-01 C	2.2E-02 C	1.1E-02 C	2.0E+01 C	2.2E+00 C
DICOFOL	115322		4.4E-01 W				1.5E-01 C	1.4E-02 C	7.2E-03 C	1.3E+01 C	1.5E+00 C
DICYCLOPENTADIENE	77736	3E-02 H		6.00E-05 A		y	4.4E-01 N	2.2E-01 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
DIELDRIN	60571	5.00E-05 I	1.60E+01 I		1.60E+01 I		4.2E-03 C	3.9E-04 C	2.0E-04 C	3.6E-01 C	4.0E-02 C
DIESEL EMISSIONS				1.40E-03 I				5.1E+00 N			
DIETHYLPHTHALATE	84662	8.00E-01 I					2.9E+04 N	2.9E+03 N	1.1E+03 N	1.6E+06 N	6.3E+04 N
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112345			5.70E-03 H				2.1E+01 N			
DIETHYLENE GLYCOL, MONOETHYL ETHER	111900	2.00E+00 H					7.3E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
DI(2-ETHYLHEXYL)ADIPATE	103231	6.00E-01 I	1.20E-03 I				5.6E+01 C	5.2E+00 C	2.6E+00 C	4.8E+03 C	5.3E+02 C
DIETHYLSTILBESTROL	56531		4.70E+03 H				1.4E-05 C	1.3E-06 C	6.7E-07 C	1.2E-03 C	1.4E-04 C
DIFENZOQUAT (AVENGE)	43222486	8.00E-02 I					2.9E+03 N	2.9E+02 N	1.1E+02 N	1.6E+05 N	6.3E+03 N
1,1-DIFLUOROETHANE	75376			1.10E+01 I		y	8.0E+04 N	4.0E+04 N			
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445756	8.00E-02 I					2.9E+03 N	2.9E+02 N	1.1E+02 N	1.6E+05 N	6.3E+03 N
3,3'-DIMETHOXYBENZIDINE	119904		1.40E-02 H				4.8E+00 C	4.5E-01 C	2.3E-01 C	4.1E+02 C	4.6E+01 C
DIMETHYLAMINE	124403			5.70E-06 W				2.1E-02 N			
2,4-DIMETHYLANILINE HYDROCHLORIDE	21436964		5.80E-01 H				1.2E-01 C	1.1E-02 C	5.4E-03 C	9.9E+00 C	1.1E+00 C
2,4-DIMETHYLANILINE	95681		7.50E-01 H				8.9E-02 C	8.3E-03 C	4.2E-03 C	7.6E+00 C	8.5E-01 C
N,N-DIMETHYLANILINE	121697	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
3,3'-DIMETHYLBENZIDINE	119937		9.20E+00 H				7.3E-03 C	6.8E-04 C	3.4E-04 C	6.2E-01 C	6.9E-02 C
1,1-DIMETHYLHYDRAZINE	57147		2.60E+00 W		3.50E+00 W		2.6E-02 C	1.8E-03 C	1.2E-03 C	2.2E+00 C	2.5E-01 C
1,2-DIMETHYLHYDRAZINE	540738		3.70E+01 W		3.70E+01 W		1.8E-03 C	1.7E-04 C	8.5E-05 C	1.5E-01 C	1.7E-02 C
2,4-DIMETHYLPHENOL	105679	2.00E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
2,6-DIMETHYLPHENOL	576261	6.00E-04 I					2.2E+01 N	2.2E+00 N	8.1E-01 N	1.2E+03 N	4.7E+01 N
3,4-DIMETHYLPHENOL	95658	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
DIMETHYLPHTHALATE	131113	1.00E+01 W					3.7E+05 N	3.7E+04 N	1.4E+04 N	2.0E+07 N	7.8E+05 N
1,2-DINITROBENZENE	528290	4.00E-04 H					1.5E+01 N	1.5E+00 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
1,3-DINITROBENZENE	99650	1.00E-04 I					3.7E+00 N	3.7E-01 N	1.4E-01 N	2.0E+02 N	7.8E+00 N
1,4-DINITROBENZENE	100254	4.00E-04 H					1.5E+01 N	1.5E+00 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131895	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
4,6-DINITRO-2-METHYLPHENOL	534521	1.00E-04 E					3.7E+00 N	3.7E-01 N	1.4E-01 N	2.0E+02 N	7.8E+00 N
2,4-DINITROPHENOL	51285	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
DINITROTOLUENE MIX			6.80E-01 I				9.8E-02 C	9.2E-03 C	4.6E-03 C	8.4E+00 C	9.4E-01 C
2,4-DINITROTOLUENE	121142	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
2,6-DINITROTOLUENE	606202	1.00E-03 H					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
DINOSEB	88857	1.00E-03 I				y	6.1E+00 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N

Sources: A = Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
DIOCTYLPHTHALATE	117840	2.00E-02 H					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
1,4-DIOXANE	123911		1.10E-02 I				6.1E+00 C	5.7E-01 C	2.9E-01 C	5.2E+02 C	5.8E+01 C
DIPHENYLAMINE	122394	2.50E-02 I					9.1E+02 N	9.1E+01 N	3.4E+01 N	5.1E+04 N	2.0E+03 N
1,2-DIPHENYLHYDRAZINE	122667		8.00E-01 I		8.00E-01 I		8.4E-02 C	7.8E-03 C	3.9E-03 C	7.2E+00 C	8.0E-01 C
DIQUAT	85007	2.20E-03 I					8.0E+01 N	8.0E+00 N	3.0E+00 N	4.5E+03 N	1.7E+02 N
DISULFOTON	298044	4.00E-05 I				y	2.4E-01 N	1.5E-01 N	5.4E-02 N	8.2E+01 N	3.1E+00 N
1,4-DITHIANE	505293	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
DIURON	330541	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
ENDOSULFAN	115297	6.00E-03 I					2.2E+02 N	2.2E+01 N	8.1E+00 N	1.2E+04 N	4.7E+02 N
ENDRIN	72208	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
EPICHLOROHYDRIN	106898	2.00E-03 H	9.90E-03 I	2.86E-04 I	4.20E-03 I		6.8E+00 C	1.0E+00 N	3.2E-01 C I	5.8E+02 C I	6.5E+01 C I
ETHION	563122	5.00E-04 I					1.8E+01 N	1.8E+00 N	6.8E-01 N	1.0E+03 N	3.9E+01 N
2-ETHOXYETHANOL	110805	4.00E-01 H		5.70E-02 I			1.5E+04 N	2.1E+02 N	5.4E+02 N	8.2E+05 N	3.1E+04 N
ETHYL ACETATE	141786	9.00E-01 I				y	5.5E+03 N	3.3E+03 N	1.2E+03 N	1.8E+06 N	7.0E+04 N
ETHYLBENZENE	100414	1.00E-01 I		2.90E-01 I		y	1.3E+03 N	1.1E+03 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
ETHYLENE DIAMINE	107153	2.00E-02 H					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
ETHYLENE GLYCOL	107211	2.00E+00 I					7.3E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
ETHYLENE GLYCOL, MONOBUTYL ETHER	111762			5.70E-03 H				2.1E+01 N			
ETHYLENE OXIDE	75218		1.00E+00 H		3.50E-01 H		6.7E-02 C	1.8E-02 C	3.2E-03 C	5.7E+00 C	6.4E-01 C
ETHYLENE THIOUREA	96457	8.00E-05 I	1.1E-01 H				6.1E-01 C I	5.7E-02 C I	2.9E-02 C I	5.2E+01 C I	5.8E+00 C I
ETHYL ETHER	60297	2.00E-01 I				y	1.2E+03 N	7.3E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
ETHYL METHACRYLATE	97632	9.00E-02 H				y	5.5E+02 N	3.3E+02 N	1.2E+02 N	1.8E+05 N	7.0E+03 N
FENAMIPHOS	22224926	2.50E-04 I					9.1E+00 N	9.1E-01 N	3.4E-01 N	5.1E+02 N	2.0E+01 N
FLUOMETURON	2164172	1.30E-02 I					4.7E+02 N	4.7E+01 N	1.8E+01 N	2.7E+04 N	1.0E+03 N
FLUORINE	7782414	6.00E-02 I					2.2E+03 N	2.2E+02 N	8.1E+01 N	1.2E+05 N	4.7E+03 N
FOMESAFEN	72178020		1.90E-01 I				3.5E-01 C	3.3E-02 C	1.7E-02 C	3.0E+01 C	3.4E+00 C
FONOFOS	944229	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
FORMALDEHYDE	50000	2.00E-01 I			4.50E-02 I		7.3E+03 N	1.4E-01 C	2.7E+02 N	4.1E+05 N	1.6E+04 N
FORMIC ACID	64186	2.00E+00 H					7.3E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
FURAN	110009	1.00E-03 I				y	6.1E+00 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
FURAZOLIDONE	67458		3.80E+00 H				1.8E-02 C	1.6E-03 C	8.3E-04 C	1.5E+00 C	1.7E-01 C
FURFURAL	98011	3.00E-03 I		1.00E-02 A			1.1E+02 N	3.7E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
GLYCIDALDEHYDE	765344	4.00E-04 I		2.90E-04 H			1.5E+01 N	1.1E+00 N	5.4E-01 N	8.2E+02 N	3.1E+01 N
GLYPHOSATE	1071836	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
HEPTACHLOR	76448	5.00E-04 I	4.50E+00 I		4.50E+00 I	y	2.3E-03 C	1.4E-03 C	7.0E-04 C	1.3E+00 C	1.4E-01 C
HEPTACHLOR EPOXIDE	1024573	1.30E-05 I	9.10E+00 I		9.10E+00 I	y	1.2E-03 C	6.9E-04 C	3.5E-04 C	6.3E-01 C	7.0E-02 C
HEXABROMOBENZENE	87821	2.00E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
HEXACHLOROBENZENE	118741	8.00E-04 I	1.60E+00 I		1.60E+00 I	y	6.6E-03 C	3.9E-03 C	2.0E-03 C	3.6E+00 C	4.0E-01 C
HEXACHLOROBUTADIENE	87683	2.00E-04 H	7.80E-02 I		7.80E-02 I	y	1.4E-01 C I	8.0E-02 C I	4.0E-02 C I	7.3E+01 C I	8.2E+00 C I
ALPHA-HCH	319846		6.30E+00 I		6.30E+00 I		1.1E-02 C	9.9E-04 C	5.0E-04 C	9.1E-01 C	1.0E-01 C
BETA-HCH	319857		1.80E+00 I		1.80E+00 I		3.7E-02 C	3.5E-03 C	1.8E-03 C	3.2E+00 C	3.5E-01 C
GAMMA-HCH (LINDANE)	58899	3.00E-04 I	1.30E+00 H				5.2E-02 C	4.8E-03 C	2.4E-03 C	4.4E+00 C	4.9E-01 C
TECHNICAL HCH	608731		1.80E+00 I		1.80E+00 I		3.7E-02 C	3.5E-03 C	1.8E-03 C	3.2E+00 C	3.5E-01 C
HEXACHLOROCYCLOPENTADIENE	77474	7.00E-03 I		2.00E-05 H		y	1.5E-01 N	7.3E-02 N	9.5E+00 N	1.4E+04 N	5.5E+02 N
HEXACHLORODIBENZODIOXIN MIX	19408743		6.20E+03 I		4.55E+03 I		1.1E-05 C	1.4E-06 C	5.1E-07 C	9.2E-04 C	1.0E-04 C

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Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
HEXACHLOROETHANE	67721	1.00E-03 I	1.40E-02 I		1.40E-02 I	y	7.5E-01 C I	4.5E-01 C I	2.3E-01 C I	4.1E+02 C I	4.6E+01 C I
HEXACHLOROPHENE	70304	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
1,6-HEXAMETHYLENE DIISOCYANATE	822060			2.90E-06 I				1.1E-02 N			
HEXANE	110543	6.00E-02 H		5.71E-02 I		y	3.5E+02 N	2.1E+02 N	8.1E+01 N	1.2E+05 N	4.7E+03 N
2-HEXANONE	591786	4.00E-02 E		1.4E-03 E			1.5E+03 N	5.1E+00 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
HEXAZINONE	51235042	3.30E-02 I					1.2E+03 N	1.2E+02 N	4.5E+01 N	6.7E+04 N	2.6E+03 N
HMX	2691410	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
HYDRAZINE	302012		3.00E+00 I		1.70E+01 I		2.2E-02 C	3.7E-04 C	1.1E-03 C	1.9E+00 C	2.1E-01 C
HYDROGEN CHLORIDE	7647010			5.70E-03 I				2.1E+01 N			
HYDROGEN SULFIDE	7783064	3.00E-03 I		2.85E-04 I			1.1E+02 N	1.0E+00 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
HYDROQUINONE	123319	4.00E-02 H					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
IRON	7439896	3.00E-01 E					1.1E+04 N	1.1E+03 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
ISOBUTANOL	78831	3.00E-01 I				y	1.8E+03 N	1.1E+03 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
ISOPHORONE	78591	2.00E-01 I	9.50E-04 I				7.0E+01 C	6.6E+00 C	3.3E+00 C	6.0E+03 C	6.7E+02 C
ISOPROPALIN	33820530	1.50E-02 I					5.5E+02 N	5.5E+01 N	2.0E+01 N	3.1E+04 N	1.2E+03 N
ISOPROPYL METHYL PHOSPHONIC ACID	1832548	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
TETRAETHYLLEAD	78002	1.00E-07 I				y	6.1E-04 N	3.7E-04 N	1.4E-04 N	2.0E-01 N	7.8E-03 N
LITHIUM	7439932	2.00E-02 E					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
MALATHION	121755	2.00E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
MALEIC ANHYDRIDE	108316	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
MANGANESE-NONFOOD	7439965	2.00E-02 I		1.43E-05 I			7.3E+02 N	5.2E-02 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
MANGANESE-FOOD	7439965	1.40E-01 I		1.43E-05 I			5.1E+03 N	5.2E-02 N	1.9E+02 N	2.9E+05 N	1.1E+04 N
MEPHOSFOLAN	950107	9.00E-05 H					3.3E+00 N	3.3E-01 N	1.2E-01 N	1.8E+02 N	7.0E+00 N
MEPIQUAT CHLORIDE	24307264	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
MERCURIC CHLORIDE	7487947	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
MERCURY (INORGANIC)	7439976			8.60E-05 I				3.1E-01 N			
METHYLMERCURY	22967926	1.00E-04 I					3.7E+00 N	3.7E-01 N	1.4E-01 N	2.0E+02 N	7.8E+00 N
METHACRYLONITRILE	126987	1.00E-04 I		2.00E-04 A		y	1.0E+00 N	7.3E-01 N	1.4E-01 N	2.0E+02 N	7.8E+00 N
METHANOL	67561	5.00E-01 I					1.8E+04 N	1.8E+03 N	6.8E+02 N	1.0E+06 N	3.9E+04 N
METHIDATHION	950378	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
METHOXYCHLOR	72435	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
METHYL ACETATE	79209	1.00E+00 H				y	6.1E+03 N	3.7E+03 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
METHYL ACRYLATE	96333	3.00E-02 A				y	1.8E+02 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
2-METHYLANILINE	95534		2.40E-01 H				2.8E-01 C	2.6E-02 C	1.3E-02 C	2.4E+01 C	2.7E+00 C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94815	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94746	5.00E-04 I					1.8E+01 N	1.8E+00 N	6.8E-01 N	1.0E+03 N	3.9E+01 N
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (	93652	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
METHYLCYCLOHEXANE	108872			8.60E-01 H		y	6.3E+03 N	3.1E+03 N			
METHYLENE BROMIDE	74953	1.00E-02 A				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
METHYLENE CHLORIDE	75092	6.00E-02 I	7.50E-03 I	8.60E-01 H	1.65E-03 I	y	4.1E+00 C	3.8E+00 C	4.2E-01 C	7.6E+02 C	8.5E+01 C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101144	7.00E-04 H	1.30E-01 H		1.30E-01 H		5.2E-01 C	4.8E-02 C	2.4E-02 C	4.4E+01 C	4.9E+00 C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101611		4.60E-02 I				1.5E+00 C	1.4E-01 C	6.9E-02 C	1.2E+02 C	1.4E+01 C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101688			1.7E-04 I				6.2E-01 N			
METHYL ETHYL KETONE (2-BUTANONE)	78933	6.00E-01 I		2.86E-01 I		y	1.9E+03 N	1.0E+03 N	8.1E+02 N	1.2E+06 N	4.7E+04 N
METHYL HYDRAZINE	60344		1.10E+00 W				6.1E-02 C	5.7E-03 C	2.9E-03 C	5.2E+00 C	5.8E-01 C

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Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANON	108101	8.00E-02 H		2.00E-02 A			2.9E+03 N	7.3E+01 N	1.1E+02 N	1.6E+05 N	6.3E+03 N
METHYL METHACRYLATE	80626	1.40E+00 I		2.00E-01 I		y	1.4E+03 N	7.3E+02 N	1.9E+03 N	2.9E+06 N	1.1E+05 N
2-METHYL-5-NITROANILINE	99558		3.30E-02 H				2.0E+00 C	1.9E-01 C	9.6E-02 C	1.7E+02 C	1.9E+01 C
METHYL PARATHION	298000	2.50E-04 I					9.1E+00 N	9.1E-01 N	3.4E-01 N	5.1E+02 N	2.0E+01 N
2-METHYLPHENOL	95487	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
3-METHYLPHENOL	108394	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
4-METHYLPHENOL	106445	5.00E-03 H					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
METHYLSTYRENE MIX	25013154	6.00E-03 A		1.00E-02 A		y	5.5E+01 N	3.7E+01 N	8.1E+00 N	1.2E+04 N	4.7E+02 N
ALPHA-METHYLSTYRENE	98839	7.00E-02 A				y	4.3E+02 N	2.6E+02 N	9.5E+01 N	1.4E+05 N	5.5E+03 N
METHYL TERT-BUTYL ETHER	1634044			8.57E-01 I		y	6.3E+03 N	3.1E+03 N			
METOLACHLOR (DUAL)	51218452	1.50E-01 I					5.5E+03 N	5.5E+02 N	2.0E+02 N	3.1E+05 N	1.2E+04 N
MIREX	2385855	2.00E-04 I				y	1.2E+00 N	7.3E-01 N	2.7E-01 N	4.1E+02 N	1.6E+01 N
MOLYBDENUM	7439987	5E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
MONOCHLORAMINE	10599903	1E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
NALED	300765	2E-03 I					7.3E+01 N	7.3E+00 N	2.7E+00 N	4.1E+03 N	1.6E+02 N
NICKEL REFINERY DUST					8.4E-01 I			7.5E-03 C			
NICKEL	7440020	2.00E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
NITRATE	14797558	1.60E+00 I					5.8E+04 N	5.8E+03 N	2.2E+03 N	3.3E+06 N	1.3E+05 N
NITRIC OXIDE	10102439	1.00E-01 W				y	6.1E+02 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
NITRITE	14797650	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
2-NITROANILINE	88744			5.70E-05 H				2.1E-01 N			
NITROBENZENE	98953	5.00E-04 I		6.00E-04 A			1.8E+01 N	2.2E+00 N	6.8E-01 N	1.0E+03 N	3.9E+01 N
NITROFURANTOIN	67209	7.00E-02 H					2.6E+03 N	2.6E+02 N	9.5E+01 N	1.4E+05 N	5.5E+03 N
NITROFURAZONE	59870		1.50E+00 H				4.5E-02 C	4.2E-03 C	2.1E-03 C	3.8E+00 C	4.3E-01 C
NITROGEN DIOXIDE	10102440	1.00E+00 W				y	6.1E+03 N	3.7E+03 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
NITROGLYCERIN	55630		2.10E+00 E				3.2E-02 C	3.0E-03 C	1.5E-03 C	2.7E+00 C	3.0E-01 C
4-NITROPHENOL	100027	8.00E-03 E					2.9E+02 N	2.9E+01 N	1.1E+01 N	1.6E+04 N	6.3E+02 N
2-NITROPROPANE	79469			5.70E-03 I	9.40E+00 H			6.7E-04 C			
N-NITROSO-DI-N-BUTYLAMINE	924163		5.40E+00 I		5.60E+00 I		1.2E-02 C	1.1E-03 C	5.8E-04 C	1.1E+00 C	1.2E-01 C
N-NITROSODIETHANOLAMINE	1116547		2.80E+00 I				2.4E-02 C	2.2E-03 C	1.1E-03 C	2.0E+00 C	2.3E-01 C
N-NITROSODIETHYLAMINE	55185		1.50E+02 I		1.50E+02 I		4.5E-04 C	4.2E-05 C	2.1E-05 C	3.8E-02 C	4.3E-03 C
N-NITROSODIMETHYLAMINE	62759		5.10E+01 I		5.10E+01 I		1.3E-03 C	1.2E-04 C	6.2E-05 C	1.1E-01 C	1.3E-02 C
N-NITROSODIPHENYLAMINE	86306		4.90E-03 I				1.4E+01 C	1.3E+00 C	6.4E-01 C	1.2E+03 C	1.3E+02 C
N-NITROSODIPROPYLAMINE	621647		7.00E+00 I				9.6E-03 C	8.9E-04 C	4.5E-04 C	8.2E-01 C	9.1E-02 C
N-NITROSO-N-ETHYLUREA	759739		1.40E+02 H				4.8E-04 C	4.5E-05 C	2.3E-05 C	4.1E-02 C	4.6E-03 C
N-NITROSO-N-METHYLETHYLAMINE	10595956		2.20E+01 I				3.0E-03 C	2.8E-04 C	1.4E-04 C	2.6E-01 C	2.9E-02 C
N-NITROSOPYRROLIDINE	930552		2.10E+00 I		2.10E+00 I		3.2E-02 C	3.0E-03 C	1.5E-03 C	2.7E+00 C	3.0E-01 C
M-NITROTOLUENE	99081	2.00E-02 E				y	1.2E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
O-NITROTOLUENE	88722	1.00E-02 H				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
P-NITROTOLUENE	99990	1.00E-02 H				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
ORYZALIN	19044883	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
OXADIAZON	19666309	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
OXAMYL	23135220	2.50E-02 I					9.1E+02 N	9.1E+01 N	3.4E+01 N	5.1E+04 N	2.0E+03 N
OXYFLUORFEN	42874033	3.00E-03 I					1.1E+02 N	1.1E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
PARAQUAT DICHLORIDE	1910425	4.50E-03 I					1.6E+02 N	1.6E+01 N	6.1E+00 N	9.2E+03 N	3.5E+02 N

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PARATHION	56382	6.00E-03 H					2.2E+02 N	2.2E+01 N	8.1E+00 N	1.2E+04 N	4.7E+02 N
PENTACHLOROBENZENE	608935	8.00E-04 I				y	4.9E+00 N	2.9E+00 N	1.1E+00 N	1.6E+03 N	6.3E+01 N
PENTACHLORONITROBENZENE	82688	3.00E-03 I	2.60E-01 H			y	4.1E-02 C	2.4E-02 C	1.2E-02 C	2.2E+01 C	2.5E+00 C
PENTACHLOROPHENOL	87865	3.00E-02 I	1.20E-01 I				5.6E-01 C	5.2E-02 C	2.6E-02 C	4.8E+01 C	5.3E+00 C
PERMETHRIN	52645531	5.00E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
PHENOL	108952	6.00E-01 I					2.2E+04 N	2.2E+03 N	8.1E+02 N	1.2E+06 N	4.7E+04 N
M-PHENYLENEDIAMINE	108452	6.00E-03 I					2.2E+02 N	2.2E+01 N	8.1E+00 N	1.2E+04 N	4.7E+02 N
O-PHENYLENEDIAMINE	95545		4.70E-02 H				1.4E+00 C	1.3E-01 C	6.7E-02 C	1.2E+02 C	1.4E+01 C
P-PHENYLENEDIAMINE	106503	1.90E-01 H					6.9E+03 N	6.9E+02 N	2.6E+02 N	3.9E+05 N	1.5E+04 N
2-PHENYLPHENOL	90437		1.90E-03 H				3.5E+01 C	3.3E+00 C	1.7E+00 C	3.0E+03 C	3.4E+02 C
PHOSPHINE	7803512	3.00E-04 I		8.60E-05 I			1.1E+01 N	3.1E-01 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
PHOSPHORIC ACID	7664382			2.90E-03 I				1.1E+01 N			
PHOSPHORUS (WHITE)	7723140	2.00E-05 I					7.3E-01 N	7.3E-02 N	2.7E-02 N	4.1E+01 N	1.6E+00 N
P-PHTHALIC ACID	100210	1.00E+00 H					3.7E+04 N	3.7E+03 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
PHTHALIC ANHYDRIDE	85449	2.00E+00 I		3.43E-02 H			7.3E+04 N	1.3E+02 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
POLYBROMINATED BIPHENYLS		7.00E-06 H	8.90E+00 H				7.5E-03 C	7.0E-04 C	3.5E-04 C	6.4E-01 C	7.2E-02 C I
POLYCHLORINATED BIPHENYLS	1336363		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
AROCLOR-1016	12674112	7.00E-05 I	7.00E-02 I		7.00E-02 I		9.6E-01 C I	8.9E-02 C I	4.5E-02 C I	8.2E+01 C I	5.5E+00 N
AROCLOR-1221	11104282		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
AROCLOR-1232	11141165		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
AROCLOR-1242	53469219		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
AROCLOR-1248	12672296		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
AROCLOR-1254	11097691	2.00E-05 I	2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C I
AROCLOR-1260	11096825		2.00E+00 I		2.00E+00 I		3.3E-02 C	3.1E-03 C	1.6E-03 C	2.9E+00 C	3.2E-01 C
POLYCHLORINATED TERPHENYLS	61788338		4.50E+00 E				1.5E-02 C	1.4E-03 C	7.0E-04 C	1.3E+00 C	1.4E-01 C
POLYNUCLEAR AROMATIC HYDROCARBONS:											
ACENAPHTHENE	83329	6.00E-02 I					2.2E+03 N	2.2E+02 N	8.1E+01 N	1.2E+05 N	4.7E+03 N
ANTHRACENE	120127	3.00E-01 I					1.1E+04 N	1.1E+03 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
BENZ[A]ANTHRACENE	56553		7.30E-01 E				9.2E-02 C	8.6E-03 C	4.3E-03 C	7.8E+00 C	8.7E-01 C
BENZO[B]FLUORANTHENE	205992		7.30E-01 E				9.2E-02 C	8.6E-03 C	4.3E-03 C	7.8E+00 C	8.7E-01 C
BENZO[K]FLUORANTHENE	207089		7.30E-02 E				9.2E-01 C	8.6E-02 C	4.3E-02 C	7.8E+01 C	8.7E+00 C
BENZO[A]PYRENE	50328		7.30E+00 I		3.10E+00 E		9.2E-03 C	2.0E-03 C	4.3E-04 C	7.8E-01 C	8.7E-02 C
CARBAZOLE	86748		2.00E-02 H				3.3E+00 C	3.1E-01 C	1.6E-01 C	2.9E+02 C	3.2E+01 C
CHRYSENE	218019		7.30E-03 E				9.2E+00 C	8.6E-01 C	4.3E-01 C	7.8E+02 C	8.7E+01 C
DIBENZ[A,H]ANTHRACENE	53703		7.30E+00 E				9.2E-03 C	8.6E-04 C	4.3E-04 C	7.8E-01 C	8.7E-02 C
DIBENZOFURAN	132649	4.00E-03 E					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
FLUORANTHENE	206440	4.00E-02 I					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
FLUORENE	86737	4.00E-02 I					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
INDENO[1,2,3-C,D]PYRENE	193395		7.30E-01 E				9.2E-02 C	8.6E-03 C	4.3E-03 C	7.8E+00 C	8.7E-01 C
2-METHYLNAPHTHALENE	91576	4.00E-02 E					1.5E+03 N	1.5E+02 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
NAPHTHALENE	91203	4.00E-02 E		1.00E-04 E			1.5E+03 N	3.7E-01 N	5.4E+01 N	8.2E+04 N	3.1E+03 N
PYRENE	129000	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
PROMETON	1610180	1.50E-02 I					5.5E+02 N	5.5E+01 N	2.0E+01 N	3.1E+04 N	1.2E+03 N
PROMETRYN	7287196	4.00E-03 I					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
PROPACHLOR	1918167	1.30E-02 I					4.7E+02 N	4.7E+01 N	1.8E+01 N	2.7E+04 N	1.0E+03 N

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PROPANIL	709988	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
PROPARGITE	2312358	2.00E-02 I					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
N-PROPYLBENZENE		1.00E-02 E				y	6.1E+01 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
PROPYLENE GLYCOL	57556	2.00E+01 H					7.3E+05 N	7.3E+04 N	2.7E+04 N	4.1E+07 N	1.6E+06 N
PROPYLENE GLYCOL, MONOETHYL ETHER	52125538	7.00E-01 H					2.6E+04 N	2.6E+03 N	9.5E+02 N	1.4E+06 N	5.5E+04 N
PROPYLENE GLYCOL, MONOMETHYL ETHER	107982	7.00E-01 H		5.70E-01 I			2.6E+04 N	2.1E+03 N	9.5E+02 N	1.4E+06 N	5.5E+04 N
PURSUIT	81335775	2.50E-01 I					9.1E+03 N	9.1E+02 N	3.4E+02 N	5.1E+05 N	2.0E+04 N
PYRIDINE	110861	1.00E-03 I					3.7E+01 N	3.7E+00 N	1.4E+00 N	2.0E+03 N	7.8E+01 N
QUINOLINE	91225		1.20E+01 H				5.6E-03 C	5.2E-04 C	2.6E-04 C	4.8E-01 C	5.3E-02 C
RDX	121824	3.00E-03 I	1.10E-01 I				6.1E-01 C	5.7E-02 C	2.9E-02 C	5.2E+01 C	5.8E+00 C
RESMETHRIN	10453868	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
RONNEL	299843	5.00E-02 H					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
ROTENONE	83794	4.00E-03 I					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
SELENIOUS ACID	7783008	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
SELENIUM	7782492	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
SILVER	7440224	5.00E-03 I					1.8E+02 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
SIMAZINE	122349	5.00E-03 I	1.20E-01 H				5.6E-01 C	5.2E-02 C	2.6E-02 C	4.8E+01 C	5.3E+00 C
SODIUM AZIDE	26628228	4.00E-03 I					1.5E+02 N	1.5E+01 N	5.4E+00 N	8.2E+03 N	3.1E+02 N
SODIUM DIETHYLDITHIOCARBAMATE	148185	3.00E-02 I	2.70E-01 H				2.5E-01 C	2.3E-02 C	1.2E-02 C	2.1E+01 C	2.4E+00 C
STRONTIUM, STABLE	7440246	6.00E-01 I					2.2E+04 N	2.2E+03 N	8.1E+02 N	1.2E+06 N	4.7E+04 N
STRYCHNINE	57249	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
STYRENE	100425	2.00E-01 I		2.86E-01 I		y	1.6E+03 N	1.0E+03 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746016		1.50E+05 H		1.50E+05 H		4.5E-07 C	4.2E-08 C	2.1E-08 C	3.8E-05 C	4.3E-06 C
1,2,4,5-TETRACHLOROBENZENE	95943	3.00E-04 I				y	1.8E+00 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
1,1,1,2-TETRACHLOROETHANE	630206	3.00E-02 I	2.60E-02 I		2.60E-02 I	y	4.1E-01 C	2.4E-01 C	1.2E-01 C	2.2E+02 C	2.5E+01 C
1,1,2,2-TETRACHLOROETHANE	79345		2.00E-01 I		2.00E-01 I	y	5.3E-02 C	3.1E-02 C	1.6E-02 C	2.9E+01 C	3.2E+00 C
TETRACHLOROETHENE	127184	1.00E-02 I	5.20E-02 E	1.4E-01 E	2.00E-03 E	y	1.1E+00 C	3.1E+00 C	6.1E-02 C	1.1E+02 C	1.2E+01 C
2,3,4,6-TETRACHLOROPHENOL	58902	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
P,A,A,A-TETRACHLOROTOLUENE	5216251		2.00E+01 H			y	5.3E-04 C	3.1E-04 C	1.6E-04 C	2.9E-01 C	3.2E-02 C
1,1,1,2-TETRAFLUOROETHANE	811972			2.29E+01 I		y	1.7E+05 N	8.4E+04 N			
TETRYL	479458	1.00E-02 H					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
THALLIC OXIDE	1314325	7.00E-05 W					2.6E+00 N	2.6E-01 N	9.5E-02 N	1.4E+02 N	5.5E+00 N
THALLIUM	7440280	7.00E-05 O					2.6E+00 N	2.6E-01 N	9.5E-02 N	1.4E+02 N	5.5E+00 N
THALIUM ACETATE	563688	9.00E-05 I					3.3E+00 N	3.3E-01 N	1.2E-01 N	1.8E+02 N	7.0E+00 N
THALLIUM CARBONATE	6533739	8.00E-05 I					2.9E+00 N	2.9E-01 N	1.1E-01 N	1.6E+02 N	6.3E+00 N
THALLIUM CHLORIDE	7791120	8.00E-05 I					2.9E+00 N	2.9E-01 N	1.1E-01 N	1.6E+02 N	6.3E+00 N
THALLIUM NITRATE	10102451	9.00E-05 I					3.3E+00 N	3.3E-01 N	1.2E-01 N	1.8E+02 N	7.0E+00 N
THALLIUM SULFATE (2:1)	7446186	8.00E-05 I					2.9E+00 N	2.9E-01 N	1.1E-01 N	1.6E+02 N	6.3E+00 N
THIOBENCARB	28249776	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
TIN	7440315	6.00E-01 H					2.2E+04 N	2.2E+03 N	8.1E+02 N	1.2E+06 N	4.7E+04 N
TITANIUM	7440326	4.00E+00 E		8.60E-03 E			1.5E+05 N	3.1E+01 N	5.4E+03 N	8.2E+06 N	3.1E+05 N
TITANIUM DIOXIDE	13463677	4.00E+00 E		8.60E-03 E			1.5E+05 N	3.1E+01 N	5.4E+03 N	8.2E+06 N	3.1E+05 N

Sources: A = Auxiliary table 5/98 W = Withdrawn from IRIS or HEAST
E = EPA-NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
TOLUENE	108883	2.00E-01 I		1.14E-01 I		y	7.5E+02 N	4.2E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
TOLUENE-2,4-DIAMINE	95807		3.20E+00 H				2.1E-02 C	2.0E-03 C	9.9E-04 C	1.8E+00 C	2.0E-01 C
TOLUENE-2,5-DIAMINE	95705	6.00E-01 H					2.2E+04 N	2.2E+03 N	8.1E+02 N	1.2E+06 N	4.7E+04 N
TOLUENE-2,6-DIAMINE	823405	2.00E-01 H					7.3E+03 N	7.3E+02 N	2.7E+02 N	4.1E+05 N	1.6E+04 N
P-TOLUIDINE	106490		1.90E-01 H				3.5E-01 C	3.3E-02 C	1.7E-02 C	3.0E+01 C	3.4E+00 C
TOXAPHENE	8001352		1.10E+00 I		1.10E+00 I		6.1E-02 C	5.7E-03 C	2.9E-03 C	5.2E+00 C	5.8E-01 C
1,2,4-TRIBROMOBENZENE	615543	5.00E-03 I				y	3.0E+01 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
TRIBUTYLTIN OXIDE	56359	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
2,4,6-TRICHLOROANILINE	634935		3.40E-02 H				2.0E+00 C	1.8E-01 C	9.3E-02 C	1.7E+02 C	1.9E+01 C
1,2,4-TRICHLOROBENZENE	120821	1.00E-02 I		5.70E-02 H		y	1.9E+02 N	2.1E+02 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
1,1,1-TRICHLOROETHANE	71556	2.00E-02 E		2.86E-01 E		y	5.4E+02 N	1.0E+03 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
1,1,2-TRICHLOROETHANE	79005	4.00E-03 I	5.70E-02 I		5.60E-02 I	y	1.9E-01 C	1.1E-01 C	5.5E-02 C	1.0E+02 C	1.1E+01 C
TRICHLOROETHENE	79016	6.00E-03 E	1.10E-02 E		6.00E-03 E	y	1.6E+00 C	1.0E+00 C	2.9E-01 C	5.2E+02 C	5.8E+01 C I
TRICHLOROFLUOROMETHANE	75694	3.00E-01 I		2.00E-01 A		y	1.3E+03 N	7.3E+02 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
2,4,5-TRICHLOROPHENOL	95954	1.00E-01 I					3.7E+03 N	3.7E+02 N	1.4E+02 N	2.0E+05 N	7.8E+03 N
2,4,6-TRICHLOROPHENOL	88062		1.10E-02 I		1.00E-02 I		6.1E+00 C	6.3E-01 C	2.9E-01 C	5.2E+02 C	5.8E+01 C
2,4,5-T	93765	1.00E-02 I					3.7E+02 N	3.7E+01 N	1.4E+01 N	2.0E+04 N	7.8E+02 N
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93721	8.00E-03 I					2.9E+02 N	2.9E+01 N	1.1E+01 N	1.6E+04 N	6.3E+02 N
1,1,2-TRICHLOROPROPANE	598776	5.00E-03 I				y	3.0E+01 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
1,2,3-TRICHLOROPROPANE	96184	6.00E-03 I	7.00E+00 H			y	1.5E-03 C	8.9E-04 C	4.5E-04 C	8.2E-01 C	9.1E-02 C
1,2,3-TRICHLOROPROPENE	96195	5.00E-03 H				y	3.0E+01 N	1.8E+01 N	6.8E+00 N	1.0E+04 N	3.9E+02 N
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76131	3.00E+01 I		8.60E+00 H		y	5.9E+04 N	3.1E+04 N	4.1E+04 N	6.1E+07 N	2.3E+06 N
1,2,4-TRIMETHYLBENZENE	95636	5.00E-02 E		1.70E-03 E		y	1.2E+01 N	6.2E+00 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
1,3,5-TRIMETHYLBENZENE	108678	5.00E-02 E		1.70E-03 E		y	1.2E+01 N	6.2E+00 N	6.8E+01 N	1.0E+05 N	3.9E+03 N
TRIMETHYL PHOSPHATE	512561		3.70E-02 H				1.8E+00 C	1.7E-01 C	8.5E-02 C	1.5E+02 C	1.7E+01 C
1,3,5-TRINITROBENZENE	99354	3.00E-02 I					1.1E+03 N	1.1E+02 N	4.1E+01 N	6.1E+04 N	2.3E+03 N
2,4,6-TRINITROTOLUENE	118967	5.00E-04 I	3.00E-02 I				2.2E+00 C I	2.1E-01 C I	1.1E-01 C I	1.9E+02 C I	2.1E+01 C I
URANIUM (SOLUBLE SALTS)		3.00E-03 I					1.1E+02 N	1.1E+01 N	4.1E+00 N	6.1E+03 N	2.3E+02 N
VANADIUM	7440622	7.00E-03 H					2.6E+02 N	2.6E+01 N	9.5E+00 N	1.4E+04 N	5.5E+02 N
VANADIUM PENTOXIDE	1314621	9.00E-03 I					3.3E+02 N	3.3E+01 N	1.2E+01 N	1.8E+04 N	7.0E+02 N
VANADIUM SULFATE	16785812	2.00E-02 H					7.3E+02 N	7.3E+01 N	2.7E+01 N	4.1E+04 N	1.6E+03 N
VINCLOZOLIN	50471448	2.50E-02 I					9.1E+02 N	9.1E+01 N	3.4E+01 N	5.1E+04 N	2.0E+03 N
VINYL ACETATE	108054	1.00E+00 H		5.71E-02 I		y	4.1E+02 N	2.1E+02 N	1.4E+03 N	2.0E+06 N	7.8E+04 N
VINYL BROMIDE	593602			8.60E-04 I		y	6.3E+00 N	3.1E+00 N			
VINYL CHLORIDE	75014		1.90E+00 H		3.00E-01 H	y	1.9E-02 C	2.1E-02 C	1.7E-03 C	3.0E+00 C	3.4E-01 C
WARFARIN	81812	3.00E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
M-XYLENE	108383	2.00E+00 H				y	1.2E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
O-XYLENE	95476	2.00E+00 H				y	1.2E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
P-XYLENE	106423					y					
XYLENES	1330207	2.00E+00 I				y	1.2E+04 N	7.3E+03 N	2.7E+03 N	4.1E+06 N	1.6E+05 N
ZINC	7440666	3.00E-01 I					1.1E+04 N	1.1E+03 N	4.1E+02 N	6.1E+05 N	2.3E+04 N
ZINC PHOSPHIDE	1314847	3E-04 I					1.1E+01 N	1.1E+00 N	4.1E-01 N	6.1E+02 N	2.3E+01 N
ZINEB	12122677	5E-02 I					1.8E+03 N	1.8E+02 N	6.8E+01 N	1.0E+05 N	3.9E+03 N

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

SUBJECT: Risk-Based Concentration Table **DATE:** 4/1/98

FROM: Jennifer Hubbard, Toxicologist
Superfund Technical Support Section (3HS41)

TO: RBC Table Users

Attached is the EPA Region III Risk-Based Concentration (RBC) Table, which we prepare and post periodically for all interested parties. This Spring 1998 version has been streamlined, as described in detail below.

IMPORTANT NOTES: To make the RBC Table more accessible and to minimize paper usage, it is now primarily available through the Internet. The address is:
http://www.epa.gov/reg3hwmd/risk/riskmenu.htm
The Table is available in both Lotus and Excel as "self-extracting" files. These files should be downloaded and then processed with your computer's "run" function. The files can then be viewed in Lotus or Excel. If you have technical questions about the toxicological or risk assessment aspects of the RBCs, please contact Jennifer Hubbard at 215-566-3328. Other questions can be addressed to Vanessa Sizer or Terri Fields at 215-566-3041. You can also consult the Frequently Asked Questions, below.

CONTENTS, USES, AND LIMITATIONS OF THE RBC TABLE

The RBC Table contains Reference Doses (RfDs) and Cancer Slope Factors (CSFs) for 400-500 chemicals. These toxicity factors have been combined with "standard" exposure scenarios to calculate RBCs--chemical concentrations corresponding to fixed levels of risk (i.e., a Hazard Quotient (HQ) of 1, or lifetime cancer risk of 1E-6, whichever occurs at a lower concentration) in water, air, fish tissue, and soil.

The Region III toxicologists use RBCs to screen sites not yet on the NPL, respond rapidly to citizen inquiries, and spot-check formal baseline risk assessments. The primary use of RBCs is for chemical screening during baseline risk assessment (see EPA Regional Guidance EPA/903/R-93-001, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening"). The exposure equations come from EPA's Risk Assessment Guidance for Superfund (RAGS), while the exposure factors are those recommended in RAGS or supplemental guidance from the Superfund program. The attached technical background document provides specific equations and assumptions. Simply put, RBCs are like risk

assessments run in reverse. For a single contaminant in a single medium, under standard default exposure assumptions, the RBC corresponds to the target risk or hazard quotient.

RBCs also have several important limitations. Specifically excluded from consideration are (1) transfers from soil to air and groundwater, 2) cumulative risk from multiple contaminants or media, and (3) dermal risk. Additionally, the risks for inhalation of vapors from water are based on a very simple model, whereas detailed risk assessments may use more detailed showering models. Also, the toxicity information in the Table has been assembled by hand and (despite extensive checking and years of use) may contain errors. It's advisable to cross-check before relying on any RfDs or CSFs in the Table. If you note any errors, please let us know.

It is important to note that this Table uses inhalation RfDs and CSFs rather than RfCs and inhalation unit cancer risks. This is because the latter factors incorporate exposure assumptions and therefore can only be used for one exposure scenario. Because risk assessors need to evaluate risks for many types of scenarios, the factors have been converted to the more traditional RfDs and CSFs. Unless otherwise indicated in the toxicity-factor source, the assumption is that RfCs and unit risks should be adjusted by a 70-kilogram body weight and a 20^3/day inhalation rate to generate the RfDs and CSFs.

Many users want to know if the RBCs can be used as valid no-action levels or cleanup levels, especially for soils. The answer is a bit complex. First, it is important to realize that the RBC Table does not constitute regulation or guidance, and should not be viewed as a substitute for a site-specific risk assessment. For sites where:

1. A single medium is contaminated;

2. A single contaminant contributes nearly all the health risk;

3. Volatilization, leaching, dermal contact, and other pathways not included in the RBCs are not expected to be significant;

4. The exposure scenarios and assumptions used in the RBC table are appropriate for the site;

5. The fixed risk levels used in the RBC table are appropriate for the site; and

6. Risk to ecological receptors is not expected to be significant;

the RBCs would probably be protective as no-action levels or cleanup goals. However, to the extent that a site deviates from this description, as most do, the RBCs would not necessarily be appropriate.

To summarize, the Table should generally not be used to set cleanup or no-action levels at CERCLA sites or RCRA Corrective Action sites, to substitute for EPA guidance for preparing

baseline risk assessments, or to determine if a waste is hazardous under RCRA.

SPECIAL NOTE

The RBC Table was originally developed by Roy L. Smith, Ph.D., for use by risk assessors in the Region III Superfund program. Dr. Smith is no longer with Region III, and the Table continues to evolve. You may notice some modifications of formatting and conventions used in the Table.

For instance, besides formatting, the following changes are noteworthy:

As usual, updated toxicity factors have been used wherever available. However, because IRIS and provisional values are updated more frequently than the RBC Table, RBC Table users are ultimately responsible for obtaining the most up-to-date values. The RBC Table is provided as a convenience, but toxicity factors are compiled from the original sources and it is those original sources that should serve as the definitive reference.

Certain outdated and withdrawn numbers have been removed from the Table.

RBCs will no longer be rounded to 1E6 ppm. For certain low-toxicity chemicals, the RBCs exceed possible concentrations at the target risks. In such cases, Dr. Smith rounded these numbers to the highest possible concentration, or 1E6 ppm. The rounding has been discontinued so that Table users can adjust the RBCs to a different target risk whenever necessary. For example, when screening chemicals at a target HQ of 0.1, noncarcinogenic RBCs may simply be divided by 10. Such scaling is not possible when RBCs are rounded.

This Table was originally compiled to assist Superfund risk assessors in screening hazardous waste sites. The large number of chemicals has made the Table unwieldy and difficult to keep current. Many of the chemicals do not typically (or even occasionally) appear at Superfund sites. In the 1998 version of the Table, the 600+ chemicals have been reduced to some 400-500 chemicals by eliminating many of those atypical chemicals. Through time, the Table may continue to grow or decrease in size. Comments on this issue would be appreciated. (A list of the deleted chemicals is attached.)

At Region III Superfund sites, noncancer RBCs are typically adjusted downward to correspond to a target HQ of 0.1 rather than 1. (This is done to ensure that chemicals with additive effects are not prematurely eliminated during screening.) However, some chemicals have RBCs at HQs of 0.1 that are lower than their RBCs at 1E-6 cancer risk. In other words, the screening RBC would change from carcinogenic to noncarcinogenic. A new feature of this Table is that these chemicals are now flagged with a "!" symbol. Therefore, assessors screening with adjusted RBCs will be alerted to this situation. (We are also soliciting comments on whether the default target HQ on the RBC table should be 0.1 rather than 1.)

Earlier versions of this Table included a substitution of inhalation toxicity factors for oral

factors whenever oral factors were unavailable (this applied only to groundwater and air, but not soil or fish). This practice has been discontinued in order to minimize the uncertainty associated with such a conversion. The discontinuation of this practice does not significantly decrease the number of available RBCs.

CAS numbers and volatility status have begun to be re-checked in accordance with comments from users. At this time, about two-thirds of the chemicals have been checked for volatility, and about 90% of the CAS numbers have been verified.

Earlier versions of this Table included soil screening levels (SSLs), when those values were available in draft form. Since the finalization of the SSL Guidance, risk assessors are urged to consult the final SSL Guidance directly. The Guidance has detailed recommendations on site-specific sampling and site-specific SSL generation. (Soil Screening Guidance: User's Guide April 1996, Publication 9355.4-23; and Soil Screening Guidance: Technical Background Document, May 1996; EPA/540/R-95/128)

FREQUENTLY ASKED QUESTIONS

To help you better understand the RBC Table, here are answers to our most often-asked questions:

1. How can the age-adjusted inhalation factor (11.66) be less than the inhalation rate for either a child (12) or an adult (20)?

> Age-adjusted factors are not intake rates, but rather partial calculations which have different units from intake rates. (Therefore, they are not directly comparable.) The fact that these partial calculations have values similar to intake rates is really coincidental, an artifact of the similar magnitude of years of exposure and time-averaged body weight.

2. For manganese, IRIS shows an oral RfD of 0.14 mg/kg/day, but the RBC Table uses 2E-2 mg/kg/day. Why?

> The IRIS RfD includes manganese from all sources, including diet. The explanatory text in IRIS recommends using a modifying factor of 3 when calculating risks associated with non-food sources, and the Table follows this recommendation. IRIS also recommends subtracting dietary exposure (default assumption in this case 5 mg). Thus, the IRIS RfD has been lowered by a factor of 2 x 3, or 6. The Table now reflects manganese RBCs for both "food" and "non-food" (most environmental) sources.

3. What is the source of the child's inhalation rate of 12 m^3/day?

> The calculation comes from basic physiology. It's a scaling of the mass-specific 20 m^3/day rate for adults from a body mass of 70 kg to 15 kg, using the 2/3 power of mass, as follows:

Ircm = mass-specific child inhalation rate (m^3/kg/day)
Irc = child inhalation rate (m^3/day)

20 m^3/day / 70 kg = 0.286 m^3/kg/day (mass-specific adult inhalation rate)

0.286 m^3/kg/day x ($70^{0.67}$) = (Ircm) x ($15^{0.67}$)

Ircm = 0.803 m^3/kg/day

Irc = Ircm x 15 kg = 0.803 m^3/kg/day x 15 kg = 12.04 m^3/day

4. Can the oral RfDs in the RBC Table be applied to dermal exposure?

Not directly. Oral RfDs are usually based on administered dose and therefore tacitly include a GI absorption factor. Thus, any use of oral RfDs in dermal risk calculations should involve removing this absorption factor. Consult the Risk Assessment Guidance for Superfund, Part A, Appendix A, for further details on how to do this.

5. The exposure variables table in the RBC background document lists the averaging time for non-carcinogens as "ED*365." What does that mean?

ED is exposure duration, in years, and * is the computer-ese symbol for multiplication. Multiplying ED by 365 simply converts the duration to days. In fact, the ED term is included in both the numerator and denominator of the RBC algorithms for non-cancer risk, canceling it altogether. See RAGS for more information.

6. Why is inorganic lead not included in the RBC Table?

EPA has no consensus RfD or CSF for inorganic lead, so it is not possible to calculate RBCs as we have done for other chemicals. EPA considers lead to be a special case because of the difficulty in identifying the classic "threshold" needed to develop an RfD.

EPA therefore evaluates lead exposure by using blood-lead modeling, such as the Integrated Exposure-Uptake Biokinetic Model (IEUBK). The EPA Office of Solid Waste has also released a detailed directive on risk assessment and cleanup of residential soil lead. The directive recommends that soil lead levels less than 400 mg/kg are generally safe for residential use. Above that level, the document suggests collecting data and modeling blood-lead levels with the IEUBK model. For the purposes of screening, therefore, 400 mg/kg is recommended for residential soils. For water, we suggest 15 ug/l (the EPA Action Level in water), and for air, the National Ambient Air Quality Standard.

7. Where did the CSFs for carcinogenic PAHs come from?

The PAH CSFs are all calculated relative to benzo[a]pyrene, which has an IRIS slope factor. The relative factors for the other PAHs can be found in "Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons," Final Draft, ECAO-CIN-842 (March, 1993).

8. May I please have a copy of a previous RBC Table?

We do not distribute outdated copies of the RBC Table. Each new version of the Table supersedes all previous versions.

9. Please elaborate on the meaning of the "W" source code in the Table.

The "W" code means that a RfD or CSF is currently not present on either IRIS or HEAST, but that it was once present on either IRIS or HEAST and was removed. Such withdrawal usually indicates that consensus on the number no longer exists among EPA scientists, but not that EPA believes the contaminant to be unimportant.

Withdrawn numbers are shown in the Table because we still need to deal with these contaminants during the long delays before replacement numbers are ready. For the purpose of screening, a "W" value is similar to a provisional value in that neither value has achieved Agency consensus. The "W" code should serve as a clear warning that before making any serious decision involving that contaminant, you will need to develop an interim value based on current scientific understanding.

If you are assessing risks at a site where a major contaminant is coded "W," consider working with your Region EPA risk assessor to develop a current toxicity constant. If the site is being studied under CERCLA, the EPA-NCEA Regional Technical Support group may be able to assist.

10. Can I get copies of supporting docouments for interim toxicity constants which are coded "E" in the RBC Table?

Unfortunately, Region 3 does not have a complete set of supporting documents. The EPA-NCEA Superfund Technical Support Center prepares these interim toxicity constants in response to site-specific requests from Regional risk assessors, and sends the documentation only to the requestor. The RBC Tables contain only the latest interim values that we've either requested or have otherwise received. NCEA maintains the master data base of these chemicals, but will not release documentation of provisional values unless they are recent. Furthermore, since NCEA's Superfund Technical Support Center is mainly for the support of Superfund, it usually cannot develop new criteria unless authorized to do so for a specific Superfund project.

If an "E"-coded contaminant is a chemical of potential concern at your site, we urge you to work with the EPA Regional risk assessor assigned to the project in order to develop or obtain documentation for provisional values. EPA Region 3 furnishes documents only when needed to support Regional risk assessments or recommendations.

Attached is a list of "E"-coded chemicals whose supporting documentation was issued prior to 1996, indicating that toxicity information may need to be updated.

Attachments

"DISCONTINUED" CHEMICALS

These chemicals may still have toxicity criteria available in IRIS, HEAST, or NCEA provisional values. However, they are not routine chemicals and therefore will not be routinely maintained in the RBC Table, unless our Table users report a significant need for chemicals to be re-added. Some of the chemicals on this Table were deleted because supporting toxicity information has been withdrawn or is unavailable.

acephate
acetone cyanohyrin
acifluorfen
acrylic acid
ally
allyl alcohol
aluminum phosphide
amdro
ametryn
m-aminophenol
amitraz
ammonium sulfamate
antimony potassium tartrate
apollo
aramite
asulam
avermectin B1
barium cyanide
bayleton
benefin
benomyl
benzotrichloride
bidrin
biphenthin
bis(2-chloro-1-methylethyl)ether
bisphenol A
boron trifluoride
4-bromophenyl phenyl ether
bromoxynil
bromoxynil octanoate
butylphthalyl butylglycolate
cacodylic acid
captafol
captan
carboxin
chloramben
chlorimuron-ethyl
chloroacetaldehyde
2-chloroacetophenone
4-chlorobenzotrifluoride
2-chloroethyl vinyl ether
4-chloro-2-methylaniline hydrochloride
chlorothalonil
chlorpropham
chlorsulfuron
chlorthiophos
coal tar creosote
cyclohexlamine
cyromazine
danitol
decabromodiphenyl ether
demeton
diallate
diethylforamide
diflubenzuron
dimethipin
dimethoate
N,N-dimethylformamide
dimethyl terephthalate
diphenamid
direct black 38
direct blue 6
direct brown 95
dodine
1,2-epoxybutane
ethephon
2-ethoxyethanol acetate
ethyl acrylate
EPTC

ethylene cyanohydrin
ethyl p-nitrophenyl phenylphosphorothioate
ethylphthalyl ethyl glycolate express
fluoridone
flurprimidol
flutolanil
fluvalinate
folpet
fosteyl-al
furium
furmecyclox
glufosinate-ammonium
haloxyfop-methyl
harmony
imazalil
imazaquin
iprodione
isoxaben
kepone
lactofen
linuron
londax
maleic hydrazide
malononitrile
mancozeb
maneb
merphos
merphos oxide
metalaxyl
methamidophos
methomyl
2-methoxyethanol acetate
2-methoxyethanol
2-methoxy-5-nitroaniline
2-methylaniline hydrochloride
methyl chlorocarbonate
4,4-methylene bisbenzeneamine
metribuzin
molinate
2-naphthylamine
napropamide
nickel subsulfide
nitrapyrin
3-nitroaniline
4-nitroaniline
nitroguanidine
norflurazon
nustar
octabromodiphenyl ether
octamethylpyrophosphoramide
paclobutrazol
pebulate
pendimethalin
pentabromo-6-chlorocyclohexane
pentabromodiphenyl ether
phenmedipham
phenylmercuric acetate
phorate
phosmet
picloram
pirimiphos-methyl
prochloraz
profluralin
pronamide
propargyl alcohol
propazine
propham
propiconazole
propylene oxide
pydrin
quinalphos
savey
selenourea
sethoxydim
sodium fluoroacetate
sodium metavanadate
systhane
tebuthiuron
temephos
terbacil
terbufos
terbutryn

tetrachlorovinphos
thallium selenide
2-(thiocyanomethylthio)-benzothiazole
thiofanox
thiram
triallate
2,4,6-trichloroaniline hydrochloride
tridiphane
trifluralin
tetraethyldithiopyrophosphate
thiophanate-methyl
tralomethrin
triasulfuron
triethylamine
vernam

NCEA ("E") CHEMICALS WITH SUPPORTING INFORMATION PRE-1996

aminodinitrotoluenes
bis(2-ethylhexyl)phthalate, inhalation CSF
chloroethane, oral CSF
dibenzofuran
1,4-dichlorobenzene, inhalation CSF
4,6-dinitro-2-methylphenol
2-hexanone
nitroglycerin
4-nitrophenol
polychlorinated terphenyls
benzo[a]pyrene, inhalation CSF
naphthalene
titanium
titanium dioxide

NCEA information on lithium, CSFs for PAHs relative to benzo[a]pyrene, tetrachloroethene CSFs, and trichloroethene were originally produced prior to 1996, but NCEA has confirmed within the last two years that the information is still current.