64573

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

COMPREHENSIVE QUALITY ASSURANCE PLAN

Savannah Division
5102 LaRoche Avenue
Savannah, Georgia 31404
(912) 354-7858

Tallahassee Division
2846 Industrial Plaza Drive
Tallahassee, Florida 32301
(904) 878-3994

Mobile Division
900 Lakeside Drive
Mobile, Alabama 36609
(205) 666-6633

South Florida Division
414 SW 12th Avenue
Deerfield Beach, Florida 33442
(305) 421-7400

Tampa Bay Division
6712 Benjamin Road, Suite 100
Tampa, Florida 33634
(813) 885-7427

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Prepared by and for:

Savannah Laboratories and Environmental Services, Inc.

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813-885-7427

September, 1992

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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 in order to ensure the best possible precision, accuracy, and representativeness of results from testing of environmental samples.

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) Use properly trained analysts to analyze all samples by approved methods and within holding times;

(4) Produce QC verifiable data which can be documented to show that the system was calibrated and within precision and accuracy control limits;

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

(6) Document all the above activities in order that all data can be independently validated.

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

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, approving analytical and quality control data, final review of report, and discussion of results with client. The project managers are assisted by QA managers and staff at each laboratory.

The QA Plan will be utilized by all five Savannah Laboratories facilities. Additionally, all labs use identical Standard Operating Procedures (SOP), all data are incorporated into a single Laboratory Information Management System (LIMS) network which generates common QA limits, etc., and is accessible to all employees. Each project is directed by a single project manager who supervises all employees involved on the project, and also reviews, approves, and signs all data reports.

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

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.

Duties of the 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) Controller

1) Supervise administration section;

2) Prepare financial reports;

3) Coordinate risk management program; and

4) Assist corporate officers with budgetary problems.

D) Corporate Technical Staff

1) Provide technical support for all divisions;

2) Coordinate technical activities affecting all divisions;

3) Write SOPs and other technical documents; and

4) Inform all divisions about new methods.

E) Business Manager

1) Supervise accounting section;

2) Coordinate purchases and payables; and

3) Maintain equipment inventory and business records.

F) 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.

G) 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 supervision of the project team including analytical department managers, field sampling crews and data management personnel;

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.

H) QA Manager

1) Coordinate with the project manager, and laboratory manager in order to insure that project QA is maintained;

2) Be available to discuss QA activities and results with client;

3) Prepare QA reports to management;

4) Perform periodic system audits;

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

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

7) Coordinate and be present during all external QA Audits.

I) 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.

J) Sample/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 client on custody problems; and

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

K) Field/Sampling Manager

1) Coordinate and schedule sampling crews;

2) Prepare sampling reports; and

3) Ensure sampling protocols are followed.

L) Department Manager

1) Organize work flow in department;

2) Assure adequate inventory of reagents and equipment;

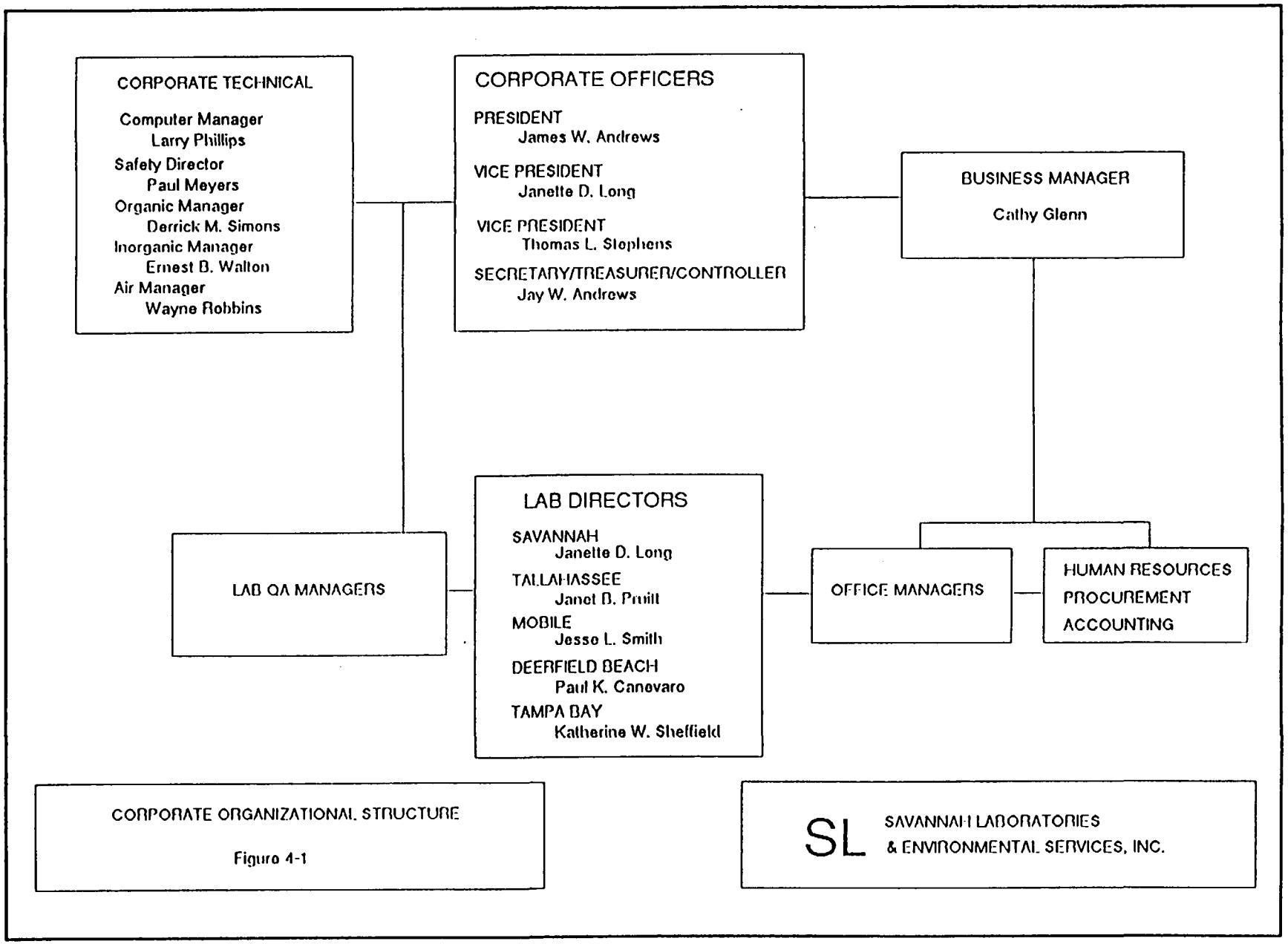
3) Ensure effective maintenance and repair of instrumentation;

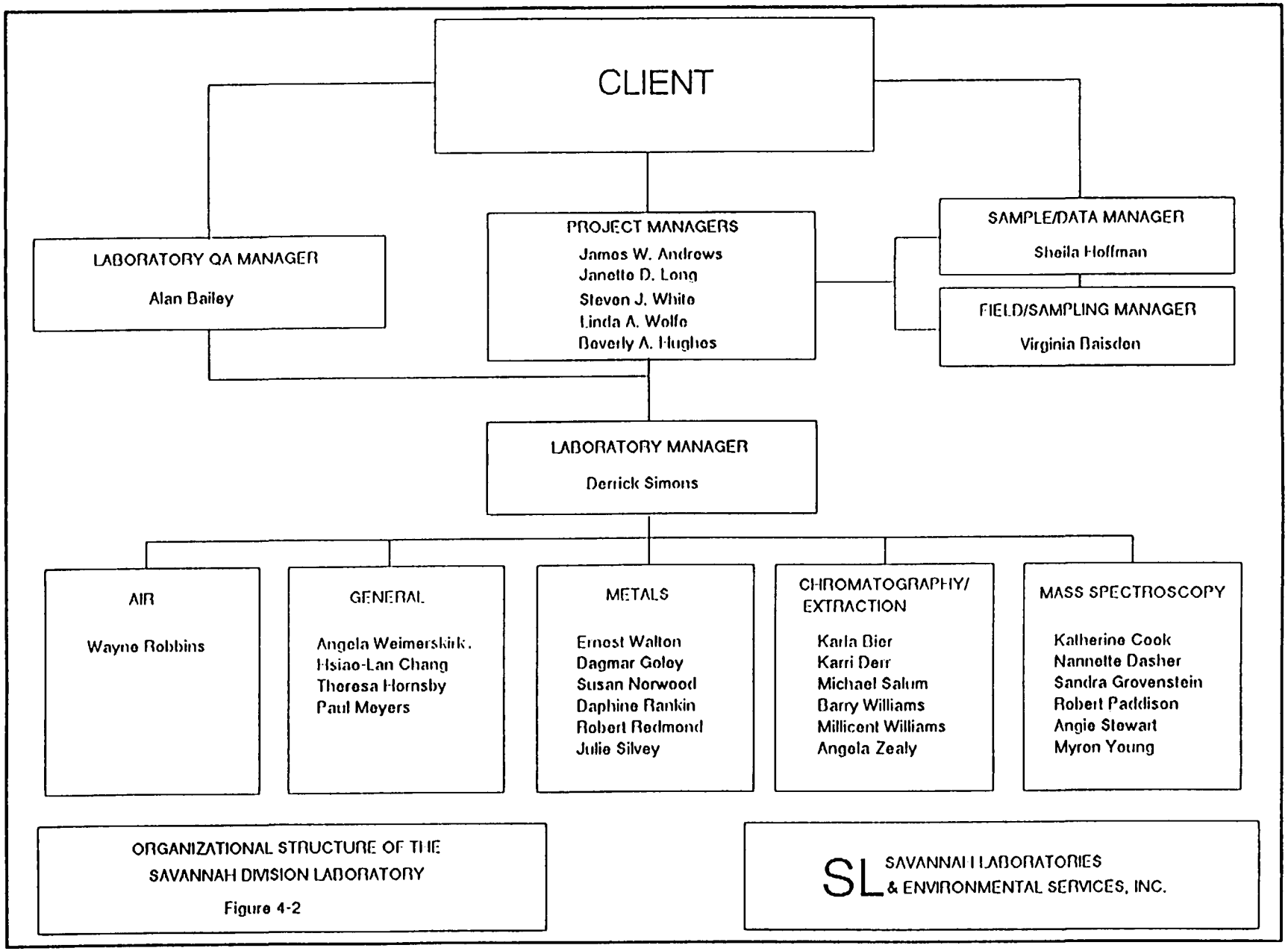
4) Investigate and evaluate new methodology and equipment; and

5) Train new employees.

A list of all technical employees and resumes for each of the professionals in the organization are provided in Section 16.0.

In case of instrument failure, high sample volume, or rapid turnaround requirements, samples are interchanged among the five facilities. In these situations, samples or preserved extracts are transported under EPA recommended chain-of-custody, handling and storage procedures. This inter-exchange of workload practice is possible because of single administrative structure, the use of identical analytical and QA protocols, and the fact that all five facilities are tied into (via telephone modem) a central computerized Laboratory Information Management System (LIMS).

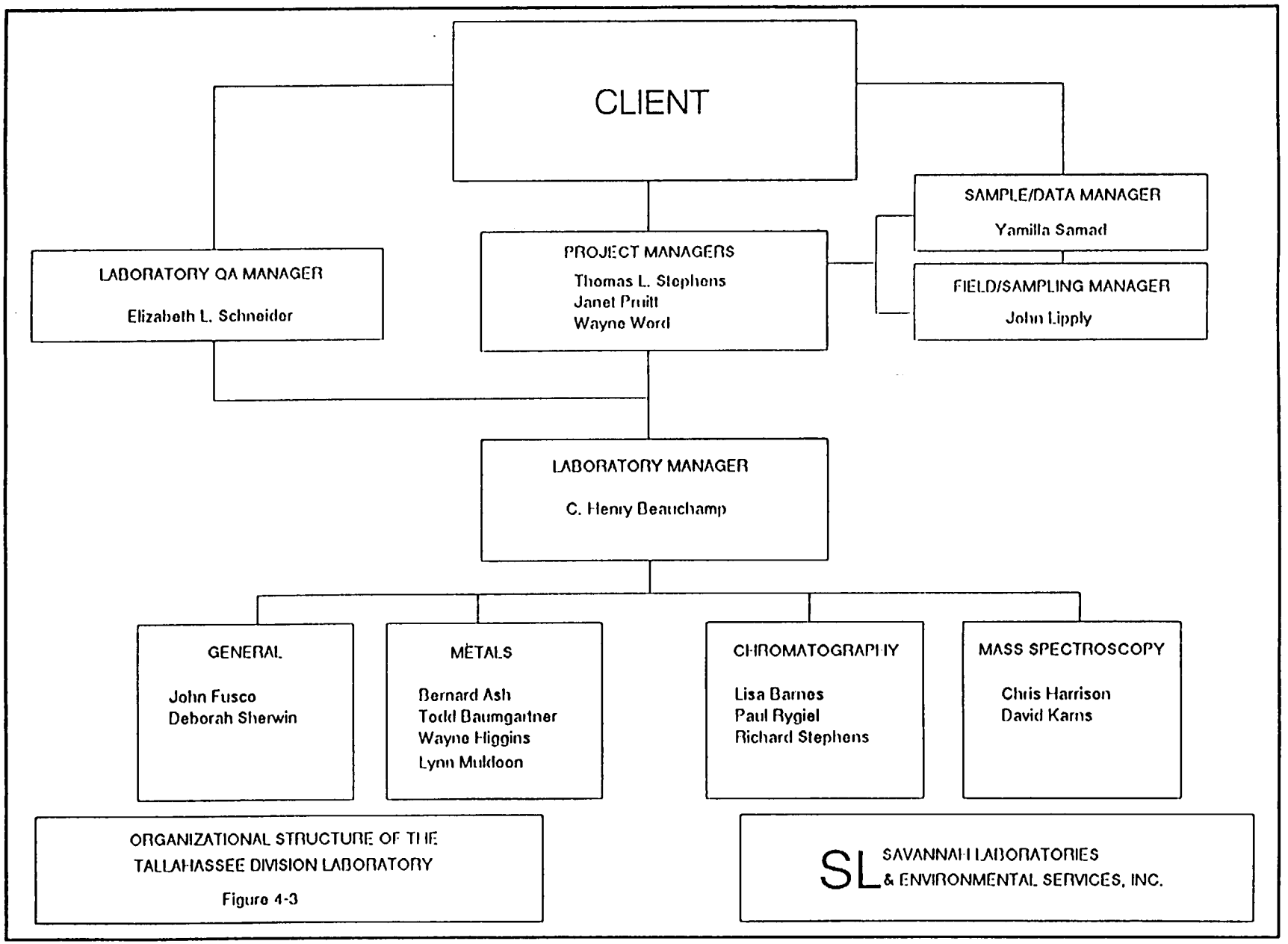

CORPORATE TECHNICAL
Computer Manager
Larry Phillips
Safety Director
Paul Meyers
Organic Manager
Derrick M. Simons
Inorganic Manager
Ernest B. Walton
Air Manager
Wayne Robbins
CORPORATE OFFICERS
PRESIDENT
James W. Andrews
VICE PRESIDENT
Janette D. Long
VICE PRESIDENT
Thomas L. Stephens
SECRETARY/TREASURER/CONTROLLER
Jay W. Andrews
BUSINESS MANAGER
Cathy Glenn
LAB QA MANAGERS
LAB DIRECTORS
SAVANNAH
Janette D. Long
TALLAHASSEE
Janet B. Pruitt
MOBILE
Jesse L. Smith
DEERFIELD BEACH
Paul K. Canevaro
TAMPA BAY
Katherine W. Sheffield
OFFICE MANAGERS
HUMAN RESOURCES
PROCUREMENT
ACCOUNTING
CORPORATE ORGANIZATIONAL STRUCTURE
Figure 4-1
SL
SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

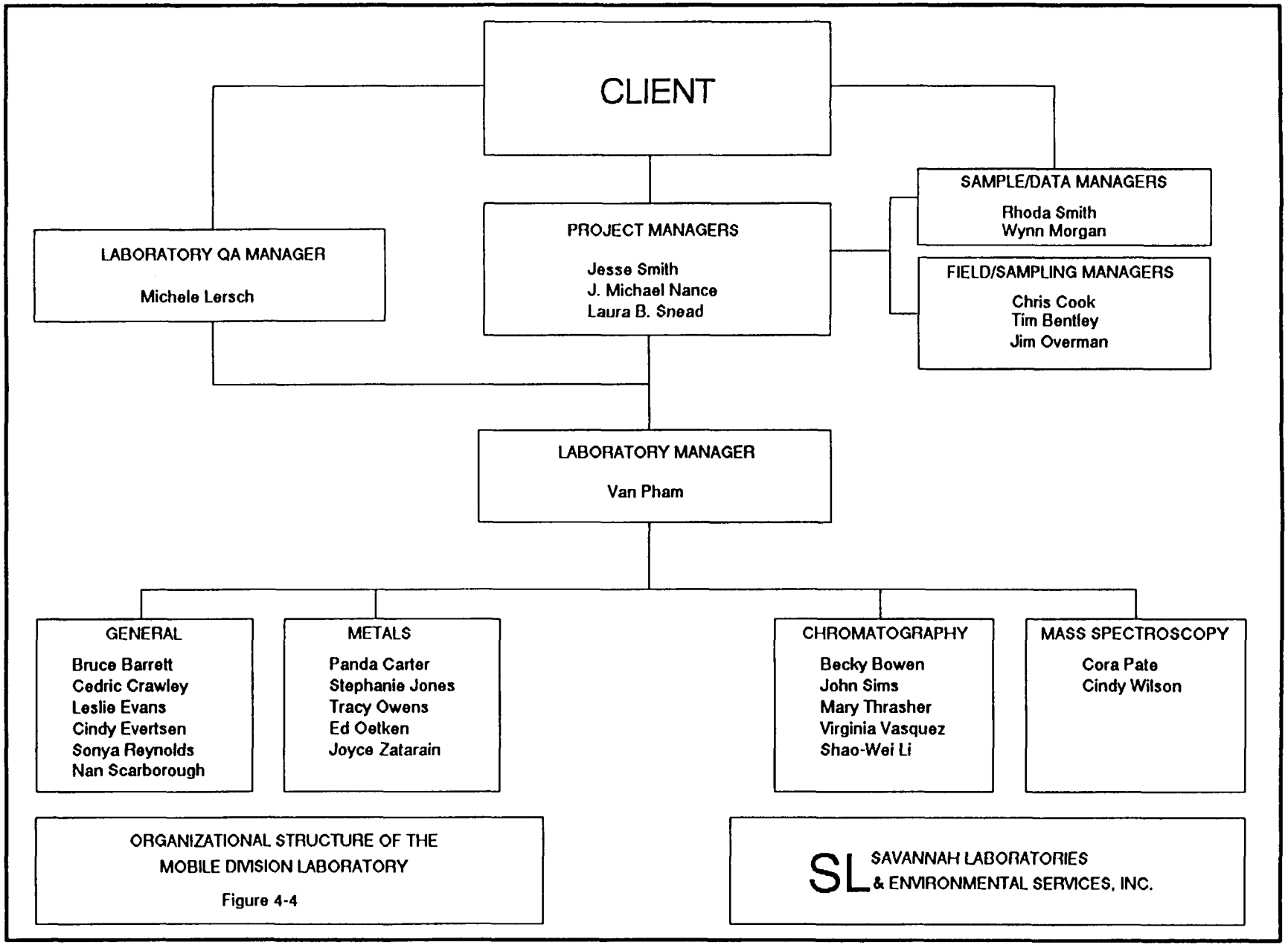


ORGANIZATIONAL STRUCTURE OF THE
SAVANNAH DIVISION LABORATORY

Figure 4-2

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

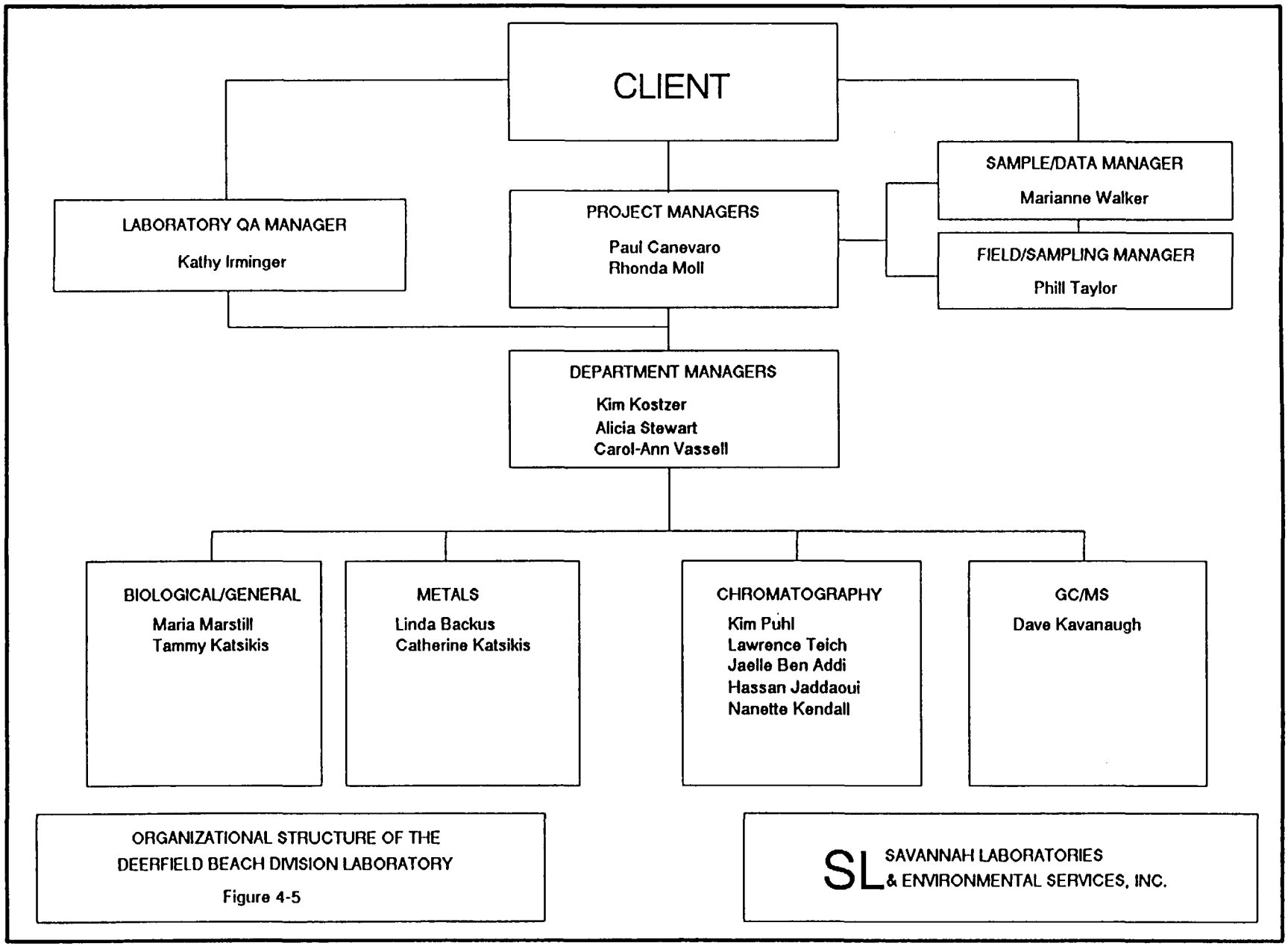

CLIENT
SAMPLE/DATA MANAGER
Yamilla Samad
LABORATORY QA MANAGER
Elizabeth L. Schneider
PROJECT MANAGERS
Thomas L. Stephens
Janet Pruitt
Wayne Word
FIELD/SAMPLING MANAGER
John Lipply
LABORATORY MANAGER
C. Henry Beauchamp
GENERAL
John Fusco
Deborah Sherwin
METALS
Bernard Ash
Todd Baumgartner
Wayne Higgins
Lynn Muldoon
CHROMATOGRAPHY
Lisa Barnes
Paul Rygiel
Richard Stephens
MASS SPECTROSCOPY
Chris Harrison
David Karns
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

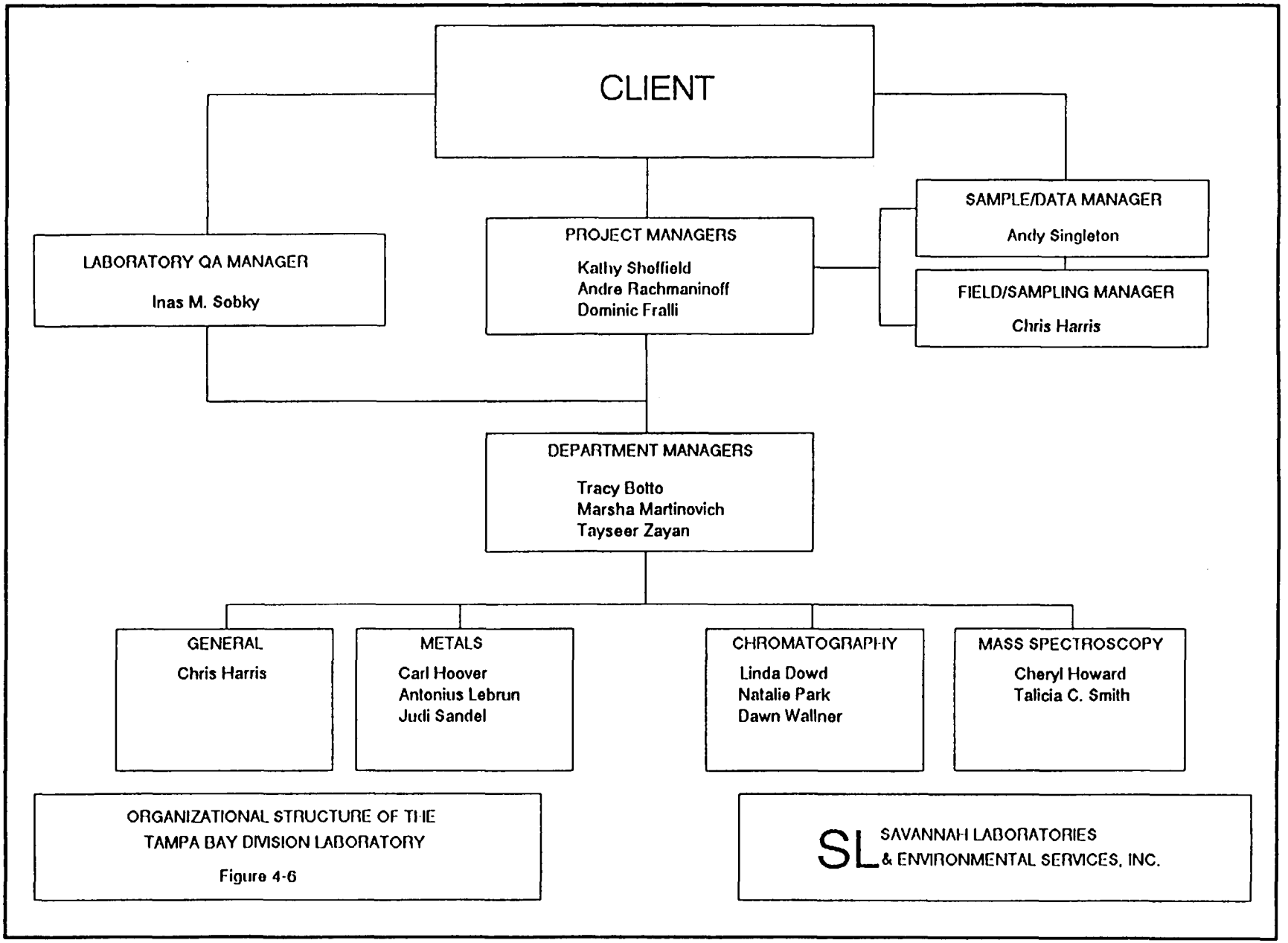
SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE
DEERFIELD BEACH DIVISION LABORATORY

Figure 4-5

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE
TAMPA BAY DIVISION LABORATORY

Figure 4-6

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5.0 QUALITY ASSURANCE OBJECTIVES (PRECISION, ACCURACY, AND PQLs)

Savannah Laboratories has a comprehensive quality assurance program which is based on the program outlined in EPA's *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)*, in the *Handbook for Analytical Quality Control in Water and Wastewater Laboratories* (EPA, 1979) 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 practical quantification limits (PQLs) for relatively clean environmental samples. Accuracy control limits are for lab control standards (LCS) or blank spike recoveries and do not apply to matrix spike (advisory only). Table 5.3 gives the same information for field parameters.

PRECISION

The Savannah Laboratories objective for precision is to meet the precision data generated by the applicable method validation on similar matrices. Relative percent difference (RPD) is used to express precision between two replicate values. In routine analyses, the values for most parameters are usually below PQLs; therefore, precision data are derived from duplicate matrix spike or lab control standard results.

The relative percent difference (RPD) is calculated as:

$$RPD = \frac{V1 - V2}{(V1 + V2)/2} \times 100$$

V1, V2 = The two values obtained by analyzing the duplicate samples.

ACCURACY

The Savannah Laboratories objective for accuracy is to meet the accuracy data generated by the applicable method validation on similar matrices. Percent recovery (%R) is used to express accuracy from the analysis of blank spikes and other QC samples.

The percent recovery (%R) is calculated as below:

$$\%R = \frac{SPV - SAV}{SA} \times 100$$

SAV - The background value, value obtained by analyzing the sample

SA - Concentration of the spike added to the sample

SPV - Value obtained by analyzing the sample with the spike added

COMPARABILITY

The Savannah Laboratories objective for comparability is to strive toward the comparability of sample parameters on similar matrices as they relate to precision and accuracy determinations. 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 distinguishing characteristic 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 distribution is within statistically defined bounds of the population mean and variance.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Aluminum	200.7A	65	75-125	0-20	20
	200.7/6010(3010)	3/2	75-125	0-20	200
	Saltwater	5	50-140	0-40	10
	CLP	45	80-120	0-20	200
Antimony	200.7/6010(3010***)	3/2	75-125	0-20	50
	204.2/7041(3005)	3/2	75-125	0-20	20
	CLP	45	80-120	0-20	60
Arsenic	200.7A	65	75-125	0-20	10
	200.7/6010(3010)	3/2	75-125	0-20	100
	206.2/7060(3020***)	3/2	75-125	0-20	10
	206.3/7061	3/2	60-140	0-40	2.0
	206.3/7061-Saltwater	3/2/5	60-140	0-40	0.10
	CLP	45	80-120	0-20	10
Barium	200.7A	65	75-125	0-20	1.0
	200.7/6010(3010)	3/2	75-125	0-20	10
	CLP	45	75-125	0-20	200
Beryllium	200.7/6010(3010)	3/2	75-125	0-20	5.0
	210.2/7091(3020)	3/2	75-125	0-20	5.0
	CLP	45	80-120	0-20	5.0
Boron	200.7/6010(3010***)	3/2	75-125	0-20	50
Cadmium	200.7A	65	75-125	0-20	0.50
	200.7/6010(3010)	3/2	75-125	0-20	5.0
	213.2/7131(3020)	3/2	75-125	0-20	1.0
	Saltwater	5	60-140	0-40	0.050
	CLP	45	80-120	0-20	5.0
Calcium	200.7/6010(3010)	3/2	75-125	0-20	500
	CLP	45	80-120	0-20	5000
Chromium	200.7A	65	75-125	0-20	1.0
	200.7/6010(3010)	3/2	75-125	0-20	10
	218.2/7191(3020)	3/2	75-125	0-20	10
	CLP	45	80-120	0-20	10
Chromium, hexavalent	7196	2	75-125	0-20	10
Cobalt	200.7/6010(3010)	3/2	75-125	0-20	10
	CLP	45	80-120	0-20	50
Copper	200.7A	65	75-125	0-20	2.5
	200.7/6010(3010)	3/2	75-125	0-20	25
	220.1/220.2(3020)	3	75-125	0-20	10
	Saltwater	5	60-140	0-40	0.50
	CLP	45	80-120	0-20	25
Iron	200.7A	65	75-125	0-20	5.0
	200.7/6010(3010)	3/2	75-125	0-20	50
	236.2(3020)	3	75-125	0-20	10
	Saltwater	5	60-140	0-40	2.0
	CLP	45	80-120	0-20	100
Lead	200.7A	65	75-125	0-20	5.0
	200.7/6010(3010)	3/2	75-125	0-20	50
	239.2/7421(3020)	3/2	75-125	0-20	5.0
	Saltwater	5	60-140	0-40	0.50
	CLP	45	80-120	0-20	3.0
Lithium	3500-Li B	4	75-125	0-20	100
Magnesium	200.7/6010(3010)	3/2	75-125	0-20	500
	CLP	45	80-120	0-20	5000
Manganese	200.7A	65	75-125	0-20	1.0
	200.7/6010(3010)	3/2	75-125	0-20	10
	CLP	45	80-120	0-20	15

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Mercury	245.1/7470	3/2	75-125	0-20	0.20
	Saltwater	5	60-140	0-40	0.10
	CLP	45	80-120	0-20	0.20
Molybdenum	200.7/6010(3010)	4/2	75-125	0-20	10
Nickel	200.7A	65	75-125	0-20	4.0
	200.7/6010(3010)	3/2	75-125	0-20	40
	249.2	3	75-125	0-20	10
	Saltwater	5	60-140	0-40	1.0
	CLP	45	80-120	0-20	40
Phosphorus	200.7***/6010***(3010***)	3/2	75-125	0-20	50
Potassium	200.7/6010(3010)	3/2	75-125	0-20	1000
	258.1/7610(3010)	3/2	75-125	0-20	100
	CLP	45	80-120	0-20	5000
Selenium	200.7/6010(3010)	3/2	75-125	0-20	100
	270.2/7740(3020***)	3/2	75-125	0-20	10
	270.3/7741	3/2	60-140	0-40	2.0
	270.3/7741 - Saltwater	3/2/5	60-140	0-40	0.10
	CLP	45	80-125	0-20	5.0
Silica	200.7/6010(3010***)	3/2	75-125	0-30	500
Silver	200.7A	65	75-125	0-20	1.0
	200.7/6010(3010***)	3/2	75-125	0-20	10
	272.1	3	75-125	0-20	10
	272.2/7761	3/2	75-125	0-20	1.0
	Saltwater	5	60-140	0-40	0.050
	CLP	45	80-120	0-20	10
Sodium	200.7/6010(3010)	3/2	75-125	0-20	500
	273.1	3	75-125	0-20	500
	CLP	45	80-120	0-20	5000
Strontium	200.7***/6010***(3010***)	3/2	75-125	0-20	10
Thallium	200.7/6010(3010)	3/2	75-125	0-20	500
	279.2/7841(3020)	3/2	75-125	0-20	10
	CLP	45	80-120	0-20	10
Tin	200.7***V/6010***V (3010***V)	3/2	75-125	0-20	50
	282.2	3	75-125	0-20	50
Titanium	200.7***/6010***(3010***)	3/2	75-125	0-20	10
Tributyl tin	Atomic absorption	40	60-140	0-40	0.0040
Vanadium	200.7/6010(3010)	3/2	75-125	0-20	10
	CLP	45	80-120	0-20	50
Zinc	200.7A	65	75-125	0-20	2.0
	200.7/6010(3010)	3/2	75-125	0-20	20
	Saltwater	5	60-140	0-40	1.0
	CLP	45	80-120	0-20	20
Zinc phosphide	FDER Special Method	31	10-210	0-80	2.0
Zirconium	200.7***/6010***(3010***)	2	75-125	0-20	5000

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/L)
Acidity	305.1/402	3/4	75-125	0-30	10
Alkalinity	310.1/403	3/4	75-125	0-30	1.0
Ammonia (as N)	350.1 350.3	3 3	90-110 75-125	0-30 0-30	0.030 0.050
Ammonia, un-ionized	FL-DER	60	NA	NA	0.010
Bicarbonate	403	4	NA	NA	1.0
BOD	405.1/507	3/4	60-140	0-30	2.0
Bromate	300.0	3	75-125	0-30	1.0
Bromide	9056/300.0 320.1	2/3 3	75-125 75-125	0-30 0-30	1.0 2.0
Carbon, total organic	415.1/9060	3/2	60-140	0-40	1.0
Carbonate	403	4	NA	NA	1.0
CBOD	507	4	NA	0-30	2.0
Chloride	325.2 325.3/9252 407A 9056/300.0	3 3/2 4 2/3	85-115 75-125 75-125 75-125	0-30 0-30 0-30 0-30	1.0 1.0 1.0 1.0
Chlorine, residual	408A 330.4 330.5	4 3 3	NA NA NA	0-30 0-30 0-30	1.0 1.0 1.0
Chlorophyll	1002G	4	NA	0-30	0.00010
COD	508B 410.2 410.4	4 3 3	60-140 60-140 60-140	0-30 0-30 0-30	20 20 20
Coliform, fecal, MPN	908C	4	NA	NA	2 MPN/ 100 mL
Coliform, fecal, MF	909C	4	NA	NA	1 col/100 mL
Coliform, total, MPN	908A	4	NA	NA	2 MPN/100 mL
Coliform, total, MF	909A	4	NA	NA	1 col/100 mL
Color	110.2/204A	3/4	NA	0-40	5 PCU
Corrosivity	203	4	NA	NA	NA
Cyanate	412K	4	60-140	0-40	0.10
Cyanide, amenable to chlorination	9012 335.1/9010	2 3/2	NA NA	0-50 0-40	0.010 0.010
Cyanide, reactive	7.3.3.2	2	NA	0-50	0.010
Cyanide, total	335.3/9012 335.2/9010 CLP	3/2 3/2 45	85-115 75-125 85-115	0-30 0-30 0-30	0.010 0.010 0.010
Cyanide, weak and dissociable	412H	4	NA	0-40	0.010
Fluoride	340.2	3	75-125	0-30	0.20

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/L)
Formaldehyde	NIOSH	35	70-125	0-30	0.25
Halogens, total organic	450.1/9020	3/2	60-140	0-40	0.010
Hardness, total	314A	4	NA	NA	3.3
Hydrogen ion (pH)	150.1/9040	3/2	90-110	0-10	NA
Nitrate (as N)	353.2 9056/300.0 352.1 353.3	3 2/3 3 3	85-115 75-125 75-125 75-125	0-30 0-30 0-30 0-30	0.050 0.10 0.10 0.050
Nitrate-Nitrite (as N)	353.2	3	85-115	0-30	0.050
Ignitability	1010	2	NA	NA	NA
Nitrite (as N)	353.2 354.1 9056/300.0 353.3	3 3 2/3 3	85-115 75-125 75-125 75-125	0-30 0-30 0-30 0-30	0.050 0.050 0.050 0.050
Nitrogen, total Kjeldahl (TKN)	351.2 351.3	3 3	65-135 75-125	0-40 0-30	0.10 0.10
Nitrogen, organic	EPA-CE	46	NA	NA	0.10
Nitrogen, total	EPA-CE	46	NA	NA	0.15
Odor	140.1/207	3/4	NA	NA	1 TON
Oil & Grease	413.1/503A 413.2/503B	3/4 3/4	60-140 60-140	0-30 0-30	5.0 1.0
Orthophosphate (as P)	365.1 365.2 365.3 9056/300.0	3 3 3 2/3	80-120 75-125 75-125 75-125	0-30 0-30 0-30 0-30	0.050 0.050 0.050 0.10
Oxygen, dissolved	360.1	3	NA	0-30	0.10
Petroleum hydrocarbons	418.1/503E	3/4	60-140	0-30	1.0
Phenolics, total recoverable	420.2/9066 420.1/9065	3/2 3/2	75-125 75-125	0-30 0-30	0.010 0.010
Phosphorus, organic (as P)	365.4	3	NA	NA	0.10
Phosphorus, total (as P)	365.4 365.3 365.2	3 3 3	60-140 60-140 60-140	0-40 0-40 0-40	0.10 0.050 0.10
Plate count, heterotrophic	907	4	NA	NA	1000 CFU/L
Radioactivity, alpha	900.0/9310/703	54/2/4	48-162	0-25	2.0 pCi/L
Radioactivity, beta	900.0/9310/703	54/2/4	NA	0-25	2.0 pCi/L
Residue, dissolved	160.1/209B	3/4	75-125	0-30	5.0
Residue, suspended	160.2/209C	3/4	75-125	0-30	5.0
Residue, total	160.3/209A	3/4	60-140	0-40	5.0
Residue, volatile	160.4/209D	3/4	NA	0-40	5.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/L)
Salinity	210	4	NA	NA	100
Settleable matter	160.5/209E	3/4	NA	0-40	0.20 mL
Silica, dissolved	370.1	3	75-125	0-30	10
Specific conductance	120.1/9050	3/2	90-110	0-10	1.0 umho/cm
Specific gravity	213E	3	NA	NA	NA
Streptococcus, fecal, MPN	910A	4	NA	NA	2 MPN/100 mL
Streptococcus, fecal, MF	910B	4	NA	NA	1 col/100 mL
Sulfate	9036 375.3 375.4 9056/300.0	2 3 3 2/3	80-120 75-125 75-125 75-125	0-30 0-30 0-30 0-30	5.0 5.0 5.0 5.0
Sulfide	376.2/427 9030-SL	3/4 2	60-140 50-150	0-40 0-50	0.40 0.40
Sulfide, reactive	7.3.4.2	2	NA	0-50	0.40
Sulfite	428 377.1	4 3	75-125 75-125	0-30 0-30	1.0 1.0
Surfactants (MBAS)	425.1	3	70-130	0-30	0.10
Temperature	170.1	3	NA	0-10	NA
Thiocyanate	412.L	4	60-140	0-40	0.10
THM formation potential	5710	4	NA	NA	0.010
Turbidity	180.1/214A	3/4	60-140	0-30	0.10 NTU

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Bromodichloromethane	501.1/501.2	49/50	54-128	0-40	0.50
Bromoform	501.1/501.2	49/50	50-140	0-40	0.50
Chlorodibromomethane	501.1/501.2	49/50	60-125	0-40	0.50
Chloroform (MS)	501.1/501.2	49/50	65-137	0-40	0.50
Bromodichloromethane	501.3	30	50-125	0-40	0.50
Bromoform	501.3	30	50-127	0-40	0.50
Chlorodibromomethane	501.3	30	50-125	0-40	0.50
Chloroform (MS)	501.3	30	50-125	0-40	0.50
Surrogate - Bromochloromethane	501.1/501.2/501.3	49/50/30	46-118	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Bromobenzene	502.1	51	57-129	0-40	0.50
Bromochloromethane	502.1	51	60-125	0-40	0.50
Bromodichloromethane	502.1	51	55-125	0-40	0.50
Bromoform	502.1	51	50-140	0-40	5.0
Bromomethane	502.1	51	60-140	0-40	5.0
Carbon tetrachloride	502.1	51	55-125	0-40	0.50
Chlorobenzene (MS)	502.1	51	25-134	0-29	0.50
Chloroethane	502.1	51	39-147	0-40	1.0
Chloroform	502.1	51	35-131	0-40	0.50
Chloromethane	502.1	51	54-125	0-40	1.0
2-Chlorotoluene	502.1	51	58-125	0-40	0.50
4-Chlorotoluene	502.1	51	50-140	0-40	0.50
Dibromochloromethane	502.1	51	55-140	0-40	0.50
1,2-Dibromoethane	502.1	51	54-132	0-40	1.0
Dibromomethane	502.1	51	50-140	0-40	0.50
1,2-Dichlorobenzene	502.1	51	56-134	0-40	0.50
1,3-Dichlorobenzene	502.1	51	58-125	0-40	0.50
1,4-Dichlorobenzene	502.1	51	51-129	0-40	0.50
Dichlorodifluoromethane	502.1	51	43-163	0-40	1.0
1,1-Dichloroethane	502.1	51	60-125	0-40	0.50
1,2-Dichloroethane	502.1	51	59-131	0-40	0.50
1,1-Dichloroethene (MS)	502.1	51	55-133	0-29	0.50
cis-1,2-Dichloroethene	502.1	51	55-125	0-40	0.50
trans-1,2-Dichloroethene	502.1	51	60-125	0-40	0.50
1,2-Dichloropropane	502.1	51	53-125	0-40	0.50
1,3-Dichloropropane	502.1	51	55-125	0-40	0.50
2,2-Dichloropropane	502.1	51	50-150	0-40	0.50
1,1-Dichloropropene	502.1	51	61-125	0-40	0.50
cis-1,3-Dichloropropene	502.1	51	51-129	0-40	0.50
trans-1,3-Dichloropropene	502.1	51	54-125	0-40	0.50
Methylene chloride	502.1	51	49-125	0-40	0.50
1,1,1,2-Tetrachloroethane	502.1	51	59-125	0-40	0.50
1,1,2,2-Tetrachloroethane	502.1	51	58-125	0-40	0.50

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Tetrachloroethene	502.1	51	50-125	0-40	0.50
1,1,1-Trichloroethane	502.1	51	55-125	0-40	0.50
1,1,2-Trichloroethane	502.1	51	57-125	0-40	0.50
Trichloroethene (MS)	502.1	51	51-142	0-24	0.50
Trichlorofluoromethane	502.1	51	55-125	0-40	0.50
1,2,3-Trichloropropane	502.1	51	59-130	0-40	1.0
Vinyl chloride	502.1	51	55-155	0-40	1.0
Surrogate - Bromochloromethane	502.1	51	46-118	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acetone	502.2***	51	50-130	0-40	25
Benzene (MS)	502.2	51	73-144	0-22	0.50
Bromobenzene	502.2	51	57-129	0-40	0.50
Bromochloromethane	502.2	51	60-125	0-40	0.50
Bromodichloromethane	502.2	51	55-125	0-40	0.50
Bromoform	502.2	51	50-140	0-40	1.0
Bromomethane	502.2	51	60-140	0-40	1.0
n-Butylbenzene	502.2	51	55-125	0-40	0.50
sec-Butylbenzene	502.2	51	55-125	0-40	0.50
tert-Butylbenzene	502.2	51	55-125	0-40	0.50
Carbon tetrachloride	502.2	51	55-125	0-40	0.50
Chlorobenzene (MS)	502.2	51	25-134	0-29	0.50
Chloroethane	502.2	51	39-147	0-50	1.0
Chloroform	502.2	51	35-131	0-40	0.50
Chloromethane	502.2	51	54-125	0-40	1.0
2-Chlorotoluene	502.2	51	58-125	0-40	0.50
4-Chlorotoluene	502.2	51	50-140	0-40	0.50
Dibromochloromethane	502.2	51	55-140	0-40	0.50
1,2-Dibromo-3-chloropropane	502.2	51	57-129	0-40	5.0
1,2-Dibromoethane	502.2	51	54-132	0-40	1.0
Dibromomethane	502.2	51	50-140	0-40	0.50
1,2-Dichlorobenzene	502.2	51	56-134	0-40	0.50
1,3-Dichlorobenzene	502.2	51	58-125	0-40	0.50
1,4-Dichlorobenzene	502.2	51	51-129	0-40	0.50
Dichlorodifluoromethane	502.2	51	43-163	0-50	1.0
1,1-Dichloroethane	502.2	51	60-125	0-40	0.50
1,2-Dichloroethane	502.2	51	59-131	0-40	0.50
1,1-Dichloroethene (MS)	502.2	51	55-133	0-29	0.50
cis-1,2-Dichloroethene	502.2	51	55-125	0-40	0.50
trans-1,2-Dichloroethene	502.2	51	60-125	0-40	0.50
1,2-Dichloropropane	502.2	51	53-125	0-40	0.50
1,3-Dichloropropane	502.2	51	55-125	0-40	0.50
2,2-Dichloropropane	502.2	51	50-150	0-40	0.50
1,1-Dichloropropene	502.2	51	61-125	0-40	0.50
cis-1,3-Dichloropropene	502.2	51	51-129	0-40	0.50
trans-1,3-Dichloropropene	502.2	51	54-125	0-40	0.50
Ethylbenzene	502.2	51	55-125	0-40	0.50
Hexachlorobutadiene	502.2	51	55-125	0-40	0.50
Isopropylbenzene	502.2	51	55-125	0-40	0.50
4-Isopropyltoluene	502.2	51	55-125	0-40	0.50

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Methylene chloride	502.2	51	49-125	0-40	1.0
Methyl ethyl ketone	502.2***	51	60-130	0-40	10
4-Methyl-2-pentanone	502.2***	51	65-125	0-40	10
Naphthalene	502.2	51	55-125	0-40	0.50
Propylbenzene	502.2	51	55-125	0-40	0.50
Styrene	502.2	51	55-125	0-40	0.50
1,1,1,2-Tetrachloroethane	502.2	51	59-125	0-40	0.50
1,1,2,2-Tetrachloroethane	502.2	51	58-125	0-40	1.0
Tetrachloroethene	502.2	51	50-125	0-40	0.50
Toluene (MS)	502.2	51	68-138	0-17	0.50
1,2,3-Trichlorobenzene	502.2	51	55-125	0-40	0.50
1,2,4-Trichlorobenzene	502.2	51	55-125	0-40	0.50
1,1,1-Trichloroethane	502.2	51	55-125	0-40	0.50
1,1,2-Trichloroethane	502.2	51	57-125	0-40	0.50
Trichloroethene (MS)	502.2	51	51-142	0-24	0.50
Trichlorofluoromethane	502.2	51	55-125	0-40	0.50
1,2,3-Trichloropropane	502.2	51	59-130	0-40	1.0
1,2,4-Trimethylbenzene	502.2	51	55-125	0-40	0.50
1,3,5-Trimethylbenzene	502.2	51	55-125	0-40	0.50
Vinyl chloride	502.2	51	55-155	0-40	1.0
o-Xylene	502.2	51	55-125	0-40	0.50
m-Xylene	502.2	51	55-125	0-40	0.50
p-Xylene	502.2	51	55-125	0-40	0.50
Surrogate - 2-Bromo-1-chloropropane	502.2	51	81-113	NA	NA
Surrogate - Fluorobenzene	502.2	51	69-108	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benzene (MS)	503.1	51	73-144	0-22	1.0
p-Bromofluorobenzene	503.1***	51	58-125	0-40	1.0
Bromobenzene	503.1	51	55-125	0-40	1.0
n-Butylbenzene	503.1	51	30-126	0-40	1.0
sec-Butylbenzene	503.1	51	47-125	0-40	1.0
2,3-Benzofuran	503.1***	51	35-125	0-40	1.0
tert-Butylbenzene	503.1	51	51-125	0-40	1.0
Chlorobenzene (MS)	503.1	51	25-134	0-29	1.0
o-Chlorotoluene	503.1	51	55-125	0-40	1.0
p-Chlorotoluene	503.1	51	58-125	0-40	1.0
p-Cymene	503.1***	51	57-125	0-40	1.0
Cyclopropylbenzene	503.1***	51	60-125	0-40	1.0
p-Dichlorobenzene	503.1	51	63-127	0-40	1.0
m-Dichlorobenzene	503.1	51	65-125	0-40	1.0
o-Dichlorobenzene	503.1	51	58-125	0-40	1.0
Ethylbenzene	503.1	51	66-125	0-40	1.0
Hexachlorobutadiene	503.1	51	23-125	0-40	1.0
Isopropylbenzene	503.1	51	61-125	0-40	1.0
Naphthalene	503.1	51	57-135	0-40	1.0
n-Propylbenzene	503.1	51	56-125	0-40	1.0
Styrene	503.1	51	50-125	0-40	1.0
Toluene (MS)	503.1	51	68-138	0-17	1.0
Trichloroethene	503.1	51	68-125	0-40	1.0
Trichlorotoluene	503.1***	51	56-125	0-40	1.0
Tetrachloroethene	503.1	51	60-128	0-40	1.0
1,3,5-Trimethylbenzene	503.1	51	52-125	0-40	1.0
1,2,4-Trimethylbenzene	503.1	51	48-125	0-40	1.0
1,2,4-Trichlorobenzene	503.1	51	55-127	0-40	1.0
1,2,3-Trichlorobenzene	503.1	51	52-125	0-40	1.0
p-Xylene	503.1	51	58-125	0-40	1.0
m-Xylene	503.1	51	56-125	0-40	1.0
o-Xylene	503.1	51	59-125	0-40	1.0
Surrogate - α,α,α-Trifluorotoluene	503.1	51	77-140	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Chloropicrin	504***V	51	60-140	0-40	0.010
1,2-Dibromoethane (MS) (EDB)	504 8011	51 2	60-140 60-140	0-40 0-40	0.020 0.020
1,2-Dibromo-3-chloropropane (MS)	504 8011	51 2	60-140 60-140	0-40 0-40	0.020 0.020
1,1-Dichloropropane	504***V	51	60-140	0-40	2.0
1,3-Dichloropropene	504***V	51	60-140	0-40	1.0
Methyl isothiocyanate	504***V	51	60-140	0-40	20

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Alachlor	505	51	48-156	0-30	1.0
Aldrin	505/508	51	48-124	0-30	0.010
Atrazine	505	51	20-159	0-40	1.0
alpha BHC	508	51	52-132	0-30	0.010
beta BHC	508	51	55-135	0-30	0.020
delta BHC	508	51	57-147	0-30	0.010
gamma BHC (Lindane) (MS)	505/508	51	52-136	0-18	0.010
alpha Chlordane	505/508	51	51-147	0-30	0.010
gamma Chlordane	505/508	51	51-147	0-30	0.010
technical Chlordane	505	51	31-141	0-40	0.10
Chloroneb	508	51	51-143	0-30	0.50
Chlorobenzilate	508	51	58-148	0-30	0.20
Chlorothalonil	508	51	51-131	0-30	0.20
Dacthal (DCPA)	508	51	53-153	0-30	0.20
4,4'-DDD	508	51	57-157	0-30	0.020
4,4'-DDE	508	51	51-147	0-30	0.020
4,4'-DDT (MS)	508	51	67-137	0-28	0.050
Dieldrin (MS)	505/508	51	51-143	0-46	0.020
Endosulfan I	508	51	47-127	0-30	0.020
Endosulfan II	508	51	52-132	0-30	0.050
Endosulfan sulfate	508	51	41-163	0-40	0.10
Endrin (MS)	505/508	51	57-142	0-23	0.020
Endrin aldehyde	508	51	48-128	0-30	0.10
Etridiazole	508	51	58-143	0-30	0.10
Heptachlor (MS)	505/508	5	42-129	0-22	0.010
Heptachlor epoxide	505/508	51	47-127	0-30	0.020
Hexachlorobenzene	505/508	51	34-164	0-40	0.050
Hexachlorocyclopentadiene	505	51	26-120	0-40	0.20
Methoxychlor	505/508	51	37-163	0-40	0.50
cis-Nonachlor	505	51	49-171	0-30	0.050
trans-Nonachlor	505	51	47-133	0-30	0.020
cis-Permethrin	508	51	51-131	0-30	1.0
trans-Permethrin	508	51	61-151	0-30	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Propachlor	508	51	58-131	0-30	1.0
Simazine	505	51	56-132	0-40	1.0
Toxaphene	505/508	51	60-168	0-40	1.0
Trifluralin	508	51	58-119	0-30	0.050
PCB 1016	505/508	51	50-130	0-40	0.50
PCB 1221	505/508	51	50-130	0-40	0.50
PCB 1232	505/508	51	50-123	0-40	0.50
PCB 1242	505/508	51	50-130	0-40	0.50
PCB 1248	505/508	51	50-130	0-40	0.50
PCB 1254	505/508	51	28-148	0-40	0.50
PCB 1260	505/508	51	28-148	0-40	0.50
Surrogate - Dibutylchlorendate (DBC)	505/508	51	28-151	NA	NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	505/508	51	22-126	NA	NA
Surrogate - Decachlorobiphenyl (DCB)	505/508	51	25-126	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Alachlor (MS)	507	51	45-140	0-30	1.0
Ametryn	507	51	51-131	0-30	1.0
Atraton	507	51	47-135	0-30	5.0
Atrazine (MS)	507	51	40-125	0-30	1.0
Bromacil	507	51	55-127	0-30	2.0
Butachlor	507	51	56-136	0-30	1.0
Butylate	507	51	38-145	0-76	2.0
Carboxin	507	51	62-142	0-30	1.0
Chlorpropham	507	51	49-137	0-30	1.0
Cycloate	507	51	46-159	0-47	2.0
Demeton	507***	51	50-140	0-30	2.5
Diazinon (MS)	507	51	40-140	0-30	1.0
Dichlorvos	507	51	57-137	0-30	1.0
Diphenamid	507	51	53-133	0-30	2.0
Disulfoton	507	51	10-178	0-60	2.0
EPTC	507	51	46-154	0-55	2.0
Ethoprop	507	51	55-120	0-30	2.5
Fenamiphos	507	51	58-122	0-30	1.0
Fenarimol	507	51	59-139	0-30	1.0
Fluridone	507	51	51-123	0-30	5.0
Hexazinone (MS)	507	51	50-130	0-30	1.0
Merphos	507	51	56-136	0-30	2.5
Metalaxyl	507***	51	40-160	0-30	1.0
Metolachlor	507	51	53-133	0-30	1.0
Metribuzin	507	51	61-141	0-30	1.0
Mevinphos	507	51	51-139	0-30	10
MGK 264	507	51	50-150	0-30	20
Molinate (MS)	507	51	37-127	0-74	2.0
Napropamide	507	51	61-141	0-30	1.0
Norflurazon	507	51	54-134	0-30	1.0
Parathion, ethyl (MS)	507***	51	18-171	0-28	1.0
Parathion, methyl	507***	51	50-135	0-30	1.0
Pebulate	507	51	58-130	0-30	2.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Prometon	507	51	42-114	0-30	1.0
Prometryn	507	51	51-125	0-30	1.0
Pronamide	507	51	51-131	0-30	2.0
Propazine	507	51	60-124	0-30	1.0
Simazine (MS)	507	51	60-140	0-30	1.0
Simetryn	507	51	59-139	0-30	1.0
Stirophos	507	51	58-138	0-30	10
Tebuthiuron	507	51	48-120	0-30	5.0
Terbacil	507	51	57-137	0-30	10
Terbufos	507	51	57-137	0-30	1.0
Terbutryn	507	51	58-130	0-30	1.0
Triademefon	507	51	61-125	0-30	1.0
Vernolate	507	51	53-133	0-30	2.0
Surrogate - Triphenylphosphate	507	51	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acifluorfen	515.1	51	21-185	0-40	1.0
Bentazon	515.1	51	32-182	0-40	1.0
Chloramben	515.1	51	53-169	0-40	1.0
2,4-D (MS)	515.1	51	25-129	0-60	0.50
Dalapon	515.1	51	40-160	0-50	10
2,4-DB	515.1	51	48-126	0-40	0.50
Dicamba	515.1	51	40-144	0-40	0.50
3,5-Dichlorobenzoic acid	515.1	51	53-151	0-40	1.0
Dichlorprop	515.1	51	46-168	0-40	0.50
Dinoseb	515.1	51	49-129	0-40	0.50
5-Hydroxydicamba	515.1	51	53-153	0-40	1.0
4-Nitrophenol	515.1	51	25-229	0-40	1.0
Pentachlorophenol	515.1	51	36-224	0-40	1.0
Picloram	515.1	51	44-138	0-40	0.50
2,4,5-T	515.1	51	25-145	0-62	0.50
2,4,5-TP (Silvex) (MS)	515.1	51	10-151	0-81	0.50

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benzene (MS)	524.2	51	73-144	0-22	1.0
Bromobenzene	524.2	51	62-122	0-30	1.0
Bromochloromethane	524.2	51	50-150	0-40	1.0
Bromodichloromethane	524.2	51	49-151	0-40	1.0
Bromoform	524.2	51	60-130	0-30	1.0
Bromomethane	524.2	51	50-150	0-40	2.0
n-Butylbenzene	524.2	51	50-150	0-40	1.0
sec-Butylbenzene	524.2	51	50-150	0-40	1.0
tert-Butylbenzene	524.2	51	50-150	0-40	1.0
Carbon tetrachloride	524.2	51	55-121	0-40	1.0
Chlorobenzene (MS)	524.2	51	68-136	0-17	1.0
Chloroethane	524.2	51	50-150	0-40	2.0
Chloroform	524.2	51	63-133	0-30	1.0
Chloromethane	524.2	51	50-150	0-40	2.0
2-Chlorotoluene	524.2	51	50-150	0-40	1.0
4-Chlorotoluene	524.2	51	50-150	0-40	1.0
Dibromochloromethane	524.2	51	47-137	0-40	1.0
1,2-Dibromo-3-chloropropane	524.2	51	46-154	0-40	2.0
1,2-Dibromoethane	524.2	51	51-135	0-30	1.0
Dibromomethane	524.2	51	58-130	0-30	1.0
1,2-Dichlorobenzene	524.2	51	60-130	0-30	1.0
1,3-Dichlorobenzene	524.2	51	50-150	0-40	1.0
1,4-Dichlorobenzene	524.2	51	63-151	0-30	1.0
Dichlorodifluoromethane	524.2	51	60-132	0-30	1.0
1,1-Dichloroethane	524.2	51	65-135	0-30	1.0
1,2-Dichloroethane	524.2	51	57-127	0-30	1.0
1,1-Dichloroethene (MS)	524.2	51	60-136	0-19	1.0
cis-1,2-Dichloroethene	524.2	51	50-150	0-40	1.0
trans-1,2-Dichloroethene	524.2	51	58-128	0-30	1.0
1,2-Dichloropropane	524.2	51	61-131	0-30	1.0
1,3-Dichloropropane	524.2	51	60-130	0-30	1.0
2,2-Dichloropropane	524.2	51	50-150	0-40	1.0
1,1-Dichloropropene	524.2	51	50-150	0-40	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
cis-1,3-Dichloropropene	524.2	51	50-150	0-40	1.0
trans-1,3-Dichloropropene	524.2	51	50-150	0-40	1.0
Ethylbenzene	524.2	51	50-150	0-40	1.0
Hexachlorobutadiene	524.2	51	50-150	0-40	1.0
Isopropylbenzene	524.2	51	50-150	0-40	1.0
4-Isopropyltoluene	524.2	51	50-150	0-40	1.0
Methylene chloride	524.2	51	40-160	0-50	1.0
Naphthalene	524.2	51	50-150	0-40	1.0
n-Propylbenzene	524.2	51	50-150	0-40	1.0
Styrene	524.2	51	50-150	0-30	1.0
1,1,1,2-Tetrachloroethane	524.2	51	50-150	0-40	1.0
1,1,2,2-Tetrachloroethane	524.2	51	62-150	0-30	1.0
Tetrachloroethene	524.2	51	60-126	0-30	1.0
Toluene (MS)	524.2	51	68-138	0-17	1.0
1,2,3-Trichlorobenzene	524.2	51	50-150	0-40	1.0
1,2,4-Trichlorobenzene	524.2	51	50-150	0-40	1.0
1,1,1-Trichloroethane	524.2	51	65-135	0-30	1.0
1,1,2-Trichloroethane	524.2	51	50-150	0-40	1.0
Trichloroethene (MS)	524.2	51	66-136	0-20	1.0
Trichlorofluoromethane	524.2	51	69-139	0-30	1.0
1,2,3-Trichloropropane	524.2	51	50-150	0-40	1.0
1,2,4-Trimethylbenzene	524.2	51	50-150	0-40	1.0
1,3,5-Trimethylbenzene	524.2	51	50-150	0-40	1.0
Vinyl chloride	524.2	51	34-131	0-30	1.0
o-Xylene	524.2	51	62-132	0-30	1.0
m-Xylene	524.2	51	50-150	0-40	1.0
p-Xylene	524.2	51	61-141	0-30	1.0
Surrogate - p-Bromofluorobenzene	524.2	51	79-125	NA	NA
Surrogate - 1,2-Dichlorobenzene-d4	524.2	51	77-135	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acenaphthylene	525	51	49-131	0-40	0.50
Alachlor	525	51	40-136	0-40	1.0
Aldrin (MS)	525	51	42-116	0-25	1.0
Anthracene	525	51	20-150	0-40	0.50
Atrazine (MS)	525	51	43-177	0-50	2.0
Benz(a)anthracene	525	51	30-150	0-50	0.50
Benzo(b)fluoranthene	525	51	20-128	0-40	0.50
Benzo(k)fluoranthene	525	51	30-150	0-40	0.50
Benzo(a)pyrene	525	51	20-160	0-40	0.50
Benzo(g,h,i)perylene	525	51	10-140	0-50	0.50
Butyl benzyl phthalate	525	51	30-130	0-40	1.0
alpha Chlordane	525	51	43-167	0-40	1.0
gamma Chlordane	525	51	41-159	0-40	1.0
Chrysene	525	51	30-150	0-40	0.50
Dibenz(a,h)anthracene	525	51	10-110	0-50	0.50
Di-n-butyl phthalate	525	51	20-164	0-50	10
Diethylphthalate	525	51	22-180	0-50	2.0
bis(2-ethylhexyl)adipate	525	51	27-125	0-50	1.0
bis(2-ethylhexyl)phthalate	525	51	28-142	0-50	2.0
Dimethylphthalate	525	51	20-150	0-40	1.0
Endrin	525	51	20-163	0-40	5.0
Fluorene	525	51	36-184	0-50	0.50
Heptachlor	525	51	25-150	0-40	1.0
Heptachlor epoxide	525	51	30-158	0-40	1.0
Hexachlorobenzene	525	51	6-144	0-40	0.50
Hexachlorocyclopentadiene	525	51	9-140	0-50	0.50
Indeno(1,2,3-cd)pyrene	525	51	16-150	0-50	0.50
Lindane (MS)	525	51	52-136	0-18	1.0
Methoxychlor	525	51	6-182	0-50	1.0
trans-Nonachlor	525	51	45-125	0-40	1.0
Pentachlorophenol (MS)	525	51	15-139	0-39	3.0
Phenanthrene	525	51	45-138	0-40	0.50
Pyrene (MS)	525	51	36-153	0-21	0.50

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Simazine	525	51	40-167	0-50	2.0
Toxaphene	525	51	20-142	0-50	50
PCBs:					
2-Chlorobiphenyl	525	51	38-142	0-40	5.0
2,3-Dichlorobiphenyl	525	51	34-136	0-40	5.0
2,4,5-Trichlorobiphenyl	525	51	10-150	0-50	5.0
2,2',4,4'-Tetrachlorobiphenyl (MS)	525	51	10-150	0-50	5.0
2,2',3',4,6-Pentachlorobiphenyl	525	51	10-150	0-50	5.0
2,2',4,4',5,6'-Hexachlorobiphenyl	525	51	10-150	0-50	5.0
2,2',3,3',4,4',6-Heptachlorobiphenyl	525	51	10-150	0-50	5.0
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	525	51	10-150	0-50	5.0
Surrogate - Perylene-d12	525	51	40-150	NA	NA
Surrogate - Pyrene-d10	525	51	40-150	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Aldicarb	531.1	33/51	50-140	0-20	0.50
Aldicarb sulfone	531.1	33/51	55-130	0-20	0.50
Aldicarb sulfoxide	531.1	33/51	40-160	0-40	0.50
Carbaryl	531.1	33/51	55-130	0-30	1.0
Carbofuran	531.1	33/51	50-130	0-20	1.0
Ethylene thiourea	531.1***	51	40-140	0-50	10
3-Hydroxycarbofuran	531.1	33/51	60-140	0-20	1.0
Methiocarb	531.1	51	53-121	0-40	5.0
Methomyl	531.1	33/51	50-150	0-20	1.0
Oxamyl	531.1	33/51	40-160	0-30	1.0
Propoxur (Baygon)	531.1	33/51	50-125	0-40	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Glyphosate	547	51	40-160	0-50	50
Endothal	548	51	20-180	0-50	25
Diquat	549/HRS	51/56	10-150	0-50	1.0
Paraquat	549/HRS	51/56	10-150	0-50	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benzyl chloride	8010(5030)	2	50-150	0-30	1.0
Bromobenzene	8010(5030)	2	70-130	0-30	10
Bromodichloromethane	601/8010(5030)	1/2	42-172	0-30	1.0
Bromoform	601/8010(5030)	1/2	13-159	0-30	5.0
Bromomethane	601/8010(5030)	1/2	10-144	0-30	1.0
Carbon tetrachloride	601/8010(5030)	1/2	43-143	0-30	1.0
Chlorobenzene (MS)	601/8010(5030)	1/2	25-134	0-29	1.0
Chloroethane	601/8010(5030)	1/2	46-137	0-30	1.0
Chloroform	601/8010(5030)	1/2	49-133	0-30	1.0
1-Chlorohexane	8010(5030)	2	50-150	0-30	1.0
2-Chloroethylvinyl ether	601/8010(5030)	1/2	14-186	0-80	10
Chloromethane	601/8010(5030)	1/2	10-193	0-30	1.0
Chlorotoluenes	8010(5030)	2	70-130	0-30	10
Dibromochloromethane	601/8010(5030)	1/2	24-191	0-30	1.0
Dibromomethane	8010(5030)	2	70-130	0-30	5.0
1,2-Dichlorobenzene	601/8010(5030)	1/2	10-208	0-30	1.0
1,3-Dichlorobenzene	601/8010(5030)	1/2	10-187	0-30	1.0
1,4-Dichlorobenzene	601/8010(5030)	1/2	42-143	0-30	1.0
Dichlorodifluoromethane	601/8010(5030)	1/2	70-130	0-30	1.0
1,1-Dichloroethane	601/8010(5030)	1/2	47-132	0-30	1.0
1,2-Dichloroethane	601/8010(5030)	1/2	51-147	0-30	1.0
1,1-Dichloroethene (MS)	601/8010(5030)	1/2	55-133	0-29	1.0
cis/trans-1,2-Dichloroethene	601/8010(5030)	1/2	38-155	0-30	1.0
Dichloromethane (methylene chloride)	601/8010(5030)	1/2	25-162	0-30	1.0
1,2-Dichloropropane	601/8010(5030)	1/2	44-156	0-30	1.0
cis/trans-1,3-Dichloropropylene	601/8010(5030)	1/2	22-178	0-30	1.0
1,1,2,2-Tetrachloroethane	601/8010(5030)	1/2	10-184	0-30	1.0
1,1,1,2-Tetrachloroethane	8010(5030)	2	70-130	0-30	1.0
Tetrachloroethylene	601/8010(5030)	1/2	26-162	0-30	1.0
1,1,1-Trichloroethane	601/8010(5030)	1/2	41-138	0-30	1.0
1,1,2-Trichloroethane	601/8010(5030)	1/2	39-136	0-30	1.0
Trichloroethene (MS)	601/8010(5030)	1/2	51-142	0-24	1.0
Trichlorofluoromethane	601/8010(5030)	1/2	21-156	0-30	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
1,2,3-Trichloropropane	8010(5030)	2	50-150	0-30	1.0
Vinyl chloride	601/8010(5030)	1/2	28-163	0-30	1.0
1,2-Dibromoethane (EDB)	8010***(5030)[1]	2	75-125	0-30	1.0
Surrogate - Bromochloromethane	601/8010(5030)	1/2	46-118	NA	NA

[1] EDB determined on Hall detector with PQL of 1.0 ug/L at client's request.

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acetone	8015***(5030)	2	40-130	0-30	25
2-Butanone (MEK)	8015(5030)	2	60-130	0-40	25
Diethyl ether	8015(5030)	2	10-130	0-50	25
Ethanol	8015(5030)	2	20-140	0-45	1000
Ethyl methacrylate	8015***(5030)	2	42-125	0-40	10
Isobutanol	8015***(5030)	2	50-125	0-40	1000
Isopropanol	8015***(5030)	2	30-140	0-40	1000
Methacrylonitrile	8015***(5030)	2	10-140	0-60	100
Methanol	8015***(5030)	2	50-150	0-40	1000
Methyl methacrylate	8015***(5030)	2	45-132	0-42	10
4-Methyl-2-pentanone (MIBK)	8015(5030)	2	65-125	0-40	25
Methyl t-butyl ether (MTBE)	8015***(5030)	2	50-150	0-30	10
Propionitrile	8015***(5030)	2	10-130	0-50	100
Gasoline	8015 (modified)	12	40-140	0-40	50
Mineral spirits	8015 (modified)	12	40-140	0-40	50
Methanol (MS)	8015 (modified/DAI*)	2	50-150	0-50	1000
Ethanol	8015 (modified/DAI*)	2	50-150	0-50	1000
n-Propanol	8015 (modified/DAI*)	2	50-150	0-50	1000
Isopropanol (MS)	8015 (modified/DAI*)	2	50-150	0-50	1000
n-Butanol	8015 (modified/DAI*)	2	50-150	0-50	1000
Isobutanol	8015 (modified/DAI*)	2	50-150	0-50	1000
Ethylene glycol (MS)	8015 (modified/DAI*)	2	50-150	0-50	10000
Propylene glycol	8015 (modified/DAI*)	2	50-150	0-50	10000
Diethylene glycol	8015 (modified/DAI*)	2	50-150	0-50	10000
Triethylene glycol	8015 (modified/DAI*)	2	50-150	0-50	10000
Tetraethylene glycol	8015 (modified/DAI*)	2	50-150	0-50	25000

* DAI = Direct Aqueous Injection

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benzene (MS)	602/8020(5030)	1/2	61-131	0-25	1.0
Chlorobenzene (MS)	602/8020(5030)	1/2	54-136	0-24	1.0
1,2-Dichlorobenzene	602/8020(5030)	1/2	37-154	0-30	1.0
1,3-Dichlorobenzene	602/8020(5030)	1/2	50-141	0-30	1.0
1,4-Dichlorobenzene	602/8020(5030)	1/2	42-143	0-30	1.0
Ethylbenzene	602/8020(5030)	1/2	32-160	0-30	1.0
Methyl t-butyl ether	602/8020***(5030)	1/2	50-150	0-30	10
Toluene (MS)	602/8020(5030)	1/2	64-144	0-29	1.0
Xylenes	602***/8020(5030)	2	50-150	0-30	1.0
Surrogate - a,a,a-Trifluorotoluene	602/8020(5030)	1/2	77-140	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acrolein	603/8030(5030)	1/2	88-118	0-30	200
Acrylonitrile	603/8030(5030)	1/2	71-135	0-30	100
Acetonitrile	8030***(5030)	2	20-115	0-30	1000

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
2-Chlorophenol (MS)	604/8040(3520)	1/2	30-111	0-26	10
4-Chloro-3-methylphenol (MS)	604/8040(3520)	1/2	41-107	0-23	10
2,4-Dichlorophenol	604/8040(3520)	1/2	44-119	0-40	10
2,4-Dimethylphenol	604/8040(3520)	1/2	24-118	0-40	10
2,4-Dinitrophenol	604/8040(3520)	1/2	12-145	0-65	50
2-Methyl-4,6-dinitrophenol	604/8040(3520)	1/2	30-136	0-40	50
3-Methyl phenol (m-cresol)	***8040(3520)	2	10-150	0-50	10
2-Methyl phenol (o-cresol)	***8040(3520)	2	10-150	0-50	10
4-Methyl phenol (p-cresol)	***8040(3520)	2	10-150	0-50	10
Cresols	8040(3520)	2	NA	NA	10
2-Nitrophenol	604/8040(3520)	1/2	43-117	0-40	10
4-Nitrophenol (MS)	604/8040(3520)	1/2	10-140	0-40	50
Pentachlorophenol (MS)	604/8040(3520)	1/2	10-135	0-41	50
Phenol (MS)	604/8040(3520)	1/2	10-122	0-60	10
Trichlorophenols	8040(3520)	2	NA	NA	10
2,3,4,5-Tetrachlorophenol	***8040(3520)	2	50-150	0-40	20
2,3,4,6-Tetrachlorophenol	***8040(3520)	2	50-150	0-40	20
Tetrachlorophenols	8040(3520)	2	NA	NA	20
2,4,5-Trichlorophenol	***8040(3520)	2	53-119	0-40	10
2,4,6-Trichlorophenol	604/8040(3520)	1/2	53-119	0-40	10
Surrogate - 2,4,6-Tribromophenol	604/8040(3520)	1/2	32-160	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Dichlorophen	604.1	18	22-125	0-30	10
Hexachlorophene	604.1	18	73-125	0-30	10

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Bis(2-ethylhexyl) phthalate (MS)	606/8060(3520)	1/2	10-162	0-82	10
Butyl benzyl phthalate (MS)	606/8060(3520)	1/2	10-137	0-73	10
Diethyl phthalate (MS)	606/8060(3520)	1/2	10-142	0-47	10
Dimethyl phthalate (MS)	606/8060(3520)	1/2	10-158	0-63	10
Di-n-butyl phthalate (MS)	606/8060(3520)	1/2	18-137	0-46	10
Di-n-octyl phthalate (MS)	606/8060(3520)	1/2	12-145	0-52	10
Surrogate - 2-Fluorobiphenyl	606/8060(3520)	1/2	27-123	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Aldrin (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	42-116 40-120	0-25 0-22	0.050 0.050
Benfluralin	608/8080(3520)***	1/2	40-140	0-40	0.010
alpha BHC	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	37-134	0-40	0.050 0.050
beta BHC	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	17-147	0-40	0.050 0.050
delta BHC	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	19-140	0-40	0.050 0.050
gamma BHC (Lindane) (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	52-136 56-123	0-18 0-15	0.050 0.050
Carbophenothion	608/8080***(3520)	1/2	50-110	0-40	1.0
alpha Chlordane	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	45-140	0-40	0.050 0.50 0.050
gamma Chlordane	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	45-140	0-40	0.050 0.50 0.050
technical Chlordane	608/8080(3520)/617	1/2/26	45-119	0-40	0.50
Chlorobenzilate	8081***V(3520)	2	50-150	0-40	0.50
Chlorothalonil	608/8080***(3520)	1/2	55-125	0-30	0.20
4,4'-DDD	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	31-141	0-50	0.10 0.10
4,4'-DDE	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	30-145	0-50	0.10 0.10
4,4'-DDT (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	67-137 38-127	0-28 0-27	0.10 0.10
Dicofol (Kelthane)	8081***V(3520)	1/2	55-115	0-40	0.050
Dieldrin (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	51-143 52-126	0-46 0-18	0.10 0.10
Endosulfan I	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	45-153	0-40	0.050 0.050
Endosulfan II	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	10-202	0-65	0.10 0.10
Endosulfan sulfate	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	26-144	0-50	0.10 0.10
Endrin (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	57-142 56-121	0-23 0-21	0.10 0.10
Endrin aldehyde	608/8080(3520)/617 CLP - 3/90	1/2/26 62	10-150	0-50	0.10 0.10
Endrin ketone	CLP - 2/88; 3/90	6/62	NA	NA	0.10

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Heptachlor (MS)	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	42-129 40-131	0-22 0-20	0.050 0.050
Heptachlor epoxide	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	37-142	0-40	0.050 0.050
Isodrin	8081***V(3520)	2	55-110	0-40	0.050
Kepone	8081***V(3520)	2	10-150	0-50	0.10
Methoxychlor	8080(3520)/617 CLP - 2/88; 3/90	2/26 6/62	50-140	0-40	0.50 0.50
Mirex	8081***V(3530)	2	52-112	0-37	0.50
Toxaphene	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	41-140	0-50	5.0 1.0 5.0
Trifluralin	608/8080***(3520)	1/2	54-124	0-40	0.010
PCB 1016	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	69-107	0-21	1.0 0.50 1.0
PCB 1221	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	15-178	0-20	2.0 0.50 2.0
PCB 1232	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	10-215	0-20	1.0 0.50 1.0
PCB 1242	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	39-150	0-20	1.0 0.50 1.0
PCB 1248	608/8080(3520)/617 CLP - 2/88 CLP - 3/90	1/2/26 6 62	38-158	0-20	1.0 0.50 1.0
PCB 1254	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	66-122	0-23	1.0 1.0
PCB 1260	608/8080(3520)/617 CLP - 2/88; 3/90	1/2/26 6/62	58-122	0-20	1.0 1.0
Surrogate - Dibutylchlorendate (DBC)	608/8080(3520)/617 CLP - 2/88	1/2/26 6	28-151 24-154	NA NA	NA NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	608/8080(3520)/617 CLP - 3/90	1/2/26 62	22-126 60-150	NA NA	NA NA
Surrogate - Decachlorobiphenyl (DCB)	608/8080(3520)/617 CLP - 3/90	1/2/26 62	25-126 60-150	NA NA	NA NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Chloroneb	608.1	10	49-125	0-30	0.4
Chloropropylate	608.1	10	51-125	0-30	0.5
Chlorobenzilate (MS)	608.1	10	53-125	0-30	0.5
Etridiazole	608.1	10	60-125	0-30	0.01
PCNB	608.1	10	60-125	0-30	0.6
Propachlor	608.1	10	51-125	0-30	0.5
Chlorothalonil	608.2	57	55-125	0-30	0.20
DCPA (Dacthal)	608.2	57	50-150	0-40	0.50
Dichloran	608.2	57	56-110	0-40	5.0
Methoxychlor	608.2	57	50-140	0-40	0.50
Permethrin	608.2	57	50-130	0-40	1.0
Surrogate - Dibutylchlorendate (DBC)	608.1/608.2	10/57	28-151	NA	NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	608.1/608.2	10/57	22-126	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
2,4-Dinitrotoluene (MS)	609/8090(3520) (FID) 609/8090(3520) (ECD)	1,2	10-125 10-125	0-40 0-40	10 0.3
2,6-Dinitrotoluene (MS)	609/8090(3520) (FID) 609/8090(3520) (ECD)	1,2	10-126 10-126	0-40 0-40	10 0.3
Isophorone (MS)	609/8090(3520)	1,2	10-117	0-40	10
Nitrobenzene (MS)	609/8090(3520)	1,2	10-118	0-40	10
Surrogate - 2-Fluorobiphenyl	609/8090(3520) (FID)	1,2	27-123	NA	NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	609/8090(3520) (ECD)	1,2	22-126	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acenaphthene (MS)	610/8100(3520)	1/2	38-111	0-21	10
Acenaphthylene	610/8100(3520)	1/2	38-110	0-23	10
Benzo(a)pyrene (MS)	610/8100(3520)	1/2	24-132	0-78	10
Benzo(b+k)fluoranthene	610/8100(3520)	1/2	28-129	0-65	10
Benzo(g,h,i)perylene	610/8100(3520)	1/2	14-147	0-87	10
Carbazole	8100***(3520)	2	16-140	0-40	10
Chrysene + Benzo(a)anthracene	610/8100(3520)	1/2	29-129	0-68	10
Fluoranthene	610/8100(3520)	1/2	12-155	0-67	10
Fluorene (MS)	610/8100(3520)	1/2	39-115	0-23	10
Indeno(1,2,3-cd) pyrene + Dibenzo(a,h)anthracene	610/8100(3520)	1/2	15-151	0-87	10
1-Methyl naphthalene	610/8100(3520)	1/2	20-140	0-50	10
2-Methyl naphthalene	610/8100(3520)	1/2	20-140	0-50	10
Naphthalene (MS)	610/8100(3520)	1/2	34-103	0-25	10
Phenanthrene + Anthracene	610/8100(3520)	1/2	38-119	0-29	10
Pyrene (MS)	610/8100(3520)	1/2	36-124	0-37	10
Diesel	8100 (modified)	12	40-140	0-40	300
Surrogate - 2-Fluorobiphenyl	610/8100(3520)	1/2	27-123	NA	NA
Surrogate - Decafluorobiphenyl	8100 (modified) (3520)	12	20-150	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acephate	614***/8141***(3520)	52/2	25-140	0-50	5.0
Azinphos methyl (MS)	614/622/8141(3520)	14/2	16-129	0-50	1.0
Bolstar (MS)	622/8141(3520)	14/2	58-156	0-40	1.0
Carbophenothion	8141***(3520)	2	20-150	0-40	1.0
Chlorpyrifos	614/622/8141(3520)	52/14/2	82-115	0-40	1.0
Chlorpyrifos methyl	622	14	20-130	0-40	1.0
Coumaphos	622/8141(3520)	14/2	51-147	0-40	1.0
Demeton-o	614/622/8141(3520)	52/14/2	36-120	0-40	2.5
Demeton-s	614/622/8141(3520)	52/14/2	36-120	0-40	2.5
Diazinon (MS)	614/622/8141(3520)	52/14/2	36-124	0-40	1.0
Dichlofenthion	614/8141***V(3520)	52/2	62-104	0-40	1.0
Dichlorvos	622/8141(3520)	14/2	49-120	0-40	2.0
Dimethoate	8141(3520)	2	38-120	0-40	10
Dioxathion	614/8141***V/3520)	52/2	25-140	0-40	10
Disulfoton (MS)	614/622/8141(3520)	52/14/2	10-178	0-66	2.0
EPN	614.1/8141(3520)	58/2	48-124	0-40	1.0
Ethion	614/614.1/8141(3520)	52/58/2	40-138	0-40	0.50
Ethoprop	622/8141(3520)	52/14/2	58-113	0-40	0.50
Famphur	8141***V(3520)	2	10-129	0-60	2.0
Fenamiphos	614***	52	40-160	0-40	0.50
Fensulfothion	622/8141(3520)	14/2	43-145	0-40	5.0
Fenthion	622/8141(3520)	14/2	10-128	0-60	1.0
Isofenphos	614***	52	40-160	0-40	0.50
Malathion	614/8141(3520)	52	60-140	0-40	1.0
Merphos	622/8141(3520)	14/2	50-130	0-40	1.0
Methamidophos	614***	52	40-160	0-40	2.0
Metolachlor	614/8141***(3520)	52/2	53-133	0-40	1.0
Mevinphos	622/8141(3520)	52/14/2	34-125	0-40	2.0
Monocrotophos	8141(3520)	52/2	25-140	0-50	10
Naled	622/8141(3520)	14/2	54-102	0-40	5.0
Parathion, ethyl (MS)	614/8141(3520)	52/2	18-171	0-28	1.0
Parathion, methyl (MS)	614/622/8141(3520)	52/14/2	40-104	0-40	0.50
Phorate (MS)	622/8141(3520)	14/2	36-125	0-40	1.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Ronnel	622/8141(3520)	14/2	45-135	0-35	1.0
Stirophos (Tetrachlorvinphos)	622/8141(3520)	14/2	48-125	0-40	1.0
Sulfotepp (MS)	8141(3520)	2	10-241	0-40	0.50
Terbufos	614.1	58	40-160	0-40	0.50
Thionazin	8141***V(3520)	2	25-160	0-60	1.0
Tokuthion (Prothiofos)	622/8141(3520)	14/2	44-125	0-40	1.0
Trichloronate	622/8141(3520)	14/2	49-161	0-40	1.0
Surrogate - Ronnel	8141/(3520)	2	45-135	NA	NA
Surrogate - Tokuthion	622/8141	14/2	44-125	NA	NA
Surrogate - Triphenylphosphate	614/622/8141	14/20/2	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
2,4-D (MS)	615/8150	53/2	25-129	0-60	0.50
2,4-DB	615/8150	53/2	40-140	0-40	0.50
2,4,5-T (MS)	615/8150	53/2	25-145	0-62	0.50
2,4,5-TP (Silvex) (MS)	615/8150	53/2	10-151	0-81	0.50
Dalapon	615/8150	53/2	10-160	0-80	10
Dicamba	615/8150	53/2	10-150	0-80	5.0
Dichlorprop	615/8150	53/2	10-150	0-80	0.50
Dinoseb	615/8150	53/2	10-150	0-80	0.50
MCPA	615/8150	53/2	10-150	0-80	10
MCPP	615/8150	53/2	10-150	0-80	10
Pentachlorophenol	615/8150***	53/2	10-150	0-80	0.10
Picloram	615/8150***V	53/2	10-150	0-40	0.050
Surrogate - 2,4-Dichlorophenylacetic acid (DCAA)	615/8150	53/2	10-135	NA	NA
Surrogate - 2,4-Dichlorophenoxy butyric acid (2,4-DB)	615/8150	53/2	40-140	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benfluralin	617***	26	40-140	0-40	0.010
Captan (MS)	617	26	55-125	0-40	0.10
Carbophenothion	617	26	50-110	0-40	1.0
Chlorothalonil	617***	26	55-125	0-30	0.20
Dichloran	617	26	56-110	0-40	5.0
Dicofol	617	26	55-115	0-40	0.10
Isodrin (MS)	617	26	55-110	0-40	0.050
Mirex	617	26	54-104	0-40	0.50
PCNB	617	26	54-100	0-40	0.01
Pendimethalin	617***	26	52-128	0-40	2.0
Permethrin	617***	26	50-130	0-40	1.0
Perthane	617	26	55-115	0-40	5.0
Strobane	617	26	48-127	0-40	2.0
Trifluralin	617	26	54-124	0-40	0.01
Chloropicrin	618	27	62-134	0-40	1.0
Ethylene dibromide	618	27	48-90	0-40	0.50
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	617/618	26/27	22-126	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Alachlor	619***	7	45-140	0-30	2.0
Ametryn	619	7	60-120	0-40	2.0
Atraton	619	7	50-115	0-40	5.0
Atrazine (MS)	619	7	40-125	0-30	2.0
Bromacil	619***	7	55-127	0-30	2.0
Hexazinone	619***	7	50-130	0-30	2.0
Metalaxyl	619***	7	50-130	0-40	1.0
Metribuzin	619***	7	61-141	0-30	2.0
Norflurazon	619***	7	54-134	0-30	2.0
Prometon	619	7	55-100	0-40	2.0
Prometryn	619	7	55-120	0-40	2.0
Propazine (MS)	619	7	33-100	0-40	2.0
Secbumeton	619	7	30-130	0-45	5.0
Simetryn	619	7	50-200	0-40	2.0
Simazine	619	7	25-174	0-50	2.0
Terbuthylazine	619	7	60-130	0-40	2.0
Terbutryn	619	7	53-113	0-40	2.0
Triadimefon	619***	7	61-125	0-30	2.0
Diphenylamine	620	23	56-125	0-30	2.0
Surrogate - Triphenylphosphate	619/620	7/23	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Aspon	622.1	8	62-104	0-40	1.0
Dichlofenthion	622.1	8	62-104	0-40	1.0
Famphur	622.1	8	10-129	0-40	2.5
Fenitrothion	622.1	8	61-103	0-40	2.0
Fonophos	622.1	8	53-133	0-40	1.0
Phosmet	622.1	8	50-150	0-40	1.0
Thionazin	622.1	8	25-160	0-40	1.0
Surrogate - Triphenylphosphate	622.1	8	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acetone	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	10-161	0-40	50 10
Acetonitrile	8240B(5030)	2	52-170	0-40	1000
Acrolein	8240(5030)/8260A(5030)	2	60-132	0-40	100
Acrylonitrile	8240(5030)/8260A(5030)	2	77-108	0-40	100
Benzene (MS)	624/8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	1/2 6 62	73-144 76-127 76-127	0-22 0-11 0-11	5.0 5.0 10
Benzyl Chloride	8240B(5030)	2	10-130	0-70	100
Bromobenzene	8260A(5030)	2	50-150	0-40	10
Bromodichloromethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	35-155	0-40	5.0 10
Bromoform	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	45-169	0-40	5.0 10
Bromomethane	624/8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	1/2/6/62	10-242	0-65	10
2-Butanone (MEK)	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	79-208	0-40	50 10
n-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
sec-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
tert-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
Carbon disulfide	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	37-138	0-40	5.0 10
Carbon tetrachloride	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	70-140	0-40	5.0 10
Chlorobenzene (MS)	624/8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	1/2 6 62	68-136 75-130 75-130	0-17 0-13 0-13	5.0 5.0 10
2-Chloro-1,3-butadiene (Chloroprene)	8240B(5030)	2	21-163	0-50	5
Chloroethane	624/8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	1/2/6/62	64-119	0-65	10
2-Chloroethyl vinyl ether	624/8240(5030)/8260A(5030)	1/2	10-305	0-65	50
Chloroform	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	51-138	0-40	5.0 10
Chloromethane	624/8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	1/2/6/62	10-273	0-65	10
3-Chloropropene (Allyl chloride)	8240B(5030)	2	81-112	0-40	5
2-Chlorotoluene	624/8240***(5030)/8260A(5030)	1/2	58-125	0-40	5.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
4-Chlorotoluene	8260A (5030)	2	50-150	0-40	5.0
Dibromochloromethane	624/8240/CLP-2/88/8260A(5030) CLP-3/90	1/2/6 62	53-149	0-40	5.0 10
1,2-Dibromo-3-chloropropane (DBCP)	8240B(5030)/8260A(5030)	2	37-127	0-40	10
1,2-Dibromoethane	8240B(5030)/8260A(5030)	2	70-112	0-40	5.0
Dibromomethane	8240B(5030)/8260A(5030)	2	78-110	0-40	5.0
1,2-Dichlorobenzene	624/8240(5030)/8260A(5030)	1/2	69-112	0-40	5.0
1,3-Dichlorobenzene	624/8240(5030)/8260A(5030)	1/2	32-180	0-40	5.0
1,4-Dichlorobenzene	624/8240(5030)/8260A(5030)	1/2	39-158	0-40	5.0
trans-1,4-Dichloro-2-butene	8240B(5030)	2	11-129	0-40	10
Dichlorodifluoromethane	8240B(5030)/8260A(5030)	2	72-146	0-40	5.0
1,1-Dichloroethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	59-155	0-40	5.0 10
1,2-Dichloroethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	49-155	0-40	5.0 10
cis/trans-1,2-Dichloroethene	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	54-156	0-40	5.0 10
1,1-Dichloroethene (MS)	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	60-136	0-19	5.0 10
1,2-Dichloropropane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	10-210	0-65	5.0 10
1,3-Dichloropropane	8260A(5030)	2	50-150	0-40	5.0
2,2-Dichloropropane	8260A(5030)	2	50-150	0-40	5.0
1,1-Dichloropropene	8260A(5030)	2	50-150	0-40	5.0
cis-1,3-Dichloropropene	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	10-227	0-65	5.0 10
trans-1,3-Dichloropropene	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	17-183	0-65	5.0 10
Ethanol	8240(5030)	2	40-160	0-40	1000
Ethylbenzene	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	37-162	0-40	5.0 10
Ethyl methacrylate	8240(5030)	2	37-139	0-40	5.0
Hexachlorobutadiene	8260A(5030)	2	50-150	0-40	5.0
2-Hexanone	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	10-164	0-40	50 10

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Iodomethane	8240B(5030)/8260A(5030)	2	37-137	0-40	5.0
Isobutyl alcohol	8240B(5030)	2	51-179	0-40	1000
Isopropylbenzene	8260A(5030)	2	50-150	0-40	5.0
p-Isopropyltoluene	8260A(5030)	2	50-150	0-40	5.0
Methacrylonitrile	8240B(5030)	2	76-111	0-40	100
Methylene chloride	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	10-221	0-65	5.0
Methylmethacrylate	8240B(5030)	2	50-130	0-40	5.0
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	68-111	0-40	50 10
Methyl t-butyl ether (MTBE)	8240***(5030)	2	50-150	0-40	10
Naphthalene	8260A(5030)	2	50-150	0-40	5.0
Pentachloroethane	8240B(5030)	2	10-276	0-65	25
Propionitrile (ethylcyanide)	8240B(5030)	2	63-112	0-40	100
n-Propylbenzene	8260A(5030)	2	50-150	0-40	5.0
Styrene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	60-109	0-40	5.0 10
1,1,1,2-Tetrachloroethane	8240B(5030)/8260A(5030)	2	34-138	0-40	5.0
1,1,2,2-Tetrachloroethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	46-157	0-40	5.0 10
Tetrachloroethene	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	64-148	0-40	5.0 10
Toluene (MS)	624/8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	1/2 6 62	68-138 76-125 76-125	0-17 0-13 0-13	5.0 5.0 10
1,2,3-Trichlorobenzene	8260A(5030)	2	50-150	0-40	5.0
1,2,4-Trichlorobenzene	8260A(5030)	2	50-150	0-40	5.0
1,1,1-Trichloroethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	52-162	0-40	5.0 10
1,1,2-Trichloroethane	624/8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	1/2/6 62	52-150	0-40	5.0 10
Trichloroethene (MS)	624/8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	1/2 6 62	66-136 71-120 71-120	0-20 0-14 0-14	5.0 5.0 10
Trichlorofluoromethane	8240(5030)/8260A(5030)	2	17-181	0-65	5.0
1,2,3-Trichloropropane	8240(5030)/8260A(5030)	2	44-103	0-40	5.0
Trichlorotrifluoroethane	8240***(5030)	2	82-130	0-23	5.0
1,2,4-Trimethylbenzene	8260A(5030)	2	50-150	0-40	5.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
1,3,5-Trimethylbenzene	8260A(5030)	2	50-150	0-40	5.0
Vinyl acetate	8240(5030)/CLP-2/88/ 8260A(5030)	2/6	49-147	0-40	10
Vinyl chloride	624/8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	1/2/6/62	10-251	0-65	10
Xylenes	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	66-114	0-40	5.0 10
Surrogate - Toluene-d8	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	77-120 88-110	NA NA	NA NA
Surrogate - p-Bromofluorobenzene	624/8240(5030)/8260A(5030) CLP-2/88; 3/90	1/2 6/62	80-125 86-115	NA NA	NA NA
Surrogate - Dibromofluoromethane	8260A(5030)	2	86-118	NA	NA
Surrogate - 1,2-Dichloroethane-d4	624/8240(5030) CLP-2/88; 3/90	1/2 6/62	80-125 76-114	NA NA	NA NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acenaphthene (MS)	625/8270B(3520) CLP-2/88; 3/90	1/2 6/62	65-116 46-118	0-20 0-31	10 10
Acenaphthylene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	54-130	0-24	10
Acetophenone	8270(3520)	2	10-150	0-50	10
2-Acetylaminofluorene	8270(3520)	2	25-150	0-50	10
Aldrin	625/8270(3520)	1/2	10-166	0-40	10
4-Aminobiphenyl	8270(3520)	2	10-150	0-50	10
Aniline	8270(3520)	2	10-150	0-50	50
Anthracene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	59-125	0-19	10
Aramite	8270(3520)	2	40-150	0-50	10
Benzidine	625/8270(3520)	1/2	10-200	0-100	80
Benzoic acid	8270(3520)/CLP-2/88	2/6	10-150	0-50	50
Benzo(a)anthracene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	54-125	0-20	10
Benzo(b)fluoranthene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	45-135	0-21	10
Benzo(k)fluoranthene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	40-160	0-33	10
Benzo(g,h,i)perylene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-219	0-50	10
Benzo(a)pyrene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	54-137	0-21	10
Benzyl alcohol	8270(3520)/CLP-2/88	2/6	10-150	0-50	10
Benzyl chloride	8270B***(3520)	2	10-150	0-50	10
alpha-BHC	625/8270(3520)	1/2	10-150	0-50	10
beta-BHC	625/8270(3520)	1/2	24-149	0-40	10
delta-BHC	625/8270(3520)	1/2	10-110	0-40	10
gamma-BHC	625/8270(3520)	1/2	10-150	0-50	10
Bis(2-chloroethoxy) methane	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	33-184	0-50	10
Bis(2-chloroethyl) ether	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	12-158	0-50	10
Bis(2-chloroisopropyl) ether	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	36-166	0-50	10
Bis(2-ethylhexyl) phthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-158	0-40	10
4-Bromophenyl phenyl ether	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	53-127	0-40	10
Butyl benzyl phthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-152	0-40	10
Carbazole	8270(3520)***/CLP-3/90	2/62	10-150	0-50	10
technical Chlordane	625/8270(3520)	1/2	10-150	0-50	50
p-Chloroaniline	8270(3520) CLP-2/88; 3/90	2 6/62	10-150	0-50	20 10
4-Chloro-3-methyl-phenol (MS)	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	53-104 23-97	0-17 0-42	10 10

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
1-Chloronaphthalene	8270(3520)	2	10-150	0-50	10
2-Chloronaphthalene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	60-118	0-40	10
2-Chlorophenol (MS)	625/8270(3520) CLP-2/88; 3/90	1/ 6/62	54-99 27-123	0-18 0-40	10 10
4-Chlorophenylphenyl ether	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	25-158	0-33	10
Chrysene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	45-131	0-25	10
3-Methyl phenol (m-Cresol)	8270(3520)	2	10-150	0-50	10
2-Methyl phenol (o-Cresol)	8270(3520)/CLP-2/88; 3/90	2/6/62	10-150	0-50	10
4-Methyl phenol (p-Cresol)	8270(3520)/CLP-2/88; 3/90	2/6/62	10-150	0-50	10
4,4'-DDD	625/8270(3520)	1/2	10-145	0-40	10
4,4'-DDE	625/8270(3520)	1/2	10-136	0-40	10
4,4'-DDT	625/8270(3520)	1/2	10-203	0-62	10
Diallate	8270(3520)	2	10-150	0-50	10
Dibenz(a,h)anthracene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	47-135	0-24	10
Dibenzofuran	8270(3520)/CLP-2/88; 3/90	2/6/62	10-150	0-50	10
Di-n-butyl phthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-118	0-50	10
1,2-Dichlorobenzene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	32-129	0-40	10
1,3-Dichlorobenzene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-172	0-42	10
1,4-Dichlorobenzene (MS)	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	46-110 36-97	0-18 0-28	10 10
3,3'-Dichlorobenzidine	625/8270(3520)/CLP-2/88 CLP 3/90	1/2/6 62	10-262	0-100	20 10
2,4-Dichlorophenol	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	39-135	0-40	10
2,6-Dichlorophenol	8270(3520)	2	10-150	0-50	10
Dieldrin	625/8270(3520)	1/2	29-136	0-40	10
Diethyl phthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-114	0-40	10
p-(Dimethylamino)azobenzene	8270(3520)	2	10-150	0-50	10
7,12-Dimethylbenz(a)anthracene	8270(3520)	2	10-150	0-50	10
3,3'-Dimethylbenzidine	8270(3520)	2	10-200	0-100	200
a,a-Dimethylphenethylamine	8270(3520)	2	10-200	0-50	2000
2,4-Dimethylphenol	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	44-112	0-25	10
Dimethylphthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-112	0-40	10
m-Dinitrobenzene	8270B(3520)	2	10-150	0-50	10
4,6-Dinitro-2-methylphenol	625/8270(3520)/CLP-2/88 CLP 3/90	1/2/6 62	10-181	0-93	50 25

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
2,4-Dinitrophenol	625/8270(3520)/CLP-2/88 CLP 3/90	1/2/6 62	10-143	0-48	50 25
2,4-Dinitrotoluene (MS)	625/8270(3520) CLP-2/88; 3/90	1/2	39-133 24-96	0-25 0-38	10 10
2,6-Dinitrotoluene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	50-158	0-40	10
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270(3520)	2	10-150	0-50	10
Di-n-octyl phthalate	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-146	0-50	10
1,4-Dioxane	8270***V(3520)	2	10-150	0-50	10
Diphenylamine/ N-nitrosodiphenylamine	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-150	0-50	10
1,2-Diphenyl hydrazine	8270(3520)	2	10-150	0-50	10
Endosulfan I	625/8270(3520)	1/2	10-150	0-50	20
Endosulfan II	625/8270(3520)	1/2	10-150	0-50	20
Endosulfan sulfate	625/8270(3520)	1/2	10-107	0-50	20
Endrin	625/8270(3520)	1/2	10-150	0-50	20
Endrin aldehyde	625/8270(3520)	1/2	10-209	0-50	50
Endrin ketone	8270/(3520)	2	10-150	0-50	50
Ethyl carbamate	8270***V(3520)	2	52-100	0-24	10
Ethyl methane sulfonate	8270(3520)	2	10-150	0-50	10
Fluoranthene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	58-124	0-19	10
Fluorene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	59-121	0-40	10
Heptachlor	625/8270(3520)	1/2	10-192	0-40	20
Heptachlor epoxide	625/8270(3520)	1/2	26-155	0-55	20
Hexachlorobenzene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	10-152	0-40	10
Hexachlorobutadiene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	24-116	0-40	10
Hexachlorocyclopentadiene	8270(3520)/CLP-2/88; 3/90	2/6/62	10-150	0-50	10
Hexachloroethane	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	40-113	0-40	10
Hexachlorophene	8270(3520)	2	10-200	0-80	5000
Hexachloropropene	8270(3520)	2	10-150	0-50	10
Indeno(1,2,3-cd)pyrene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	33-147	0-36	10
Isophorone	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	21-196	0-60	10
Isosafrole	8270(3520)	2	10-150	0-50	10
Methapyrilene	8270(3520)	2	10-150	0-50	2000
3-Methylcholanthrene	8270(3520)	2	10-150	0-50	10

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Methylmethanesulfonate	8270(3520)	2	10-150	0-50	10
2-Methylnaphthalene	8270(3520)/CLP-2/88; 3/90	2/6/62	10-150	0-50	10
1-Methylnaphthalene	8270B(3520)	2	10-150	0-50	10
Naphthalene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	46-111	0-50	10
1,4-Napthoquinone	8270(3520)	2	10-150	0-50	10
1-Napthylamine	8270(3520)	2	10-150	0-50	10
2-Napthylamine	8270(3520)	2	10-150	0-50	10
Nicotine	8270(3520)	2	10-150	0-50	100
2-Nitroaniline	8270(3520)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	50 25
3-Nitroaniline	8270(3520)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	50 25
4-Nitroaniline	8270(3520)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	50 25
Nitrobenzene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	35-180	0-40	10
2-Nitrophenol	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	29-182	0-40	10
4-Nitrophenol (MS)	625/8270(3520) CLP-2/88 CLP-3/90	1/2 6 62	10-112 10-80 10-80	0-108 0-50 0-50	50 50 25
4-Nitroquinoline-1-oxide	8270(3520)	2	10-150	0-50	100
N-Nitrosodi-n-butylamine	8270(3520)	2	10-150	0-50	10
N-Nitrosodiethylamine	8270(3520)	2	10-150	0-50	10
N-Nitrosodimethylamine	625/8270(3520)	1/2	10-150	0-50	10
N-Nitrosodi-n-propylamine (MS)	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	39-142 41-116	0-60 0-38	10 10
N-Nitrosomethylethylamine	8270(3520)	2	10-150	0-50	10
N-Nitrosomorpholine	8270(3520)	2	10-150	0-50	10
N-Nitrosopiperidine	8270(3520)	2	10-150	0-50	10
N-Nitrosopyrrolidine	8270(3520)	2	10-150	0-50	10
5-Nitro-o-toluidine	8270(3520)	2	10-150	0-50	10
PCB-1016	625/8270(3520)	1/2	10-150	0-50	500
PCB-1221	625/8270(3520)	1/2	10-150	0-50	500
PCB-1232	625/8270(3520)	1/2	10-150	0-50	500
PCB-1242	625/8270(3520)	1/2	10-150	0-50	500
PCB-1248	625/8270(3520)	1/2	10-150	0-50	500
PCB-1254	625/8270(3520)	1/2	10-150	0-50	500

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
PCB-1260	625/8270(3520)	1/2	10-150	0-50	500
Pentachlorobenzene	8270(3520)	2	10-150	0-50	10
Pentachloronitrobenzene	8270(3520)	2	10-150	0-50	10
Pentachlorophenol (MS)	625/8270(3520) CLP 2/88 CLP 3/90	1/2 6 62	15-139 9-103 9-103	0-39 0-50 0-50	50 50 25
Phenacetin	8270(3520)	2	10-150	0-50	10
Phenanthrene	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	54-119	0-20	10
Phenol (MS)	625/8270(3520) CLP 2/88 CLP 3/90	1/2 6 62	10-96 12-89 12-110	0-21 0-42 0-42	10 10 10
p-Phenylenediamine	8270(3520)	2	10-200	0-50	2000
2-Picoline	8270(3520)	2	10-150	0-50	200
Pronamide	8270(3520)	2	10-150	0-50	10
Pyrene (MS)	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	36-153 26-127	0-21 0-31	10 10
Pyridine	8270(3520)	2	10-150	0-50	200
Safrole	8270(3520)	2	10-150	0-50	10
Strychnine	8270(3520)	2	10-150	0-50	100
1,2,4,5-Tetrachlorobenzene	8270(3520)	2	10-150	0-50	10
Trichlorophenols	8270(3520)	2	NA	NA	10
2,3,4,5-Tetrachlorophenol	8270***(3520)	2	10-150	0-50	50
2,3,4,6-Tetrachlorophenol	8270(3520)	2	45-129	0-22	50
o-Toluidine	8270(3520)	2	10-150	0-50	10
Toxaphene	625/8270(3520)	1/2	10-200	0-80	2000
1,2,4-Trichlorobenzene (MS)	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	49-108 39-98	0-24 0-28	10 10
Tetrachlorophenols	8270(3520)	2	NA	NA	50
2,4,5-Trichlorophenol	8270(3520) CLP-2/88 CLP-3/90	2 6 62	45-113	0-21	10 50 25
2,4,6-Trichlorophenol	625/8270(3520)/CLP-2/88; 3/90	1/2/6/62	37-144	0-40	10
o,o,o-Triethyl-phosphorothioate	8270(3520)	2	10-150	0-50	10
1,3,5-Trinitrobenzene	8270(3520)	2	10-150	0-50	200
Surrogate - Nitrobenzene-d5	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	61-115 35-114	NA NA	NA NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Surrogate - 2-Fluorobiphenyl	625/8270(3520) CLP-2/88; 3/90	1/2 6/62	59-119 43-116	NA NA	NA NA
Surrogate - p-Terphenyl-d14	8270(3520) CLP-2/88; 3/90	2 6/62	46-136 33-141	NA NA	NA NA
Surrogate - Phenol-d5	625/8270(3520) CLP-2/88 CLP 3/90	1/2 6 62	10-106 10-94 10-110	NA NA NA	NA NA NA
Surrogate - 2-Fluorophenol	8270(3520) CLP-2/88 CLP 3/90	2 6 62	10-104 21-100 21-110	NA NA NA	NA NA NA
Surrogate - 2,4,6-Tribromophenol	8270(3520) CLP-2/88; 3/90	2 6/62	41-143 10-123	NA NA	NA NA
Surrogate - 2-Chlorophenol-d4	CLP-3/90	62	33-110	NA	NA
Surrogate - 1,2-Dichlorobenzene-d4	CLP-3/90	62	16-110	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (MS)	613/8280 8270 (Screen)	1/2 2	63-137	0-40	0.0050 10
Polychlorinated Dibenzo-p-dioxin and Dibenzofuran classes					
tetra-CDD (MS)	8280	2	63-137	0-40	0.0050
tetra-CDF (MS)	8280	2	60-142	0-40	0.0050
penta-CDD (MS)	8280	2	37-163	0-40	0.0050
penta-CDF (MS)	8280	2	52-148	0-40	0.0050
hexa-CDD (MS)	8280	2	42-158	0-40	0.0050
hexa-CDF (MS)	8280	2	58-142	0-40	0.0050
hepta-CDD (MS)	8280	2	20-170	0-50	0.010
hepta-CDF (MS)	8280	2	20-170	0-50	0.010
octa-CDD (MS)	8280	2	20-170	0-50	0.010
octa-CDF (MS)	8280	2	20-170	0-50	0.010
Internal Standard - $^{13}C_{12}$-2,3,7,8-TCDD	8280	2	40-120	NA	NA
Internal Standard - $^{13}C_{12}$-OCDD	8280	2	40-120	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Benfluralin	627	9	40-140	0-40	0.010
Ethalfluralin	627	9	40-140	0-40	2.0
Isopropalin	627	9	48-140	0-40	0.10
Profluralin	627	9	55-140	0-40	0.20
Trifluralin (MS)	627	9	17-140	0-50	0.010
Surrogate - 2,4,5,6-Tetrachloro-m-xylene	627	9	22-126	NA	NA
Cyanazine	629	25	20-180	0-50	5.0
Benomyl	631	55	50-126	0-30	5.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Amobam	630	63	70-130	0-20	*
Ferbam	630	63	70-130	0-20	*
Mancozeb	630	63	70-130	0-20	*
Maneb	630	63	70-130	0-20	*
Metham	630	63	70-130	0-20	*
Nabam	630	63	70-130	0-20	*
Polyram	630	63	70-130	0-20	*
Zineb	630	63	70-130	0-20	*
Ziram	630	63	70-130	0-20	20

* All compounds reported as Ziram

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Aminocarb	632	13	60-125	0-30	1.0
Barban	632	13	55-125	0-30	1.0
Bromacil	632***V	13	52-125	0-30	2.0
Carbaryl (MS)	632	13	55-125	0-30	5.0
Carbofuran	632	13	55-125	0-30	10
Chlorpropham	632	13	55-125	0-30	1.0
Diuron (MS)	632	13	55-125	0-30	1.0
Fenuron	632	13	60-125	0-30	5.0
Fluometuron	632	13	59-125	0-40	1.0
Linuron	632	13	55-125	0-30	1.0
Methiocarb	632	13	51-137	0-30	5.0
Methomyl	632	13	52-132	0-30	1.0
Monuron	632	13	56-132	0-30	1.0
Neburon	632	13	54-126	0-30	1.0
Oxamyl	632	13	57-125	0-30	10
Propham	632	13	50-125	0-30	1.0
Propoxur	632	13	56-125	0-30	1.0
Siduron	632	13	55-125	0-30	1.0
Swep	632	13	58-125	0-35	1.0
Surrogate - Propachlor	632	13	45-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Bromacil	633	41	52-125	0-30	2.0
DEET	633	41	55-125	0-30	5.0
Hexazinone	633	41	52-125	0-30	0.50
Metribuzin	633	41	50-125	0-30	1.0
Terbacil	633	41	50-130	0-30	5.0
Triadimefon	633	41	48-125	0-30	1.0
Tricyclazole	633	41	53-125	0-30	5.0
Surrogate - Triphenylphosphate	633	41	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Butylate (MS)	634	15	38-145	0-76	2.0
Cycloate	634	15	46-159	0-47	2.0
EPTC	634	15	46-154	0-55	2.0
Molinate (MS)	634	15	37-127	0-74	2.0
Pebulate	634	15	22-172	0-50	2.0
Vernolate	634	15	39-147	0-45	2.0
Surrogate - Tokuthion	634	15	44-125	NA	NA
Surrogate - Triphenylphosphate	634	15	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Rotenone	635	19	59-125	0-30	2.0
Bensulide	636	16	22-140	0-50	2.0
Oryzalin	638	21	50-130	0-30	1.0
Bendiocarb	639	20	10-165	0-50	2.0
Bentazon	643	59	50-150	0-40	5.0
2,4,-D	644***	64	25-129	0-60	2.0
2,4,-DB	644***	64	48-126	0-40	1.0
Dicamba	644***	64	40-144	0-40	0.50
Picloram	644	64	44-138	0-40	0.50

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Alachlor (MS)	645	28	45-140	0-30	1.0
Butachlor	645	28	50-124	0-40	1.0
Diphenamid	645	28	57-119	0-40	1.0
Fluridone	645	28	45-154	0-40	1.0
Lethane	645	28	33-153	0-50	1.0
Norflurazon	645	28	48-110	0-40	1.0
Surrogate - Triphenylphosphate	645	28	40-125	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acenaphthene (MS)	8310	2	44-162	0-52	1.0
Acenaphthylene	8310	2	10-139	0-40	1.0
Acridine	8310***	2	10-200	0-40	0.50
Anthracene	8310	2	10-126	0-40	0.20
Benzo(a)anthracene	8310	2	12-135	0-40	0.20
Benzo(b)fluoranthene	8310	2	6-150	0-40	0.20
Benzo(k)fluoranthene	8310	2	10-159	0-40	0.50
Benzonitrile	8310***	2	10-200	0-40	10
Benzo(g,h,i)perylene	8310	2	10-120	0-40	0.50
Benzo(a)pyrene	8310	2	10-128	0-40	0.20
7,8-Benzoquinoline	8310***	2	10-200	0-40	1.0
Carbazole	8310***	2	10-150	0-40	1.0
Chrysene (MS)	8310	2	10-199	0-40	0.20
Dibenzo(a,h)anthracene	8310	2	10-110	0-40	1.0
2,4-Dimethylquinoline	8310***	2	10-200	0-40	20
Fluoranthene	8310	2	41-155	0-54	0.50
Fluorene (MS)	8310	2	10-142	0-40	0.50
Indeno(1,2,3-cd)pyrene	8310	2	10-116	0-40	0.50
1-Methylnaphthalene	8310	2	10-125	0-40	1.0
2-Methylnaphthalene	8310	2	10-125	0-40	1.0
8-Methylquinoline	8310***	2	10-200	0-40	5.0
Naphthalene (MS)	8310	2	50-135	0-40	1.0
Phenanthrene	8310	2	10-155	0-40	0.20
Pyrene (MS)	8310	2	50-158	0-43	0.50
Quinaldine	8310***	2	10-200	0-40	5.0
Quinoline	8310***	2	10-200	0-40	40
Surrogate - 2-Fluorobiphenyl	8310	2	60-140	NA	NA
Surrogate - 4-Terphenyl-d4	8310	2	60-140	NA	NA

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
Acetaldehyde	8315	2	30-110	0-40	200
Formaldehyde	8315	2	50-155	0-30	20
Aldicarb (Temik) (MS)	8318	2	34-124	0-40	10
Aldicarb sulfone	8318	2	54-116	0-40	5.0
Aldicarb sulfoxide	8318***	2	30-140	0-40	5.0
Carbaryl (Sevin)	8318	2	55-125	0-40	5.0
Carbofuran (Furadan) (MS)	8318	2	52-125	0-40	10
Dioxacarb	8318	2	56-124	0-40	5.0
3-Hydroxycarbofuran	8318	2	47-123	0-40	5.0
Methiocarb (Mesurol)	8318	2	51-137	0-40	5.0
Methomyl (Lannate)	8318	2	57-125	0-40	5.0
Oxamyl (MS)	8318***	2	50-150	0-40	5.0
Promecarb	8318	2	48-122	0-40	5.0
Propoxur (Baygon)	8318	2	47-127	0-40	5.0

TABLE 5.1. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/L)
1,3-Dinitrobenzene (MS)	8330	2	54-166	0-30	0.20
2,4-Dinitrotoluene (MS)	8330	2	60-140	0-30	0.20
2,6-Dinitrotoluene	8330	2	60-140	0-30	0.50
Diphenylamine	8330***V	2	65-140	0-30	10
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDK)	8330	2	54-166	0-30	1.0
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)	8330	2	41-165	0-30	5.0
Nitrobenzene	8330	2	52-152	0-30	5.0
Nitroglycerin	8330***V	2	71-121	0-22	10
n-Nitrosodiphenylamine	8330***V	2	55-121	0-30	10
2-Nitrotoluene (MS)	8330	2	50-144	0-30	20
3-Nitrotoluene	8330	2	55-165	0-30	10
4-Nitrotoluene	8330	2	54-166	0-30	20
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330	2	54-162	0-30	20
1,3,5-Trinitrobenzene	8330	2	50-150	0-30	0.50
2,4,6-Trinitrotoluene	8330	2	50-17	0-30	0.20
Surrogate - 2-Fluorobiphenyl	8330	2	40-140	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/kg)
Aluminum	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	20 40
Antimony (MS)	6010(3050) CLP 7041(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	5.0 12 5.0
Arsenic (MS)	6010(3050) 7060(3050) 7061 CLP	2 2 2 45	70-130 70-130 70-130 70-130	0-30 0-30 0-30 0-20	10 1.0 1.0 20
Barium (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	1.0 40
Beryllium (MS)	6010(3050) CLP 7091(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	0.50 1.0 0.10
Boron	6010(3050***)	2	70-130	0-30	5.0
Cadmium (MS)	6010(3050) CLP 7131(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	0.50 1.0 0.10
Calcium	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	50 1000
Chromium (MS)	6010(3050) CLP 7191(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	1.0 2.0 1.0
Cobalt (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	1.0 10
Copper (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	2.5 5.0
Iron	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	5.0 20
Lead (MS)	6010(3050) 7421(3050) CLP	2 2 45	70-130 70-130 70-130	0-30 0-30 0-20	5.0 0.50 0.60
Lithium	3500-Li B(3050***)	4/2	70-130	0-30	10
Magnesium	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	50 1000
Manganese (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	1.0 3.0
Mercury (MS)	7471 CLP	2 45	70-130 70-130	0-30 0-20	0.030 0.030
Molybdenum	6010(3050)	2	70-130	0-30	1.0
Nickel (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	4.0 8.0
Potassium	6010(3050) CLP 7610(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	100 1000 10

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/kg)
Selenium (MS)	6010(3050) 7740(3050) 7741 CLP	2 2 2 45	70-130 70-130 70-130 70-130	0-30 0-30 0-30 0-20	50 1.0 1.0 1.0
Silica	6010(3050***)	2	70-130	0-30	50
Silver (MS)	6010(3050) CLP 7761(3050)	2 45 2	70-130 70-130 70-130	0-30 0-20 0-30	1.0 2.0 0.10
Sodium	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	50 1000
Strontium	6010***(3050***)	2	70-130	0-30	1.0
Thallium (MS)	6010(3050) 7841(3050) CLP	2 2 45	70-130 70-130 70-130	0-30 0-30 0-20	50 1.0 2.0
Tin	6010***V(3050***V)	2	70-130	0-30	5.0
Titanium	6010***(3050***)	2	70-130	0-30	1.0
Tributyl tin	Atomic absorption	40	70-130	0-40	0.10
Vanadium (MS)	6010(3050) CLP	 45	70-130 70-130	0-30 0-20	1.0 10
Zinc (MS)	6010(3050) CLP	2 45	70-130 70-130	0-30 0-20	2.0 4.0
Zinc phosphide	FDER Special Method	31	NA	NA	NA
Zirconium	6010***(3050***)	2	70-130	0-30	500

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/kg)
Ammonia (as N) (extractable)	EPA-CE-3-140 350.3(EPA-CE)	46 3/46	75-125 75-125	0-30 0-30	0.50 0.50
BOD	EPA-CE	46	60-140	0-40	200
BTU	D240-76	38	70-130	0-30	200 BTU/lb
Carbon, total organic	EPA-CE [Walkley-Black] 9060	46 [43] 2	60-140 60-140	0-40 0-40	50 50
Cation exchange capacity	9081/EPA-CE	2/46	70-130	0-40	0.0033 meq/100 g
Chloride (extractable)	9251(5050) 9252 407A	2 2 4	75-125 75-125 75-125	0-30 0-30 0-30	20 20 20
Chloride, total	9251(5050) 9056(5050)	2 2	70-130 70-130	0-40 0-40	100 100
COD	EPA-CE	46	60-140	0-40	100
Coliform, fecal	908C(AOAC)	4(36)	NA	NA	3 MPN/g
Coliform, total	908A(AOAC)	4(36)	NA	NA	3 MPN/g
Cyanide, amenable to chlorination	9012 9010	2 2	NA NA	0-50 0-40	1.0 1.0
Cyanide, reactive	7.3.3.2	2	NA	0-50	1.0
Cyanide, total	9012(9010A) 9010 CLP	2 2 45	75-125 75-125 85-115	0-30 0-30 0-25	1.0 1.0 0.30
EP Toxicity	1310	2	NA	NA	NA
Formaldehyde	NIOSH	35	80-120	0-20	13
Fluoride (extractable)	340.2	3	75-125	0-25	4.0
Halogens, total	9056(5050)	2	70-130	0-40	200
Halogens, total organic (EOX)	EPA-600/4-84-008	44	60-140	0-50	10
Hydrogen ion (pH)	9045	2	NA	0-10	NA
Ignitability	1010	2	NA	NA	NA
Nitrate (as N) (extractable)	EPA-CE	46	75-125	0-30	5.0
Nitrate-Nitrite (as N)	EPA-CE	46	75-125	0-30	5.0
Nitrite (as N) (extractable)	EPA-CE	46	75-125	0-30	5.0
Nitrogen, organic	EPA-CE	46	NA	NA	25
Nitrogen, total	EPA-CE	46	NA	NA	30
Nitrogen, total Kjeldahl	EPA-CE	46	65-135	0-30	25

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/kg)
Oil and Grease	9070(9071)	2	60-140	0-50	10
Orthophosphate	365.1	3	75-125	0-30	1.0
Paint filter liquids	9095	2	NA	0-40	NA
Petroleum hydrocarbons	9073	2	60-140	0-50	10
Phenolics, total recoverable	9066(EPA-CE) 9065-(EPA-CE)	2 (46) 2 (46)	60-140 60-140	0-40 0-40	0.40 0.40
Phosphorus, total	EPA-CE-3-2/3 EPA-CE-3-2/2	46 46	60-140 60-140	0-40 0-40	25 5.0
Radioactivity, alpha	900.0/9310	2	NA	0-30	NA
Radioactivity, beta	900.0/9310	2	NA	0-30	NA
Residue, fixed (% ash)	EPA-CE	46	NA	0-40	0.10%
Solids, total	EPA-CE	46	NA	0-30	0.10%
Solids, volatile	EPA-CE	46	75-125	0-30	0.10%
Specific gravity	EPA-CE	46	NA	0-10	NA
Streptococcus, fecal	910A	4/36	NA	NA	3 MPN/g
Sulfate (extractable)	9036 9038 375.3	2 2 3	75-125 75-125 75-125	0-25 0-25 0-25	100 100 10
Sulfide	9030-SL	2	50-150	0-50	10
Sulfide, reactive	7.3.4.2	2	NA	0-50	10
Sulfur	D129-64/9056(5050)	38/2	70-130	0-30	170
Surfactants (MBAS) (extractable)	425.1	3	60-140	0-40	20
Toxic compound leaching procedure	1311	48	NA	NA	NA
Water (Karl Fisher)	D1744	38	NA	0-30	50

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Benzyl chloride	8010(5030)	2	50-150	0-30	5.0
Bromobenzene	8010(5030)	2	70-130	0-30	50
Bromodichloromethane	8010(5030)	2	42-172	0-30	5.0
Bromoform	8010(5030)	2	13-159	0-30	25
Bromomethane	8010(5030)	2	10-144	0-30	5.0
Carbon tetrachloride	8010(5030)	2	43-143	0-30	5.0
Chlorobenzene (MS)	8010(5030)	2	31-122	0-27	5.0
Chloroethane	8010(5030)	2	46-137	0-30	5.0
Chloroform	8010(5030)	2	49-133	0-30	5.0
1-Chlorohexane	8010(5030)	2	50-150	0-30	5.0
2-Chloroethylvinyl ether	8010(5030)	2	14-186	0-80	50
Chloromethane	8010(5030)	2	10-193	0-30	5.0
Chlorotoluenes	8010(5030)	2	70-130	0-30	50
Dibromochloromethane	8010(5030)	2	24-191	0-30	5.0
Dibromomethane	8010(5030)	2	70-130	0-30	25
1,2-Dichlorobenzene	8010(5030)	2	10-208	0-30	5.0
1,3-Dichlorobenzene	8010(5030)	2	10-187	0-30	5.0
1,4-Dichlorobenzene	8010(5030)	2	42-143	0-30	5.0
Dichlorodifluoromethane	8010(5030)	2	70-130	0-30	5.0
1,1-Dichloroethane	8010(5030)	2	47-132	0-30	5.0
1,2-Dichloroethane	8010(5030)	2	51-147	0-30	5.0
1,1-Dichloroethylene (MS)	8010(5030)	2	51-132	0-28	5.0
cis/trans 1,2-Dichloroethene	8010(5030)	2	38-155	0-30	5.0
Dichloromethane (Methylene chloride)	8010(5030)	2	25-162	0-30	5.0
1,2-Dichloropropane	8010(5030)	2	44-156	0-30	5.0
cis/trans-1,3-Dichloropropylene	8010(5030)	2	22-178	0-30	5.0
1,1,2,2-Tetrachloroethane	8010(5030)	2	10-184	0-30	5.0
1,1,1,2-Tetrachloroethane	8010(5030)	2	70-130	0-30	5.0
Tetrachloroethene	8010(5030)	2	26-162	0-30	5.0
1,1,1-Trichloroethane	8010(5030)	2	41-138	0-30	5.0
1,1,2-Trichloroethane	8010(5030)	2	39-136	0-30	5.0
Trichloroethene (MS)	8010(5030)	2	56-133	0-26	5.0
Trichlorofluoromethane	8010(5030)	2	21-156	0-30	5.0

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
1,2,3-Trichloropropane	8010(5030)	2	50-150	0-30	5.0
Vinyl chloride	8010(5030)	2	28-163	0-30	5.0
1,2-Dibromoethane (EDB)[1]	8010***(5030)	2	75-125	0-30	5.0
Surrogate - Bromochloromethane	8010(5030)	2	43-127	NA	NA

[1] EDB determined on Hall detector with PQL of 5.0 ug/kg at client's request.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acetone	8015***(5030)	2	40-130	0-30	130
2-Butanone (MEK)	8015(5030)	2	60-130	0-40	130
Diethyl ether	8015(5030)	2	10-130	0-50	130
Ethanol	8015(5030)	2	20-140	0-45	5000
Ethyl methacrylate	8015***(5030)	2	42-125	0-40	50
Isobutanol	8015***(5030)	2	50-120	0-40	5000
Isopropanol	8015***(5030)	2	30-140	0-40	5000
Methacrylonitrile	8015***(5030)	2	10-140	0-60	500
Methanol	8015***(5030)	2	50-150	0-40	5000
Methyl methacrylate	8015***(5030)	2	45-132	0-42	50
4-Methyl-2-pentanone (MIBK)	8015(5030)	2	65-125	0-40	130
Methyl t-butyl ether (MTBE)	8015***(5030)	2	50-150	0-30	50
Propionitrile	8015***(5030)	2	10-130	0-50	500
Gasoline	8015 (modified)	12	40-140	0-40	250
Methanol (MS)	8015 (modified/DEI*)	2	50-150	0-50	1000
Ethanol	8015 (modified/DEI*)	2	50-150	0-50	1000
n-Propanol	8015 (modified/DEI*)	2	50-150	0-50	1000
Isopropanol (MS)	8015 (modified/DEI*)	2	50-150	0-50	1000
n-Butanol	8015 (modified/DEI*)	2	50-150	0-50	1000
Isobutanol	8015 (modified/DEI*)	2	50-150	0-50	1000
Ethylene glycol (MS)	8015 (modified/DEI*)	2	50-150	0-50	10000
Diethylene glycol	8015 (modified/DEI*)	2	50-150	0-50	10000
Propylene glycol	8015 (modified/DEI*)	2	50-150	0-50	10000
Triethylene glycol	8015 (modified/DEI*)	2	50-150	0-50	10000
Tetraethylene glycol	8015 (modified/DEI*)	2	50-150	0-50	25000

* DEI = Direct Extract Injection

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Benzene (MS)	8020(5030)	2	63-133	0-27	5.0
Chlorobenzene (MS)	8020(5030)	2	69-129	0-25	5.0
1,2-Dichlorobenzene	8020(5030)	2	37-154	0-30	5.0
1,3-Dichlorobenzene	8020(5030)	2	50-141	0-30	5.0
1,4-Dichlorobenzene	8020(5030)	2	42-143	0-30	5.0
Ethylbenzene	8020(5030)	2	32-160	0-30	5.0
Methyl tert-butyl ether (MTBE)	8020***(5030)	2	50-150	0-30	50
Toluene (MS)	8020(5030)	2	70-138	0-26	5.0
Xylenes	8020(5030)	2	50-150	0-30	5.0
m-Xylene	8020(5030)	2	50-150	0-30	5.0
o+p Xylene	8020(5030)	2	50-150	0-30	5.0
Surrogate - a,a,a-Trifluorotoluene	8020(5030)	2	67-137	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acrolein	8030(5030)	2	88-118	0-30	1000
Acrylonitrile	8030(5030)	2	71-135	0-30	500
Acetonitrile	8030***(5030)	2	20-115	0-30	5000

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2-Chlorophenol (MS)	8040(3550)	2	27-150	0-26	330
4-Chloro-3-methylphenol (MS)	8040(3550)	2	20-151	0-39	330
2,4-Dichlorophenol	8040(3550)	2	44-119	0-40	330
2,4-Dimethylphenol	8040(3550)	2	24-118	0-40	330
2,4-Dinitrophenol	8040(3550)	2	12-145	0-65	1700
2-Methyl-4,6-dinitrophenol	8040(3550)	2	30-136	0-40	1700
3-Methyl phenol (m-cresol)	***8040(3550)	2	10-150	0-50	330
2-Methyl phenol (o-cresol)	***8040(3550)	2	10-150	0-50	330
4-Methyl phenol (p-cresol)	***8040(3550)	2	10-150	0-50	330
Cresols	8040(3550)	2	10-150	0-50	330
2-Nitrophenol	8040(3550)	2	43-117	0-40	330
4-Nitrophenol (MS)	8040(3550)	2	10-130	0-34	1700
Pentachlorophenol (MS)	8040(3550)	2	10-162	0-80	1700
Phenol (MS)	8040(3550)	2	13-149	0-30	330
Trichlorophenols	8040(3550)	2	NA	NA	330
2,3,4,6-Tetrachlorophenol	***8040(3550)	2	50-150	0-40	660
2,3,4,5-Tetrachlorophenol	***8040(3550)	2	50-150	0-40	660
Tetrachlorophenols	8040(3550)	2	NA	NA	660
2,4,6-Trichlorophenol	8040(3550)	2	53-119	0-40	330
2,4,5-Trichlorophenol	***8040(3550)	2	53-119	0-40	330
Surrogate - 2,4,6-Tribromophenol	8040(3550)	2	10-186	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Butyl benzyl phthalate (MS)	8060(3550)	2	10-137	0-66	330
Bis(2-ethylhexyl) phthalate (MS)	8060(3550)	2	10-151	0-54	330
Di-n-butyl phthalate (MS)	8060(3550)	2	14-123	0-41	330
Diethyl phthalate (MS)	8060(3550)	2	10-145	0-34	330
Dimethyl phthalate (MS)	8060(3550)	2	10-147	0-31	330
Di-n-octyl phthalate (MS)	8060(3550)	2	10-147	0-86	330
Surrogate - 2-Fluorobiphenyl	8060(3550)	2	17-164	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Aldrin (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	40-137 34-132 34-132	0-39 0-43 0-43	1.7 8.0 1.7
Benfluralin	8080***(3550)	2	40-140	0-40	0.33
alpha-BHC	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	37-134	0-40	1.7 8.0
beta-BHC	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	17-147	0-40	1.7 8.0
gamma-BHC (Lindane) (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	41-134 46-127 46-127	0-36 0-50 0-50	1.7 8.0 1.7
delta-BHC	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	19-140	0-40	1.7 8.0
Carbophenothion	8080***(3550)	2	20-150	0-50	33
Chlordane	8080(3550)	2	45-119	0-40	17
alpha Chlordane	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	45-140	0-40	1.7 80
gamma Chlordane	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	45-140	0-40	1.7 80
Chlorobenzilate	8081***V(3550)	2	50-150	0-40	17
Chloroneb	8080***V(3550)	2	49-125	0-30	13
Chloropropylate	8080***V(3550)	2	51-125	0-30	16
Chlorothalonil	8080***(3550)	2	35-130	0-40	6.7
4,4'-DDD	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	31-141	0-50	3.3 16
4,4'-DDE	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	30-145	0-50	3.3 16
4,4'-DDT (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	48-150 23-134 23-134	0-34 0-50 0-50	3.3 16 3.3
Dicofol (Kelthane)	8081***V(3550)	2	40-125	0-40	20
Dieldrin (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	42-139 31-134 31-134	0-41 0-38 0-38	3.3 16 3.3
Endosulfan I	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	45-153	0-40	1.7 8.0
Endosulfan II	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	10-202	0-65	3.3 16
Endosulfan sulfate	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	26-144	0-50	3.3 16
Endrin (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	44-151 42-139 42-139	0-31 0-45 0-45	3.3 16 3.3
Endrin aldehyde	8080(3550)/CLP-3/90	2/62	10-150	0-50	3.3
Endrin ketone	CLP-2/88 CLP-3/90	6 62	NA NA	NA NA	16 3.3
Etridiazole	8080***V(3550)	2	50-125	0-30	0.33
Heptachlor (MS)	8080(3550) CLP-2/88 CLP-3/90	2 6 62	40-136 35-130 35-130	0-34 0-31 0-31	1.7 8.0 1.7

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Heptachlor epoxide	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	37-142	0-40	1.7 8.0
Isodrin	8081***V(3550)	2	10-150	0-50	3.3
Kepone	8081***V(3550)	2	10-150	0-50	17
Methoxychlor	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	50-140	0-40	17 80
Mirex	8081***V(3550)	2	20-100	0-50	33
Pendimethalin	8080***(3550)	2	35-125	0-50	67
Permethrin (total)	8080***(3550)	2	40-140	0-50	33
Propachlor	8080***V(3550)	2	51-125	0-30	16
Toxaphene	8080(3550)/CLP-3/90 CLP-2/88	2/62 6	41-126	0-50	170 160
Trifluralin	8080***(3550)	2	40-140	0-40	0.33
PCB-1016	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	69-107 50-130	0-21 0-50	33 80 5000
PCB-1221	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	15-178 50-130	0-20 0-50	67 80 5000
PCB-1232	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	10-215 50-130	0-20 0-50	33 80 5000
PCB-1242	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	39-150 50-130	0-20 0-50	33 80 5000
PCB-1248	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	38-158 50-130	0-20 0-50	33 80 5000
PCB-1254	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	66-122 50-130	0-23 0-50	33 160 5000
PCB-1260	8080(3550)/CLP-3/90 CLP-2/88 EPA-600/4-81-045	2/62 6 61	58-122 50-130	0-20 0-50	33 160 5000
Surrogate - Dibutylchlorendate (DBC)	8080(3550) CLP-2/88	2 6	45-131 24-150	NA NA	NA NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8080(3550) CLP-3/90	2 62	19-132 60-150	NA NA	NA NA
Surrogate - Decachlorobiphenyl (DCB)	8080(3550) CLP-3/90	2 62	47-126 60-150	NA NA	NA NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2,4-Dinitrotoluene (MS)	8090(3550)(FID) (ECD)	2	10-125 10-125	0-40 0-40	330 10
2,6-Dinitrotoluene (MS)	8090(3550)(FID) (ECD)	2	10-126 10-126	0-40 0-40	330 10
Isophorone (MS)	8090(3550)	2	10-117	0-40	330
Nitrobenzene (MS)	8090(3550)	2	10-118	0-40	330
Surrogate - 2-Fluorobiphenyl	8090(3550)(FID)	2	17-164	NA	NA
Surrogate - 2,4,5,6-Tetrachloro-m-xylene (TCMX)	8090(3550)(ECD)	2	19-132	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acenaphthene	8100(3550)	2	37-115	0-32	330
Acenaphthylene	8100(3550)	2	36-114	0-32	330
Benzo(a)pyrene	8100(3550)	2	21-125	0-45	330
Benzo(b+k)fluoranthene	8100(3550)	2	26-128	0-41	330
Benzo(g,h,i)perylene	8100(3550)	2	25-126	0-42	330
Carbazole	8100***(3550)	2	16-132	0-31	330
Chrysene+Benzo(a)anthracene	8100(3550)	2	30-127	0-42	330
Fluoranthene	8100(3550)	2	28-132	0-33	330
Fluorene	8100(3550)	2	36-117	0-33	330
Indeno(1,2,3-cd)Pyrene + Dibenzo(a,h)anthracene	8100(3550)	2	20-131	0-47	330
1-Methylnaphthalene	8100(3550)	2	20-140	0-50	330
2-Methylnaphthalene	8100(3550)	2	20-140	0-50	330
Napthalene	8100(3550)	2	29-111	0-45	330
Phenanthrene + Anthracene	8100(3550)	2	38-118	0-32	330
Pyrene	8100(3550)	2	35-123	0-32	330
Diesel	8100 (modified)	12	40-140	0-40	10000
Mineral spirits	8100 (modified)	12	40-140	0-40	10000
Surrogate - 2-Fluorobiphenyl	8100(3550)	2	17-164	NA	NA
Surrogate - Decafluorobiphenyl	8100 (modified) (3550)	12	20-150	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acephate	8141***(3550)	2	40-140	0-50	167
Alachlor	8141***(3550)	2	45-140	0-30	33
Ametryn	8141***V(3550)	2	40-140	0-50	66
Atrazine	8141***V(3550)	2	40-125	0-30	66
Azinphos methyl (MS)	8141(3550)	2	16-129	0-50	66
Bolstar (MS)	8141(3550)	2	58-156	0-40	33
Bromacil	8141***(3550)	2	40-140	0-50	66
Butylate	8141***(3550)	2	38-145	0-76	66
Carbophenothion	8141***V(3550)	2	20-150	0-40	66
Chlorpyrifos	8141(3550)	2	82-115	0-40	33
Coumaphos	8141(3550)	2	51-147	0-40	330
Cycloate	8141***(3550)	2	46-159	0-47	66
Demeton-O	8141(3550)	2	36-120	0-40	83
Demeton-S	8141(3550)	2	36-120	0-40	83
Diazinon (MS)	8141(3550)	2	36-124	0-30	33
Dichlofenthion	8141***V(3550)	2	40-140	0-50	33
Dichlorvos	8141(3550)	2	49-120	0-40	66
Dimethoate	8141(3550)	2	38-120	0-40	2000
Disulfoton (MS)	8141(3550)	2	10-134	0-93	130
Dioxathion	8141***V(3550)	2	40-140	0-50	330
EPN	8141(3550)	2	48-124	0-30	33
EPTC	8141***(3550)	2	46-154	0-55	66
Ethion	8141(3550)	2	40-138	0-40	17
Ethoprop	8141(3550)	2	58-113	0-40	17
Famphur	8141(3550)	2	10-129	0-60	330
Fenamiphos	8141***(3550)	2	40-160	0-40	17
Fensulfothion	8141(3550)	2	43-145	0-40	330
Fenthion	8141(3550)	2	10-128	0-60	33
Fonofos	8141***(3550)	2	40-160	0-40	33
Hexazinone	8141***(3550)	2	40-140	0-50	33
Isofenphos	8141***(3550)	2	40-160	0-40	17
Malathion	8141(3550)	2	60-140	0-40	33
Merphos	8141(3550)	2	50-130	0-40	33
Metalaxyl	8141***(3550)	2	40-140	0-50	33
Methamidophos	8141***(3550)	2	40-140	0-50	66
Methyl chlorpyrifos	8141***(3550)	2	40-140	0-50	33
Metolachlor	8141***(3550)	2	40-140	0-50	33
Metribuzin	8141***(3550)	2	40-140	0-50	33
Mevinphos	8141(3550)	2	34-125	0-40	66
Molinate	8141***(3550)	2	37-127	0-74	66
Monocrotophos	8141***(3550)	2	40-140	0-50	330
Naled	8141(3550)	2	54-102	0-40	330

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Norflurazon	8141***(3550)	2	40-140	0-50	33
Parathion, ethyl (MS)	8141(3550)	2	15-141	0-79	33
Parathion, methyl (MS)	8141(3550)	2	40-104	0-40	17
Pebulate	8141***(3550)	2	22-172	0-50	33
Phorate	8141(3550)	2	36-125	0-40	33
Prometon	8141***V(3550)	2	40-140	0-50	66
Prometryn	8141***V(3550)	2	40-140	0-50	66
Propazine	8141***V(3550)	2	40-140	0-50	66
Ronnel	8141(3550)	2	22-127	0-35	33
Simazine	8141***V(3550)	2	20-150	0-50	66
Stirophos (Tetrachlorvinphos)	8141(3550)	2	48-125	0-40	33
Sulfotepp (MS)	8141(3550)	2	13-171	0-65	17
Terbufos	8141***(3550)	2	40-140	0-50	17
Terbutryn	8141***V(3550)	2	40-140	0-50	330
Terbutylazine	8141***V(3550)	2	40-140	0-50	66
Thionazin	8141(3550)	2	25-160	0-60	66
Tokuthion (Prothiofos)	8141(3550)	2	44-125	0-40	33
Triadimefon	8141***(3550)	2	40-140	0-50	33
Trichloronate	8141(3550)	2	49-161	0-40	330
Vernolate	8141***(3550)	2	39-147	0-45	66
Surrogate - Ronnel	8141(3550)	2	22-127	NA	NA
Surrogate - Tokuthion	8141(3550)	2	50-125	NA	NA
Surrogate - Triphenylphosphate	8141(3550)	2	40-125	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2,4-D (MS)	8150	2	10-130	0-47	50
Dalapon	8150	2	10-170	0-40	2000
2,4-DB	8150	2	20-160	0-40	50
Dicamba	8150	2	20-160	0-40	20
Dichlorprop	8150	2	30-170	0-40	100
Dinoseb	8150	2	30-170	0-40	100
MCPA	8150	2	30-170	0-40	2000
MCPP	8150	2	30-170	0-40	2000
Picloram	8150***	2	10-150	0-40	3.3
2,4,5-T (MS)	8150	2	24-115	0-46	50
2,4,5-TP (Silvex) (MS)	8150	2	10-150	0-54	50
Surrogate - 2,4-Dichlorophenoxy butanoic acid (2,4-DB)	8150	2	20-160	NA	NA
Surrogate - 2,4-Dichlorophenyl acetic acid (DCAA)	8150	2	10-148	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acetone	8240(5030)/8260(5030) CLP-2/88; 3/90	2 6/62	29-92	0-40	50
Acetonitrile	8240B(5030)	2	78-151	0-40	200
Acrolein	8240(5030)/8260A(5030)	2	22-164	0-65	200
Acrylonitrile	8240(5030)/8260A(5030)	2	61-145	0-40	100
Benzene (MS)	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	48-150 66-142 66-142	0-27 0-21 0-21	5.0 5.0 10
Benzyl Chloride	8240B(5030)	2	50-150	0-40	100
Bromobenzene	8260A(5030)	2	50-150	0-40	10
Bromodichloromethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	35-155	0-40	5.0 10
Bromoform	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	45-169	0-40	5.0 10
Bromomethane (Methyl bromide)	8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	2/6/62	10-242	0-65	10
2-Butanone (MEK)	8240(5030)/8260(5030)/ 8260A(5030) CLP-2/88; 3/90	2 6/62	10-111	0-40	50 10
n-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
sec-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
tert-Butylbenzene	8260A(5030)	2	50-150	0-40	5.0
Carbon disulfide	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	35-244	0-65	5.0 10
Carbon tetrachloride	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	70-140	0-40	5.0 10
Chlorobenzene (MS)	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	54-138 60-133 60-133	0-33 0-21 0-21	5.0 5.0 10
2-Chloro-1,3-butadiene (Chloroprene)	8240B(5030)	2	28-256	0-65	10
Chloroethane	8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	2/6/62	44-136	0-40	10
2-Chloroethyl vinyl ether	8240(5030)/8260A(5030)	2	10-305	0-65	50
Chloroform	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	51-138	0-40	5.0 10
Chloromethane	8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	2/6/62	10-273	0-65	10
Chloropicrin	8240***(5030)	2	50-130	0-40	5.0
3-Chloropropene (Allyl chloride)	8240B(5030)	2	88-127	0-40	5.0
2-Chlorotoluene	8240***(5030)/8260A(5030)	2	48-125	0-40	5.0
4-Chlorotoluene	8260A(5030)	2	50-150	0-40	5.0
Dibromochloromethane	8240/CLP-2/88/8260A(5030) CLP-3/90	2/6 62	53-149	0-40	5.0 10

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
1,2-Dibromo-3-chloropropane (DBCP)	8240B(5030)/8260A(5030)	2	26-165	0-40	10
1,2-Dibromoethane (EDB)	8240B(5030)/8260A(5030)	2	86-153	0-40	5.0
Dibromomethane	8240B(5030)/8260A(5030)	2	50-150	0-40	5.0
1,2-Dichlorobenzene	8240(5030)/8260A(5030)	2	81-113	0-40	5.0
1,3-Dichlorobenzene	8240(5030)/8260A(5030)	2	63-130	0-40	5.0
1,4-Dichlorobenzene	8240(5030)/8260A(5030)	2	69-126	0-40	5.0
trans-1,4-Dichloro-2-butene	8240B(5030)	2	79-178	0-40	5.0
Dichlorodifluoromethane	8240B(5030)/8260A(5030)	2	50-150	0-40	5.0
1,1-Dichloroethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP - 3/0	2/6 62	59-155	0-40	5.0 10
1,2-Dichloroethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	49-155	0-40	5.0 10
cis/trans-1,2-Dichloroethene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	54-156	0-40	5.0 10
1,1-Dichloroethene (MS)	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	36-161 59-172 59-172	0-50 0-22 0-22	5.0 5.0 10
1,2-Dichloropropane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	10-210	0-65	5.0 10
1,3-Dichloropropane	8260A(5030)	2	50-150	0-40	5.0
2,2-Dichloropropane	8260A(5030)	2	50-150	0-40	5.0
1,1-Dichloropropene	8260A(5030)	2	50-150	0-40	5.0
cis-1,3-Dichloropropene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	10-227	0-65	5.0 10
trans-1,3-Dichloropropene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	17-183	0-65	5.0 10
Ethanol	8240(5030)	2	40-160	0-40	1000
Ethylbenzene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	37-162	0-40	5.0 10
Ethyl methacrylate	8240(5030)	2	47-87	0-40	5.0
Hexachlorobutadiene	8260A(5030)	2	50-150	0-40	5.0
2-Hexanone	8240(5030)/8260(5030) CLP-2/88; 3/90	2 6/62	22-86	0-40	50 10
Iodomethane	8240B(5030)/8260A(5030)	2	77-105	0-40	5.0
Isobutyl alcohol	8240B(5030)	2	63-173	0-40	1000
Isopropylbenzene	8260A(5030)	2	50-150	0-40	5.0
p-Isopropyltoluene	8260A(5030)	2	50-150	0-40	5.0
Methacrylonitrile	8240B(5030)	2	69-145	0-60	100
Methylene chloride	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	10-221	0-65	5.0 10

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Methylisothiocyanate	8240***(5030)	2	20-120	0-60	100
Methyl methacrylate	8240B(5030)	2	32-118	0-45	5.0
4-Methyl-2-pentanone (MIBK)	8240(5030)/8260A(5030) CLP-2/88; 3/90	2 6/62	64-125	0-49	50 10
Methyl t-butyl ether (MTBE)	8240***(5030)	2	40-150	0-40	50
Naphthalene	8260A(5030)	2	50-150	0-40	5.0
Pentachloroethane	8240B(5030)	2	41-165	0-50	25
Propionitrile (ethylcyanide)	8240B(5030)	2	73-227	0-65	200
n-Propylbenzene	8260A(5030)	2	50-150	0-40	5.0
Styrene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	89-101	0-40	5.0 10
1,1,1,2-Tetrachloroethane	8240B(5030)/8260A(5030)	2	50-150	0-40	5.0
1,1,2,2-Tetrachloroethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	46-157	0-40	5.0 10
Tetrachloroethene	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	64-148	0-40	5.0 10
Toluene (MS)	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	51-141 59-139 59-139	0-27 0-21 0-21	5.0 5.0 10
1,2,3-Trichlorobenzene	8260A(5030)	2	50-150	0-40	5.0
1,2,4-Trichlorobenzene	8260A(5030)	2	50-150	0-40	5.0
1,1,1-Trichloroethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	52-162	0-40	5.0 10
1,1,2-Trichloroethane	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	52-150	0-40	5.0 10
Trichloroethene (MS)	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	43-140 62-137 62-137	0-27 0-24 0-24	5.0 5.0 10.0
Trichlorofluoromethane	8240(5030)/8260A(5030)	2	17-181	0-65	5.0
1,2,3-Trichloropropane	8240(5030)/8260A(5030)	2	43-105	0-40	5.0
Trichlorotrifluoroethane	8240***(5030)	2	60-140	0-40	5.0
1,2,4-Trimethylbenzene	8260A(5030)	2	50-150	0-40	5.0
1,3,5-Trimethylbenzene	8260A(5030)	2	50-150	0-40	5.0
Vinyl acetate	8240(5030)/CLP-2/88/ 8260A(5030)	2/6	50-150	0-40	10
Vinyl chloride	8240(5030)/CLP-2/88; 3/90/ 8260A(5030)	2/6/62	10-251	0-65	10
Xylenes	8240(5030)/CLP-2/88/ 8260A(5030) CLP-3/90	2/6 62	50-150	0-40	5.0 10
Surrogate - Toluene-d8	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	68-123 81-117 84-138	NA NA NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Surrogate - p-Bromofluorobenzene	8240(5030)/8260A(5030) CLP-2/88 CLP-3/90	2 6 62	64-126 74-121 59-113	NA NA NA	NA
Surrogate - Dibromofluoromethane	8260A(5030)	2	80-120	NA	NA
Surrogate - 1,2-Dichloroethane-d4	8240(5030) CLP-2/88; 3/90	2 6/62	46-143 70-121	NA NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acenaphthene (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	51-108 31-137	0-26 0-19	330
Acenaphthylene	8270(3550)/CLP-2/88; 3/90	2/6/62	54-140	0-24	330
Acetophenone	8270(3550)	2	10-150	0-50	330
2-Acetylaminofluorene	8270(3550)	2	25-150	0-50	330
Aldrin	8270(3550)	2	10-166	0-40	330
4-Aminobiphenyl	8270(3550)	2	10-150	0-50	330
Aniline	8270(3550)	2	10-150	0-50	330
Anthracene	8270(3550)/CLP-2/88; 3/90	2/6/62	48-130	0-30	330
Aramite	8270(3550)	2	40-150	0-50	330
Benzidine	8270(3550)	2	10-200	0-100	2700
Benzo(a)anthracene	8270(3550)/CLP-2/88; 3/90	2/6/62	42-143	0-25	330
Benzoic acid	8270(3550)/CLP-2/88	2/6	10-150	0-50	1700
Benzo(b)fluoranthene	8270(3550)/CLP-2/88; 3/90	2/6/62	49-123	0-25	330
Benzo(k)fluoranthene	8270(3550)/CLP-2/88; 3/90	2/6/62	24-137	0-38	330
Benzo(g,h,i)perylene	8270(3550)/CLP-2/88; 3/90	2/6/62	10-219	0-50	330
Benzo(a)pyrene	8270(3550)/CLP-2/88; 3/90	2/6/62	44-141	0-29	330
Benzyl alcohol	8270(3550)/CLP-2/88	2/6	10-150	0-50	330
Benzyl chloride	8270B***(3550)	2	10-150	0-50	330
alpha-BHC	8270(3550)	2	10-150	0-50	330
beta-BHC	8270(3550)	2	24-149	0-40	330
delta-BHC	8270(3550)	2	10-110	0-40	330
gamma-BHC	8270(3550)	2	10-150	0-50	330
Bis(2-chloroethoxy) methane	8270(3550)/CLP-2/88; 3/90	2/6/62	33-184	0-50	330
Bis(2-chloroethyl) ether	8270(3550)/CLP-2/88; 3/90	2/6/62	12-158	0-50	330
Bis(2-chloroisopropyl) ether	8270(3550)/CLP-2/88; 3/90	2/6/62	36-166	0-50	330
Bis(2-ethylhexyl) phthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-158	0-40	330
4-Bromophenyl phenyl ether	8270(3550)/CLP-2/88; 3/90	2/6/62	53-127	0-40	330
Butyl benzyl phthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-152	0-40	330
Carbazole	8270***(3550)/CLP-3/90	2/62	10-150	0-50	330
Technical Chlordane	8270(3550)	2	10-150	0-50	1700
p-Chloroaniline	8270(3550) CLP-2/88; 3/90	2 6/62	10-150	0-50	660 330
4-Chloro-3-methylphenol (MS) (p-Chloro-m-cresol)	8270(3550) CLP-2/88; 3/90	2 6/62	38-112 26-103	0-23 0-33	330 330

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
1-Chloronaphthalene	8270(3550)	2	10-150	0-50	330
2-Chloronaphthalene	8270(3550)/CLP-2/88; 3/90	2/6/62	60-118	0-40	330
2-Chlorophenol (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	45-105 25-102	0-31 0-50	330 330
4-Chlorophenylphenyl ether	8270(3550)/CLP-2/88; 3/90	2/6/62	25-158	0-33	330
Chrysene	8270(3550)/CLP-2/88; 3/90	2/6/62	40-148	0-27	330
m-Cresol	8270(3550)	2	10-150	0-50	330
o-Cresol	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
p-Cresol	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
4,4'-DDD	8270(3550)	2	10-145	0-40	330
4,4'-DDE	8270(3550)	2	10-136	0-40	330
4,4'-DDT	8270(3550)	2	10-203	0-62	330
Diallate	8270(3550)	2	10-150	0-50	330
Dibenz(a,h)anthracene	8270(3550)/CLP-2/88; 3/90	2/6/62	40-147	0-28	330
Dibenzofuran	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
Di-n-butylphthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-118	0-50	330
1,2-Dichlorobenzene	8270(3550)/CLP-2/88; 3/90	2/6/62	32-129	0-40	330
1,3-Dichlorobenzene	8270(3550)/CLP-2/88; 3/90	2/6/62	10-172	0-42	330
1,4-Dichlorobenzene (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	46-112 28-104	0-28 0-27	330 330
3,3'-Dichlorobenzidine	8270(3550)/CLP-2/88 CLP 3/90	2/6 62	10-262	0-100	660 330
2,4-Dichlorophenol	8270(3550)/CLP-2/88; 3/90	2/6/62	39-135	0-40	330
2,6-Dichlorophenol	8270(3550)	2	10-150	0-50	330
Dieldrin	8270(3550)	2	29-136	0-40	330
Diethylphthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-114	0-40	330
p-(Dimethylamino)azobenzene	8270(3550)	2	10-150	0-50	330
7,12-Dimethylbenz(a)anthracene	8270(3550)	2	10-150	0-50	330
3,3'-Dimethylbenzidine	8270(3550)	2	10-200	0-100	1700
a,a-Dimethylphenethylamine	8270(3550)	2	10-150	0-50	1700
2,4-Dimethylphenol	8270(3550)/CLP-2/88; 3/90	2/6/62	15-151	0-22	330
Dimethylphthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-112	0-40	330
m-Dinitrobenzene	82708(3550)	2	10-150	0-50	330
4,6-Dinitro-2-methylphenol	8270(3550)/CLP-2/88 CLP 3/90	2/6 62	10-181	0-93	1700 800

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2,4-Dinitrophenol	8270(3550)/CLP-2/88 CLP 3/90	2/6 62	10-167	0-87	1700 800
2,4-Dinitrotoluene (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	35-111 28-89	0-29 0-47	330 330
2,6-Dinitrotoluene	8270(3550)/CLP-2/88; 3/90	2/6/62	50-158	0-40	330
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270(3550)	2	10-150	0-50	330
Di-n-octylphthalate	8270(3550)/CLP-2/88; 3/90	2/6/62	10-146	0-50	330
1,4-Dioxane	8270***V(3550)	2	10-150	0-50	330
Diphenylamine/ N-nitrosodiphenylamine	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
1,2-Diphenyl hydrazine	8270(3550)	2	10-150	0-50	330
Endosulfan I	8270(3550)	2	10-150	0-50	660
Endosulfan II	8270(3550)	2	10-150	0-50	660
Endosulfan sulfate	8270(3550)	2	10-107	0-50	660
Endrin	8270(3550)	2	10-150	0-50	660
Endrin aldehyde	8270(3550)	2	10-209	0-50	1700
Endrin ketone	8270/(3550)	2	10-150	0-50	1700
Ethyl methanesulfonate	8270(3550)	2	10-150	0-50	330
Fluoranthene	8270(3550)/CLP-2/88; 3/90	2/6/62	54-135	0-21	330
Fluorene	8270(3550)/CLP-2/88; 3/90	2/6/62	59-121	0-40	330
Heptachlor	8270(3550)	2	10-192	0-40	660
Heptachlor epoxide	8270(3550)	2	26-155	0-55	660
Hexachlorobenzene	8270(3550)/CLP-2/88; 3/90	2/6/62	10-152	0-40	330
Hexachlorobutadiene	8270(3550)/CLP-2/88; 3/90	2/6/62	24-116	0-40	330
Hexachlorocyclopentadiene	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
Hexachloroethane	8270(3550)/CLP-2/88; 3/90	2/6/62	40-113	0-40	330
Hexachlorophene[1]	8270(3550)	2	10-200	0-80	170,000
Hexachloropropene	8270(3550)	2	10-150	0-50	330
Indeno(1,2,3-cd)pyrene	8270(3550)/CLP-2/88; 3/90	2/6/62	18-157	0-83	330
Isophorone	8270(3550)/CLP-2/88; 3/90	2/6/62	21-196	0-60	330
Isosafrole	8270(3550)	2	10-150	0-50	330
Methapyrilene	8270(3550)	2	10-150	0-50	3300

[1] Exhibits non-reproducible chromatographic behavior.

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
3-Methylcholanthrene	8270(3550)	2	10-150	0-50	330
Methyl methanesulfonate	8270(3550)	2	10-150	0-50	330
1-Methylnaphthalene	8270B(3550)	2	10-150	0-50	330
2-Methylnaphthalene	8270(3550)/CLP-2/88; 3/90	2/6/62	10-150	0-50	330
Naphthalene	8270(3550)/CLP-2/88; 3/90	2/6/62	53-125	0-21	330
1,4-Napthoquinone	8270(3550)	2	10-150	0-50	330
1-Napthylamine	8270(3550)	2	10-150	0-50	330
2-Napthylamine	8270(3550)	2	10-150	0-50	330
Nicotine	8270(3550)	2	10-150	0-50	3300
2-Nitroaniline	8270(3550)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	1700 800
3-Nitroaniline	8270(3550)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	1700 800
4-Nitroaniline	8270(3550)/CLP-2/88 CLP-3/90	2/6 62	10-150	0-50	1700 800
Nitrobenzene	8270(3550)/CLP-2/88; 3/90	2/6/62	35-180	0-40	330
2-Nitrophenol	8270(3550)/CLP-2/88; 3/90	2/6/62	29-182	0-40	330
4-Nitrophenol (MS)	8270(3550) CLP-2/88 CLP-3/90	2 6 62	10-130 11-114 11-114	0-34 0-50 0-50	1700 1700 800
4-Nitroquinoline-1-oxide	8270(3550)	2	10-150	0-50	3300
N-Nitroso-di-n-butylamine	8270(3550)	2	10-150	0-50	330
N-Nitrosodiethylamine	8270(3550)	2	10-150	0-50	330
N-Nitrosodimethylamine	8270(3550)	2	10-150	0-50	330
N-Nitroso-di-n-propylamine (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	27-140 41-126	0-35 0-38	330 330
N-Nitrosomethylethylamine	8270(3550)	2	10-150	0-50	330
N-Nitrosomorpholine	8270(3550)	2	10-150	0-50	330
N-Nitrosopiperidine	8270(3550)	2	10-150	0-50	330
N-Nitrosopyrrolidine	8270(3550)	2	10-150	0-50	330
5-Nitro-o-toluidine	8270(3550)	2	10-150	0-50	330
PCB 1016	8270(3550)	2	10-150	0-50	17000
PCB 1221	8270(3550)	2	10-150	0-50	17000
PCB 1232	8270(3550)	2	10-150	0-50	17000
PCB 1242	8270(3550)	2	10-150	0-50	17000
PCB 1248	8270(3550)	2	10-150	0-50	17000

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
PCB 1254	8270(3550)	2	10-150	0-50	17000
PCB 1260	8270(3550)	2	10-150	0-50	17000
Pentachlorobenzene	8270(3550)	2	10-150	0-50	330
Pentachloronitrobenzene	8270(3550)	2	10-150	0-50	330
Pentachlorophenol (MS)	8270(3550) CLP-2/88 CLP-3/90	2 6 62	10-107 17-109 17-109	0-89 0-47 0-47	1700 1700 800
Phenacetin	8270(3550)	2	10-150	0-50	330
Phenanthrene	8270(3550)/CLP-2/88; 3/90	2/6/62	56-129	0-21	330
Phenol (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	37-112 26-90	0-36 0-35	330 330
p-Phenylenediamine	8270(3550)	2	10-150	0-50	1700
2-Picoline	8270(3550)	2	10-150	0-50	330
Pronamide	8270(3550)	2	10-150	0-50	330
Pyrene (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	33-139 35-142	0-25 0-36	330 330
Pyridine	8270(3550)	2	10-150	0-50	330
Safrole	8270(3550)	2	10-150	0-50	330
Strychnine	8270(3550)	2	10-150	0-50	3300
Trichlorophenols	8270(3550)	2	NA	NA	1700
1,2,4,5-Tetrachlorobenzene	8270(3550)	2	10-150	0-50	330
2,3,4,5-Tetrachlorophenol	8270***(3550)	2	10-150	0-50	1700
2,3,4,6-Tetrachlorophenol	8270(3550)	2	36-121	0-31	1700
o-Toluidine	8270(3550)	2	10-150	0-50	330
Toxaphene	8270(3550)	2	10-150	0-50	67000
1,2,4-Trichlorobenzene (MS)	8270(3550) CLP-2/88; 3/90	2 6/62	48-107 38-107	0-28 0-23	330 330
Tetrachlorophenols	8270(3550)	2	NA	NA	1700
2,4,5-Trichlorophenol	8270(3550)/CLP-2/88 CLP-3/90	2/6 62	39-123	0-27	1700 800
2,4,6-Trichlorophenol	8270(3550)/CLP-2/88; 3/90	2/6/62	37-144	0-40	330
o,o,o-Triethylphosphorothioate	8270(3550)	2	10-150	0-50	330
1,3,5-Trinitrobenzene	8270(3550)	2	10-150	0-50	330
Surrogate - Nitrobenzene-d5	8270(3550) CLP-2/88; 3/90	2 6/62	22-124 23-120	NA NA	NA NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Surrogate - 2-Fluorobiphenyl	8270(3550) CLP-2/88; 3/90	2 6/62	35-116 30-115	NA NA	NA NA
Surrogate - p-Terphenyl-d14	8270(3550) CLP-2/88; 3/90	2 6/62	29-137 18-137	NA NA	NA NA
Surrogate - Phenol-d5	8270(3550) CLP-2/88; 3/90	2 6/62	32-123 24-113	NA NA	NA NA
Surrogate - 2-Fluorophenol	8270(3550) CLP-2/88; 3/90	2 6/62	27-120 25-121	NA NA	NA NA
Surrogate - 2,4,6-Tribromophenol	8270(3550) CLP-2/88; 3/90	2 6/62	17-123 19-122	NA NA	NA NA
Surrogate - 2-Chlorophenol-d4	CLP-3/90	62	20-130	NA	NA
Surrogate - 1,2-Dichlorobenzene-d4	CLP-3/90	62	20-130	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	8280 8270 (Qual. Screen)	2 2	69-145	0-40	0.50 330
Polychlorinated Dibenzo-p-dioxins and Dibenzofurans classes					
tetra-CDD	8280	2	69-145	0-40	0.50
tetra-CDF	8280	2	59-142	0-40	0.50
penta-CDD	8280	2	41-203	0-40	0.50
penta-CDF	8280	2	55-146	0-40	0.50
hexa-CDD	8280	2	45-174	0-53	0.50
hexa-CDF	8280	2	50-154	0-46	0.50
hepta-CDD	8280	2	20-170	0-50	1.0
hepta-CDF	8280	2	20-170	0-50	1.0
octa-CDD	8280	2	20-170	0-50	1.0
octa-CDF	8280	2	20-170	0-50	1.0
Internal Standard - $^{13}C_{12}$-2,3,7,8-TCDD	8280	2	40-120	NA	NA
Internal Standard - $^{13}C_{12}$-OCDD	8280	2	40-120	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Aminocarb	632(3550)***	13/2	50-150	0-50	20
Barban	632(3550)***V	13/2	50-150	0-50	20
Bromacil	632(3550)***	13/2	50-150	0-50	40
Carbaryl (MS)	632(3550)***V	13/2	50-150	0-50	50
Carbofuran	632(3550)***V	13/2	50-150	0-50	50
Chlorpropham	632(3550)***V	13/2	50-150	0-50	20
Diuron (MS)	632(3550)***V	13/2	50-150	0-50	5.0
Fenuron	632(3550)***V	13/2	50-150	0-50	10
Fluometuron	632(3550)***V	13/2	50-150	0-50	10
Linuron	632(3550)***V	13/2	50-150	0-50	5.0
Methiocarb	632(3550)***V	13/2	50-150	0-50	50
Methomyl	632(3550)***V	13/2	50-150	0-50	200
Monuron	632(3550)***V	13/2	50-150	0-50	5.0
Neburon	632(3550)***V	13/2	50-150	0-50	5.0
Oxamyl	632(3550)***V	13/2	50-150	0-50	50
Propachlor	632(3550)***	13/2	25-148	NA	NA
Propham	632(3550)***V	13/2	50-150	0-50	50
Propoxur	632(3550)***V	13/2	50-150	0-50	50
Siduron	632(3550)***V	13/2	50-150	0-50	20
Swep	632(3550)***	13/2	50-150	0-50	20

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
2,4-D	644(3550)***	64/2	40-150	0-50	67
2,4-DB	644(3550)***	64/2	40-150	0-50	33
Dicamba	644(3550)***	64/2	40-150	0-50	17
Picloram	644(3550)***	64/2	40-150	0-50	17

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acenaphthene (MS)	8310	2	11-144	0-35	20
Acenaphthylene	8310	2	10-139	0-40	20
Acridine	8310***	2	10-200	0-40	10
Anthracene	8310	2	10-126	0-40	4.0
Benzo(a)anthracene	8310	2	12-135	0-40	4.0
Benzo(b)fluoranthene	8310	2	10-150	0-40	4.0
Benzo(k)fluoranthene	8310	2	10-159	0-40	10
Benzonitrile	8310***	2	10-200	0-40	200
Benzo(g,h,i)perylene	8310	2	10-120	0-40	10
Benzo(a)pyrene	8310	2	10-128	0-40	4.0
7,8-Benzoquinoline	8310***	2	10-200	0-40	20
Carbazole	8310***	2	10-150	0-40	20
Chrysene (MS)	8310	2	10-199	0-40	4.0
Dibenzo(a,h)anthracene	8310	2	10-110	0-40	20
2,4-Dimethylquinoline	8310***	2	10-200	0-40	400
Fluoranthene	8310	2	56-136	0-28	10
Fluorene (MS)	8310	2	10-142	0-40	10
Indeno(1,2,3-cd)pyrene	8310	2	10-116	0-40	10
1-Methylnaphthalene	8310	2	10-125	0-40	20
2-Methylnaphthalene	8310	2	10-125	0-40	20
8-Methylquinoline	8310***	2	10-200	0-40	100
Naphthalene (MS)	8310	2	31-159	0-34	20
Phenanthrene	8310	2	10-155	0-40	4.0
Pyrene (MS)	8310	2	49-156	0-28	10
Quinaldine	8310***	2	10-200	0-40	100
Quinoline	8310***	2	10-200	0-40	800
Surrogate - 2-Fluorobiphenyl	8310	2	60-140	NA	NA
Surrogate - 4-Terphenyl-d4	8310	2	60-140	NA	NA

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
Acetaldehyde	8315	2	30-110	0-40	2000
Formaldehyde	8315	2	50-155	0-40	100
Aldicarb (Temik) (MS)	8318	2	44-114	0-50	20
Aldicarb sulfone	8318	2	58-118	0-50	50
Aldicarb sulfoxide	8318***	2	33-143	0-50	50
Carbofuran (Furadan) (MS)	8318	2	53-123	0-50	30
Carbaryl (Sevin)	8318	2	56-126	0-50	50
Dioxacarb	8318	2	55-125	0-50	100
Ethylene thiourea	8318***	2	30-140	0-50	330
3-Hydroxycarbofuran	8318	2	60-120	0-50	20
Methiocarb (Mesurol)	8318	2	52-122	0-50	50
Methomyl (Lannate)	8318	2	54-114	0-50	20
Oxamyl (MS)	8318***	2	45-161	0-50	50
Promecarb	8318	2	44-120	0-50	20
Propoxur (Baygon)	8318	2	46-116	0-50	20

TABLE 5.2. LABORATORY ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR SOLIDS AND SEMISOLIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (ug/kg)
1,3-Dinitrobenzene (MS)	8330	2	54-166	0-30	100
2,4-Dinitrotoluene (MS)	8330	2	60-140	0-30	100
2,6-Dinitrotoluene	8330	2	60-140	0-30	100
Diphenylamine	8330***v	2	65-140	0-30	100
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	8330	2	54-166	0-30	50
Methyl-2,4,6-trinitro-phenylnitramine (Tetryl)	8330	2	41-165	0-30	200
Nitrobenzene	8330	2	52-152	0-30	50
Nitroglycerin	8330***v	2	46-190	0-50	1000
n-Nitrosodiphenylamine	8330***v	2	55-121	0-30	100
2-Nitrotoluene (MS)	8330	2	50-144	0-30	200
3-Nitrotoluene	8330	2	55-165	0-30	100
4-Nitrotoluene	8330	2	54-166	0-30	200
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	8330	2	54-162	0-30	500
1,3,5-Trinitrobenzene	8330	2	50-150	0-30	100
2,4,6-Trinitrotoluene	8330	2	50-170	0-30	200
Surrogate - 2-Fluorobiphenyl	8330	2	40-140	NA	NA

TABLE 5-3. FIELD ANALYTICAL METHODS, QA OBJECTIVES AND PRACTICAL QUANTITATION LIMITS (PQL) FOR WATER AND OTHER LIQUIDS

PARAMETER	METHOD (Prep)	REFERENCE	ACCURACY* (% Rec)	PRECISION* (% RPD)	PQL** (mg/L)
Chlorine, residual	330.5	3	NA	0-40	1.0
Hydrogen ion (pH)	150.1/9040	3/2	85-115	0-15	NA
Oxygen (dissolved)	360.1	3	NA	0-30	0.20
Salinity	210	4	NA	NA	100
Specific conductance	120.1/9050	3/2	90-110	0-10	5.0 umho/cm
Temperature	170.1	3	NA	0-10	NA
Turbidity	180.1/214A	3/4	60-140	0-30	0.10 NTU
Water level	EPA	12	NA	0-5	0.10 ft.

REFERENCES AND NOTES FOR TABLES 5.1, 5.2, AND 5.3

* Accuracy data are presented as recoveries for spikes, surrogates, or lab control standards (LCS). For routine analysis of organics, percent recoveries are evaluated only on the CLP or lab selected matrix spike/LCS compounds. The routine organic matrix spiking/LCS compounds are designated by an (MS) following the parameter name. Not all of the matrix spike or surrogate compounds listed in these tables are used with a given set of samples. Precision data are presented as relative percent difference (%RPD). Since reportable levels (above PQL) for most of the organic parameters may not be detected in all environmental samples, precision is usually evaluated on duplicate matrix spike or LCS data.

Accuracy and precision control limits are primarily derived from in-house laboratory data. For inorganic parameters, accuracy and precision control limits that have been generated from historical data have been rounded to the nearest "5". In some cases, published limits may be used in lieu of in-house limits because insufficient in-house data are available to calculate limits. In cases where insufficient data are available to generate in-house limits, and no EPA-approved method limits exist, limits are estimated based on available data. In-house data will be generated for all parameters by the next annual revision of this plan.

** PQL - Practical Quantitation Limits - These are the normal reporting limits for routine environmental samples. In all cases, PQLs are higher than laboratory established Method Detection Limits (MDL). These PQLs are taken from SW-846 (Third Edition) or derived from in-house data on routine environmental samples. If samples are highly contaminated or contain interfering substances, PQLs may be elevated by a dilution factor.

*** This compound is not included in EPA's list of compounds for this method. However, Savannah Laboratories has verified (validated) that this coupound can be analyzed by this method and will report data for this compound if specifically requested by the client.

***V Method validation data for this compound are included in Appendix A.

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14. *Determination of Organophosphorus Pesticides in Industrial and Municipal Wastewater: EPA Method 622*; January, 1982.

15. *Determination of Thiocarbamate Pesticides in Industrial and Municipal Wastewaters by Gas Chromatography: EPA Method 634*; January, 1982.

16. *Determination of Bensulide in Industrial and Municipal Wastewaters by Liquid Chromatography: EPA Method 636.*

17. *Determination of Mercaptobenzothiazole in Wastewaters by Liquid Chromatography: EPA Method 640.*

18. *Determination of Hexachlorophene and Dichlorophen in Industrial and Municipal Wastewaters: EPA Method 604.1.*

19. *Determination of Rotenone in Industrial and Municipal Wastewaters by Liquid Chromatography: EPA Method 635.*

20. *Determination of Bendiocarb in Industrial and Municipal Wastewaters by Liquid Chromatography: EPA Method 639.*

21. *Determination of Oryzalin in Industrial and Municipal Wastewaters: EPA Method 638.*

22. *Determination of MBTS and TCMTB in Industrial and Municipal Wastewater by Liquid Chromatography: EPA Method 637.*

23. *Determination of Diphenylamine in Industrial and Municipal Wastewater by Gas Chromatography: EPA Method 620.*

24. *C, H, and O Compounds: EPA Method 616.*

25. *Determination of Cyanazine in Industrial and Municipal Wastewater: EPA Method 629;* January, 1982.

26. *Determination of Organohalide Pesticides and PCBs in Industrial and Municipal Wastewater: EPA Method 617;* January, 1982.

27. *Determination of Volatile Pesticides in Municipal and Industrial Wastewater by Gas Chromatography: EPA Method 618.*

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59. *Analysis of Bentazon in Wastewater by Liquid Chromatography: EPA Method 643.*

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6.0 SAMPLING PROCEDURES

When Savannah Laboratories has field sampling responsibilities, an experienced field sampling crew will be sent to the site for sample collection and delivery of samples to the laboratory. Each crew will be supervised by a highly qualified field sampling manager who is trained according to EPA and DER protocol for groundwater and other environmental sampling. On past projects, these managers have had their field sampling techniques critiqued by FDER personnel (Bureau of Groundwater Protection), Georgia EPD personnel, and EPA Region IV field coordinators.

The DER Interim Field Activity SOPs have been adopted by Savannah Laboratories. The notarized statement of intent is found at the end of this section.

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 (VOCs)	Drinking water, groundwater, surface water, wastewater, soils, sediment, and tissues
Semivolatile Organics	Drinking water, groundwater, surface water, wastewater, soils, sediment, and tissues
Pesticides/Herbicides/PCBs	Drinking water, groundwater, surface water, wastewater, soils, sediment, and tissues
Metals (total and/or dissolved)	Drinking water, groundwater, surface water, wastewater, soils, sediment, and tissues
Coliform (total/fecal)	Drinking water, groundwater, surface water, wastewater, soils, sediment and tissues
Cyanide/Sulfide	Drinking water, groundwater, surface water, wastewater, soils and sediment
TRPH, TPH(1)	Drinking water, groundwater, surface water, wastewater, soils and sediment
Nutrients(2)	Drinking water, groundwater, surface water, wastewater, soils and sediment
General: pH, specific conductance, temperature, turbidity, TSS, TDS, TOC, DO, COD, BOD	Drinking water, groundwater, surface water, wastewater, soils and sediment

Footnotes:
(1) TRPH = Total Recoverable Petroleum Hydrocarbons
TPH = Total Petroleum Hydrocarbons

(2) Nutrients = Nitrogen, Phosphorus Series; Chloride, Sulfate

6.2 Sampling Equipment

Sampling equipment conforms to construction and usage conditions detailed in the DER *General Sampling Protocols* SOP, Revised October 29, 1991. A specific equipment listing is provided at the beginning of each subsection of "Sampling Procedures" (Section 6.4).

Following is a list of other routinely used equipment.

Item	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 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	Equipment decontamination
Analyte-free water contained in contaminant-free glass or plastic bottles	Equipment decontamination
Isopropyl alcohol (nanograde) contained in contaminant-free glass or plastic bottles	Equipment decontamination
10% Nitric acid (metals grade) contained in contaminant-free glass bottles	Equipment decontamination (except for stainless steel equipment)
Glass or plastic jugs	Transport of cleaning wastes
Sample preservation reagents contained in dispenser bottles or reagent bottles	Sample preservation
Field carrier (covered, divided tray or box)	Transport of preservation reagents
pH paper	Field-check of sample preservation
Disposable pipettes	Addition of preservation reagents
Standard buffer solutions	Calibration of field pH meter
Standard KCl solution	Calibration check of field conductivity meter
Disposable unpowdered latex gloves	Contamination control

6.3 Decontamination and Cleaning Procedures

Sample containers will be obtained or cleaned by option 2a or 2b in the DER *SOP for Cleaning and Decontaminating Sampling Equipment*, revised October 29, 1991.

Sampling equipment will be cleaned and decontaminated according to protocols outlined in the DER *SOP for Cleaning and Decontaminating Sampling Equipment*, revised October 29, 1991.

6.4 Sampling Protocols

6.4.1 General Considerations

All sampling will be performed according to the general protocols outlined in the DER *General Sampling Protocols* SOP, Section I, revised October 29, 1991.

6.4.2 Wastewater Sampling

Wastewater samples will be collected according to the DER SOPs *Sampling Procedures for Wastewater and Surface Water*, revised October 25, 1991 and *General Sampling Protocols*, Section III.F, revised October 29, 1991.

Below is a list of equipment available for wastewater sampling and the parameters which may be sampled.

Type	Construction Materials	Use	Permissible Parameters
Autosampler[1]	Silicon tubing, plastic collection vessel	Composite samples	Metals, non-metallic inorganics, nutrients, demands, radiological
	Teflon tubing, glass collection vessel	Composite samples	Organics, non-metallic inorganics, nutrients, demands, radiological
Kemmerer	SS or glass, acrylic stopper	Grab @ specific depth	All inorganics
Bucket, beaker, unpreserved sample bottle, dipper[2]	SS, glass or Teflon Plastic	Discrete grab Discrete grab	All All inorganics

[1] Three automatic samplers are available among the five divisions. Refrigeration capability is available.

[2] Device is lowered into stream via decontaminated lines or rods.

6.4.3 Surface Water Sampling

Surface water samples will be collected according to the DER SOPs *Sampling Procedures for Wastewater and Surface Water*, revised October 25, 1991 and *General Sampling Protocols*, Section III.A revised October 29, 1991 and the *EPA Region IV Standard Operating Procedures and Quality Assurance Manual*, Section 4.8.3, revised February 1991. Below is a list of equipment available for surface water sampling and the parameters which may be sampled.

Type	Material	Use	Permissible Parameters
DO Dunker	SS or glass	discrete grab, depth *composite*	All
Kemmerer	SS or glass acrylic stopper	grab @ specific depth	Inorganics
Beaker	SS or glass	discrete grab[1]	All
Bailer	SS or Teflon	grab @ specific depth[2]	All
Peristaltic pump with weighted tubing	SS or Teflon silicon tubing	grab at specific depth	Inorganics

Footnotes:

1 Beaker is inverted, submerged, then turned over to fill.
2 Depth limited by length of bailer.

6.4.4 Groundwater Sampling

Groundwater samples will be collected according to the DER SOP *Groundwater Sampling Procedures*, revised October 28, 1991.

Below is a listing of pump types and tubing materials used by Savannah Laboratories. Equipment may be interchanged among the five laboratory locations according to need.

Pump Type	Units	Use	Parameters	Description
Positive displacement				
Submersible	4	Purging	All	1
Bladder	2	Purging, sampling	Inorganics	2
Suction lift				
Centrifugal	4	Purging	All	3
Peristaltic	4	Field filtration, purging	Metals	4

1. Submersible pump housing, internal surfaces, and upper fitting for tubing are stainless steel. A 4' to 8' length of Teflon tubing is attached to the stainless steel fitting. The remainder of the discharge tubing is garden hose. The suspension cable is 3' to 4' of stainless steel or Teflon-coated stainless steel, attached to a nylon rope. A check valve at the upper stainless steel/Teflon junction prevents backflow of purge water into the well.

2. The bladder pump housing is Lexan plastic and the tubing is polyethylene. This pump is used for purging only in the case of 2" diameter deep wells. After bladder pump purging, one well volume is purged with an appropriate bailer prior to sampling.

3. Centrifugal surface pumps utilize 4' joinable sections of PVC pipe with a 3' to 4' Teflon tail piece. Only the Teflon portion contacts

the formation water. A foot valve prevents backflow of purge water into the well.

4. Peristaltic pumps are routinely used only for in-line field filtration of metals samples. Tubing may be medical grade silicone, Tygon, or polypropylene flexible tubing. On rare occasions, a small diameter shallow well may be purged using this pump. In this case, a Teflon tailpipe arrangement would be used, with only the Teflon contacting the formation water. To prevent backflow of purge water, the tubing is withdrawn from the well while the pump is running.

Below is a listing of bailer materials available for groundwater sampling.

Bailer Material	Permissible Parameters	Non-permissible Parameters
PVC	Metals; non-metallic inorganics: nutrients, demands; biological	Organics, volatile or extractable
Stainless Steel	All parameters	None
Teflon	All parameters	None
Clear PVC or acrylic	Free product thickness	

6.4.5 Potable Water Sampling

Potable water samples will be collected according to the DER SOP *Groundwater Sampling Procedures*, revised October 28, 1991, and the *EPA Region IV SOP and QAM*, Section 4.10.2, revised February 1991. Equipment available for potable water sampling is listed under groundwater sampling (6.4.4).

6.4.6 Sampling for Soil and Sediment

Soil samples will be collected according to the DER SOPs *Soil Sampling Procedures*, Revised October 28, 1991, and *General Sampling Protocols*, Section III.D, revised October 28, 1991.

Sediments will be collected according to the DER SOP *General Sampling Protocols*, Section III.B , revised October 29, 1991 and the *EPA Region IV SOP and QAM*, Section 4.8.3.3, revised February 1991.

Below is a list of soil and sediment sampling devices used by Savannah Laboratories.

Type	Material	Use	Permissible Parameters
Trowel, spoon	SS Teflon-coated SS	sampling	All
Shovel	Aluminum SS	sampling sampling	Demands, nutrients Metals, organics
Corer	SS PVC pipe	sampling sampling	All Inorganics
Hand auger	SS	sampling	All
Ponar grab sampler	SS	sediment sampling	All
Mixing tray	Metal, foil-lined glass Plastic	homogenizing, compositing homogenizing compositing	Extractable organics Inorganics

6.4.7 Sludge Sampling

Domestic waste residual sludges will be collected according to the *EPA POTW Sludge Sampling and Analysis Guidance Document*, revised August 1989.

Sludges from solid and hazardous waste sites will be collected according to the *EPA Region IV SOP and QAM*, Sections 4.12.3 and 4.12.5, revised February 1991.

6.4.8 Liquid Hazardous Waste

Hazardous wastes, drums, and tanks of unknown origins and concentrations are typically not sampled by Savannah Laboratories because the sample operations are inherently dangerous to the personnel involved. Drums and tanks are occasionally sampled when the primary constituents are known and do not present a toxic, fire, or explosion hazard.

If drum tank or pit sampling is undertaken, it is performed according to the *EPA Region IV SOP and QAM*, Sections 4.12.3 and 4.12.4, Revised February 1991.

6.4.9 Biological Specimens and Tissues

Fish tissues are prepared for analysis according to DER QA Guidance Document #90-01, revised August 15, 1990, using properly decontaminated stainless steel implements.

Other biological specimens are obtained and prepared in a manner which will preclude contamination from implements or other specimens.

6.5 Special Sampling Considerations

Details of sampling such as compositing, duplicate or split samples, filtration, and special procedures for volatiles, oil and grease, and microbiological samples will be observed as outlined in the DER SOP *General Sampling Protocols*, Section IV.A through .E, revised October 29, 1991.

6.6 Sample Preservation and Holding Times

Sample preservation, holding times, required sample volumes, and container types are listed in Table 6.1 for water samples and Table 6.2 for soil and sediment samples. These tables are taken from *40 CFR Part 136*, Table II for water, and DER *QAS Guidance Document # 90-02* for soil. Table 6.3 lists the approved procedures, preservation, and holding times for water for parameters not listed on Table 6.1.

6.7 Sample Preservation Protocols

Sample preservation will be accomplished by option V.A.1 of the DER SOP *General Sampling Protocols*, revised October 29, 1991. The efficacy of the preservation will be checked at the laboratory immediately upon receipt, for all preserved samples except volatiles. Necessary adjustments will be made and recorded in a laboratory logbook. The pH of volatiles samples will be checked upon analysis, unless the client requests a sacrificial vial to be checked upon receipt.

Special preservation protocols will be followed as outlined in the DER SOP *General Sampling Protocols*, Section V.B.2.a, b, and c, revised October 29, 1991.

6.8 Sample Dispatch and Recordkeeping

Samples will be labeled, packed, and shipped according to the DER SOP *General Sampling Protocols*, Section V.C, revised October 29, 1991. Examples of a sample label, monitoring well sampling log, and chain-of-custody forms are present in Figures 6.1, 6.2, and 6.3.

See Section 7 for sample custody procedures.

6.9 Field Reagent and Standard Storage

All reagents, standards, and solvents used in field activities are stored and transported as listed in Table 6.4 and according to the DER SOP *General Sampling Protocols*, Section VI.A, revised October 29, 1991.

TABLE 6.1

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Bacterial Tests:			
Coliform, fecal and total	250-mL P	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	6 hours
Fecal streptococci	250-mL P	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	1-L P	Cool, 4°C	48 hours
Bromide	100-mL P	None required	28 days
Biochemical oxygen demand, carbonaceous	1-L P	Cool, 4°C	48 hours
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 amber G	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
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	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	125-mL amber G	Cool, 4°C, HCl or H_2SO_4 to pH < 2	28 days

TABLE 6.1

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Orthophosphate	100-mL P	Filter immediately, cool, 4°C	48 hours
Oxygen, dissolved (Probe)	G bottle & top	None required	Analyze immediately
Winkler	G bottle & top	Fix on site and store in dark	8 hours
Phosphorus (elemental)	G	Cool, 4°C	48 hours
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)	500-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, add zinc acetate plus sodium hydroxide to pH > 9	7 days
Sulfite	100-mL P	None required	Analyze immediately
Surfactants	1-L 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:[6]			
Purgeable halocarbons	4 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	4 X 40-mL G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], HCl to pH < 2[9] or 0.06% ascorbic acid[5]	14 days
Acrolein and acrylonitrile	1-L 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
Phenols[11]	1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days

TABLE 6.1

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES FOR WATER SAMPLES

PARAMETER	SAMPLE CONTAINER[1]	SAMPLE PRESERVATION[2,3]	RECOMMENDED HOLDING TIMES[4]
Benzidines[11,12]	1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days[13]
Phthalate esters[11]	1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
Nitrosamines[11,14]	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
Pesticides[11]	1-L G, Teflon-lined cap	Cool, 4°C, pH 5-9[15]	Extraction-7 days Analysis-40 days
PCBs[11]	1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
Nitroaromatics and isophorone[11]	1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days
Polynuclear aromatic hydrocarbons[11]	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
Haloethers[11]	1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-7 days Analysis-40 days
Chlorinated hydrocarbons[11]	1-L G, Teflon-lined cap	Cool, 4°C	Extraction-7 days Analysis-40 days
TCDD[11]	1-L G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Extraction-30 days Analysis-45 days of collection
Total organic halogens	500-mL amber G, Teflon-lined cap	Cool, 4°C H_2SO_4 to pH < 2	28 days
Total petroleum hydrocarbons	1-L 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	1-L G	Cool, 4°C, H_2SO_4 to pH < 2	28 days
Radiological Tests:			
Alpha, beta and radium	P,G	HNO_3 to pH < 2	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 chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, chemical 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 analysis and still be considered valid.

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% $Na_2S_2O_3$.

TABLE 6.2

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

PARAMETER	SAMPLE CONTAINER	SAMPLE PRESERVATION	RECOMMENDED HOLDING TIMES
Cyanide	500-mL P	Cool to 4°C	14 days
Sulfide	500-mL P	Cool to 4°C	7 days
Oil & grease, Total petroleum hydrocarbons	500-mL G	Cool to 4°C	28 days
Nutrients/TOC	500-mL P	Cool to 4°C	28 days
Metals (except Mercury)	500-mL P	None required	6 months
Semivolatile organics, pesticides, etc.	500-mL G with Teflon-lined lid	Dark, cool to 4°C	Extraction-14 days Analysis-within 40 days of extraction
Volatile organics	125-mL amber G with Teflon-lined lid	Dark, cool to 4°C	14 days
Mercury	500-mL P	Cool to 4°C	28 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]
Bromine	DPD Colorimetric[5]	SM 408E	P, G	None required	Analyze immediately
Bromates	Ion Chromatography	EPA-SOP (300.0)[6]	P, G	Cool, 4° C	30 days
Chlorophylls	Spectrophotometric	SM 1002G	P, G[7]	14 d in dark	30 days[7]
Corrosivity	Calculated ($CaCO_3$ Stability, Langelier Index)	SM 203 ASTM 0513-82	P, G	Cool, 4° C[8]	7 days[8]
Odor	Human Panel	SM 207	G only	Cool, 4° C	6 hours
Salinity	Electrometric[9] Hydrometric Argentometric	SM 210A	G, wax seal	Analyze immediately or use wax seal	30 days[9]
Taste	Human Panel	SM 211 A,B ASTM 1292-86	G only	Cool, 4° C	24 hours
Transparency	Irradiometric[10]	17-3.021 FAC	----	----	Analyze in-situ
Un-ionized Ammonia	Calculated[11]	DER-SOP[12]	P, G	Cool, 4° C $Na_2S_2O_3$[11]	8 hours unpreserved 28 days preserved[11]
Organic Pesticides[13]	GC and HPLC	EPA (600-Series)[13]	[14]	[14]	[14]

** Source: 17-160.700, F.A.C.

1. SM XXX - procedures from "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WPCF, 16th Edition, 1985.

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. The approved procedure is for residual chlorine. However, in the absence of chlorine, the DPD colorimetric procedure can be adapted to measure bromine content of the sample. In such case, the validity of this assumption must be verified by using another procedure for chlorine which is not affected by the presence of bromine (i.e., negligible interference).

6. "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 45268 (copy available from the DER QA Section).

7. Collect sample in opaque bottles and process under reduced light. Samples on filter 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.

8. 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 solids.

9. The eletrometric and hydrometric analytical methods are suited for field use. 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.

10. 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.

11. The results of the measurements of pH, temperature, salinity (if applicable) and the ammonium ion concentration in the sample are used to calculate the concentration of ammonia in the unionized state. Temperature, pH and salinity must be measured on site at the time of sample collection. Laboratory analysis of the ammonium ion concentration should be conducted within eight hours of sample collection. If prompt analysis of ammonia is impossible, preserve samples with H_2SO_4 to pH between 1.5 and 2. Acid-preserved samples, stored at 4° C, may be held up to 28 days for ammonia determination. Sodium thiosulfate should only be used if fresh samples contain residual chlorine.

12. DER Central Analytical Laboratory, Tallahassee, FL, Revision No. 1, October 3, 1983. The 1983 draft is available from the DER QA Section.

13. 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 10 of 40 CFR Part 136 (July 1989).

14. Container, preservation and holding time as specified in each individual method shall be followed.

FIGURE 6.1

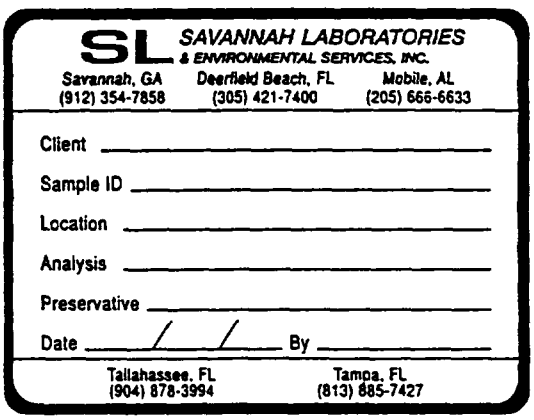

SL
SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.
Savannah, GA (912) 354-7858
Deerfield Beach, FL (305) 421-7400
Mobile, AL (205) 666-6633
Client
Sample ID
Location
Analysis
Preservative
Date / / By
Tallahassee, FL (904) 878-3994
Tampa, FL (813) 885-7427

FIGURE 6.2

MONITORING WELL SAMPLING LOG

CLIENT/FACILITY: _____

WELL ID; _____

WELL LOCKED: ____ YES ____ NO BAILER PRESENT: ____ YES ____ NO

* WATER LEVEL: _____ (0.01 ft) WELL DEPTH: _____ (ft)

WATER EVACUATION: _____ (liters) YIELD: _____ (L/H)

FLOATERS: ____ YES ____ NO ____ (ft) SINKERS: ____ YES ____ NO

** pH: _____ (units) CALIBRATED: _____/_____ (Date/Time)

** SC: _____ (umhos/cm) CALIBRATED: _____/_____ (Date/Time)

TEMP: _____ (oC) CALIBRATED: _____/_____ (Date/Time)

BOTTLES LABELED: ____ YES ____ NO

SAMPLING COMPLETED: _____/_____ (Date/Time)

BAILER RETURNED & WELL LOCKED: ____ YES ____ NO

CUSTODY FORM COMPLETED: ____ YES ____ NO

SAMPLES ICED: ____ YES ____ NO

COOLERS SEALED: ____ YES ____ NO SEAL NO: _____

CARRIER: _____ DATE/TIME: _____

COLLECTOR: _____ DATE/TIME: _____
Signature

NOTES: _____

_____

_____

_____

_____

* Fisher Electronic WL Meter
** Corning Checkmate 90

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) 878-9504
☐	414 SW 12th Avenue, Deerfield Beach, FL 33442	Phone (305) 421-7400	Fax (305) 421-2584
☐	900 Lakeside Drive, Mobile, AL 36693	Phone (205) 666-6633	Fax (205) 666-6696
☐	6712 Benjamin Road, Suite 100, Tampa,FL 33634	Phone (813) 885-7427	Fax (813) 885-7049

P. O. NUMBER	PROJECT NUMBER	PROJECT NAME	MATRIX TYPE	REQUIRED ANALYSES	PAGE	OF
CLIENT NAME		TELEPHONE/FAX NO.			☐ STANDARD TAT	
CLIENT ADDRESS		CITY, STATE, ZIP CODE			☐ EXPEDITED TAT *	
SAMPLER(S) NAME		CLIENT PROJECT MANAGER			REPORT DUE DATE _____	
					* SUBJECT TO RUSH FEES	

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATON	NUMBER OF CONTAINERS SUBMITTED	REMARKS

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

LABORATORY USE ONLY

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

FIGURE 6.3

TABLE 6.4

FIELD REAGENT STORAGE AND TRANSPORT

CHEMICAL	METHOD OF STORAGE	METHOD OF TRANSPORT
Nitric Acid	Stored in original container or dedicated repipet dispenser in vented acid storage cabinet; segregated from other acids.	Transferred to dedicated reagent bottle or repipet dispenser; transported in divided box containing only acids (each acid in separate compartment).
Hydrochloric acid	See above	See above
Sulfuric acid	See above	See above
Sodium hydroxide	Dry flake or pellet form stored in original container in reagent cabinet. solutions stored in separate cabinet.	Dry forms transported in original or dedicated transfer container. Solutions transferred to dedicated plastic container and transported segregated from acids.
Zinc acetate solution	Stored in dedicated repipet dispenser in reagent storage cabinet.	Transported in compartmentalized box in capped repipet dispenser.
EDTA Solution	Stored in dedicated repipet dispenser in reagent storage cabinet.	Transported in compartmentalized box in capped repipet dispenser.
Isopropanol	Stored in original container in vented solvent storage cabinet in volatile analysis/custody area.	Transported in bottle jacket in original container.
pH and conductivity standards	Stored in reagent storage cabinet in air conditioned laboratory.	Transported in dedicated plastic containers.

6.10 Field Waste Disposal

Field-generated wastes will be handled according to the DER SOP *General Sampling Protocols*, Section VI.B. Wastes transported back to the laboratory for disposal will be handled in accordance with section 8.4 of this document.

6.11 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 reporting limits.

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

Laboratory deionized with 0.2 micron polishing filler: microbiology

Private well water: any analysis for which acceptability is demonstrated

Purchased deionized: any analysis for which acceptability is demonstrated

Purchased organic-free: VOCs, extractable organics, and any analysis for which acceptability is demonstrated

Analyte-free water will be 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.

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
Quality Assurance Section

STANDARD OPERATING PROCEDURES TO BE USED AND INCORPORATED
BY REFERENCE IN THE
COMPREHENSIVE QA PLAN

Name of Organization:

Savannah Laboratories & Environmental Services, Inc.

Address: 5102 LaRoche Avenue
Savannah, GA 31404

Comorehensive QA Plan Number: 890142G

Check the specific protocols that your organization will be using while collecting environmental samples. Note: check only documents and protocols as listed in the "DER Quality Assurance Interim Standard Operating Procedures" dated October 29, 1991 for which your organization has current equipment capabilities.

SAMPLING PROTOCOLS

X	General Sampling	X	Soil
X	Wastewater	X	Sediment
X	Surface Water	X	Domestic waste Sludges
X	Potable Water	X	Sludges - Solid and Hazardous Waste
X	Groundwater	X	Liquid Hazardous Wastes
X	Fish Tissue		

CALIBRATIONS

X	pH	X	Dissolved Oxygen
X	Specific Conductance		OVAs
X	Temperature	X	Residual Chlorine
X	Automatic WW Samplers		

DECONTAMINATION AND CLEANING PROTOCOLS

- X Container Cleaning protocols
- X Sampling Equipment (includes teflon, stainless steel and other construction materials)
- X Lanyards and Well Sounders or Tapes used to Measure Groundwater Level
- X Wastewater automatic samplers
- X Teflon Tubing
- X Non-teflon tubing
- X Heavily contaminated equipment
- X Field Meters, Flow-Meters and Other Field Instruments
- ___ Augers, soil boring and drilling rigs (not used for collecting samples)
- X Pumps used only for purging
- X Pumps used for purging and sampling
- X Field filtration equipment
- X Analyte-free water containers

PRESERVATION, HOLDING TIMES AND CONTAINERS TYPES

- X Aqueous samples - 40 CFR Part 136, Table II
- X Aqueous samples - 17-160.700, F.A.C., Table 4
- X Solid samples - 17-160.700, F.A.C., Table 5

QUALITY CONTROL REQUIREMENTS AND PROTOCOLS

- ___ Minimum Field quality control requirements
- ___ QA Targets for Field Protocols

STATEMENT OF INTENT TO COMPLY WITH THE STANDARD OPERATING PROCEDURES MANUALS

Before me, the undersigned authority, personally appeared Janette D. Long (name) Vice-President (title) Savannah Laboratories (organization), and Alan C. Bailey (name) Quality Assurance Manager (title) Savannah Laboratories (organization), who were sworn and said that they have obtained copies of all documents pertinent to the protocols that they have identified on the opposite side of this statement and that these documents shall be incorporated by reference into the Comprehensive Quality Assurance Plan attached hereto or identified herein. They further state that the organization of which they are officials or officers as identified herein has the equipment and capability to perform the protocols specified by these documents and will require that said protocols shall be followed when performing the specified activity. They state that they understand that final approval of the Comprehensive Quality Assurance Plan attached hereto or identified herein is contingent upon satisfying the Department's review requirements in all other sections of the Plan.

They further state that the information, statements, facts and representations given and made above are true and correct to the best of their knowledge and belief, and that they are aware that any misrepresentations or falsifications constitute grounds for rejection of approval of the Comprehensive QA Plan attached hereto or identified herein, and further constitute violations of Section 117.03(2), F.S., which provides that "[a]ny person making a false oath before a notary public shall be guilty of perjury and shall be subject to penalties, forfeitures, and disabilities that are prescribed by law in case of perjury under Chapter 873."

9-10-92 Janette D Long
DATE (print name Janette D. Long)
(Title: Vice-President)
(Organization Savannah Laboratories)

9-10-92 Alan C. Bailey
DATE (print name Alan C. Bailey)
Quality Assurance Officer
(Organization Savannah Laboratories)

Witness my hand and official seal at Savannah Laboratories
this Tenth day of September,
1992

My commission expires: Notary Public, Chatham County, Ga. My Commission Expires July 10, 1994

Sheila Bryant Hoffman
(SIGNATURE OF NOTARY PUBLIC)

Sheila Bryant Hoffman
(NAME OF NOTARY PUBLIC TYPED, PRINTED OR STAMPED)

7.0 SAMPLE CUSTODY

7.1 Sample Custody Objectives

The primary objective of sample custody 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 are maintained in a secure area. 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. 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 and Legal Custody Procedures

All samples requiring sample or special legal custody procedures are received by the laboratory custodian under a chain-of-custody procedure. Legal custody is a special type of sample custody in which all events associated with a specific sample are documented in writing.

7.3 Laboratory and Field Custody Procedures

The following procedures apply to the custody activity 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 "Sample Container

FIGURE 7.1

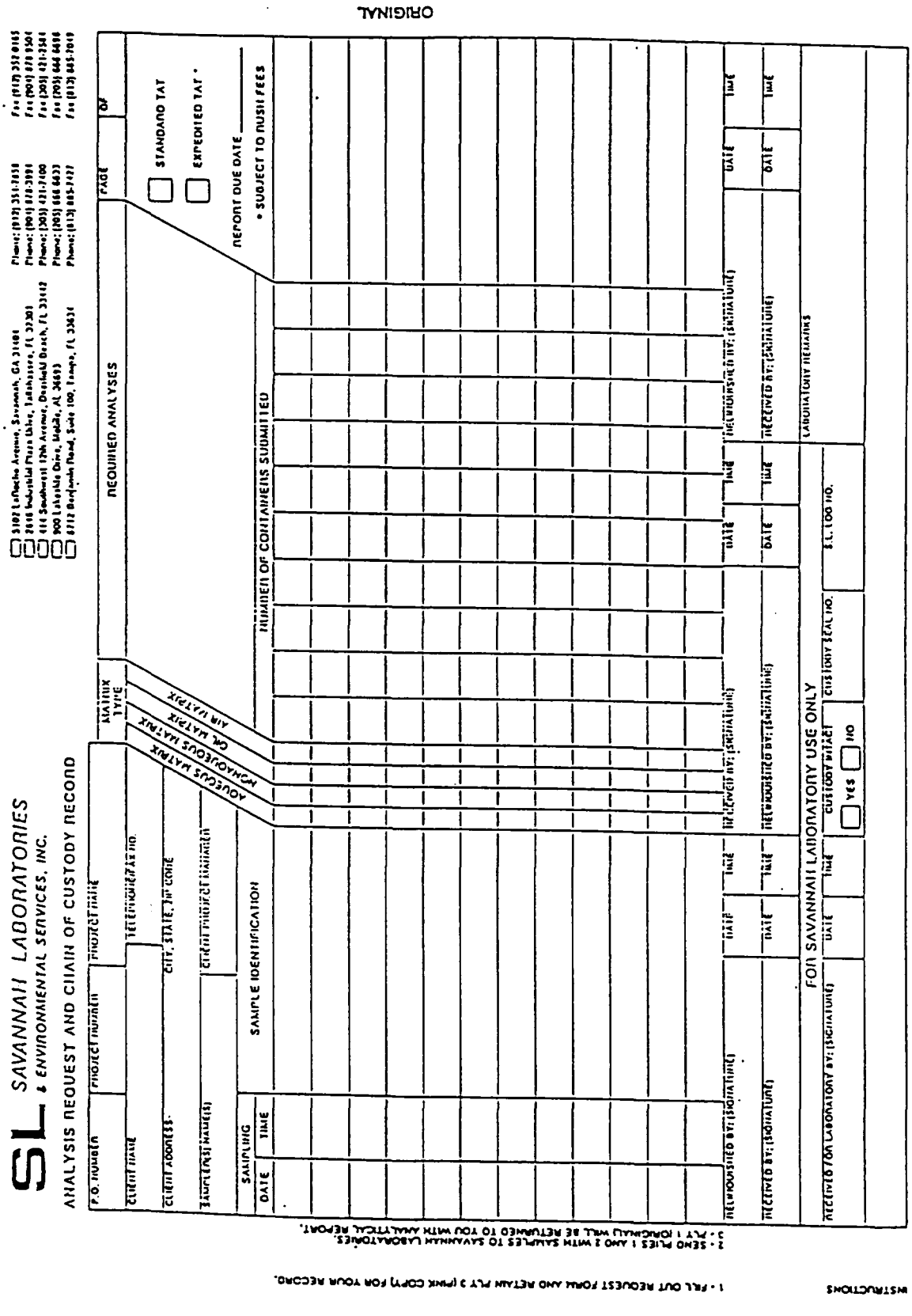
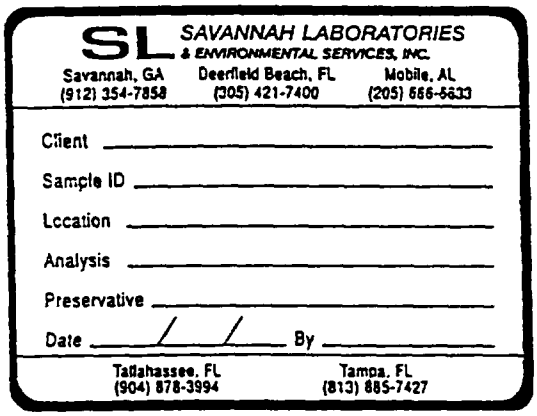

ORIGINAL
SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.
ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD
P.O. NUMBER
PROJECT NAME
CLIENT NAME
TELEPHONE/FAX NO.
CLIENT ADDRESS
CITY, STATE, ZIP CODE
SAMPLER(S) NAME(S)
CONTACT PERSON FOR INFORMATION
SAMPLING
DATE
TIME
SAMPLE IDENTIFICATION
MATRIX TYPE
AQUEOUS MATRIX
NONAQUEOUS MATRIX
OIL MATRIX
AIR MATRIX
REQUIRED ANALYSES
NUMBER OF CONTAINERS SUBMITTED
PAGE
OF
STANDARD TAT
EXPEDITED TAT *
REPORT DUE DATE
* SUBJECT TO RUSH FEES
RELINQUISHED BY: (SIGNATURE)
DATE
TIME
RECEIVED BY: (SIGNATURE)
FOR SAVANNAH LABORATORY USE ONLY
RECEIVED FOR LABORATORY BY: (SIGNATURE)
CUSTODY INTACT?
YES
NO
CUSTODY SEAL NO.
P.O. LOG NO.
LABORATORY REMARKS
5102 LaRoche Avenue, Savannah, GA 31404
2846 Industrial Plaza Drive, Tallahassee, FL 32301
414 Southeast 17th Avenue, Deerfield Beach, FL 33441
900 Lakeside Drive, Mobile, AL 36693
8912 Benjamin Road, Suite 100, Tampa, FL 33634
Phone: (912) 351-8020
Phone: (904) 878-3994
Phone: (305) 421-4480
Phone: (205) 666-6633
Phone: (813) 885-7427
Fax (912) 350-0165
Fax (904) 878-3501
Fax (305) 421-4561
Fax (205) 666-6696
Fax (813) 885-7049
INSTRUCTIONS
1 - FILL OUT REQUEST FORM AND RETAIN PLY 3 (PINK COPY) FOR YOUR RECORD.
2 - SEND PLIES 1 AND 2 WITH SAMPLES TO SAVANNAH LABORATORIES.
3 - PLY 1 (ORIGINAL) WILL BE RETURNED TO YOU WITH ANALYTICAL REPORT.

FIGURE 7.2


SL
SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.
Savannah, GA (912) 354-7858
Deerfield Beach, FL (305) 421-7400
Mobile, AL (205) 666-6633
Client
Sample ID
Location
Analysis
Preservative
Date / /
By
Tallahassee, FL (904) 878-3994
Tampa, FL (813) 885-7427

Temperature-Lab Use Only" is prefilled with tap water and supplied with each sample shipment to monitor sample temperature upon receipt.

Projects which require sample containers to be screened for contaminating properties prior to shipment and certified "contaminant-free" can be provided upon the client's request and expense. Containers will be provided with a unique batch assignment number to permit traceability. A sample container preparation logbook (Figure 7.3) is maintained by custody personnel in the event this level of service is requested. All standard custody procedures are maintained for precleaned sample containers.

7.3.2 Chain of Custody Documentation, Traceability, and Sample Integrity

Formal chain-of-custody procedures are initiated by a ***custody dispatch 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*** and is required prior to relinquishment of the samples. If the site address is different from the client address, the site address 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. Coolers are sealed in the field with the SL Custody Seal (Figure 7.4) 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. A copy of each airbill package tracking form associated with a shipment of samples is maintained in the appropriate client files.

The ***sample receipt custodian*** 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***. The ***sample manager*** is also notified of the incident and is responsible for client notification. A sample custody excursion form (Figure 7.5) is filed by the sample manager, and any corrective action required by the client is documented on the accompanying project chain-of-custody form which is dated and signed by the sample or project manager.

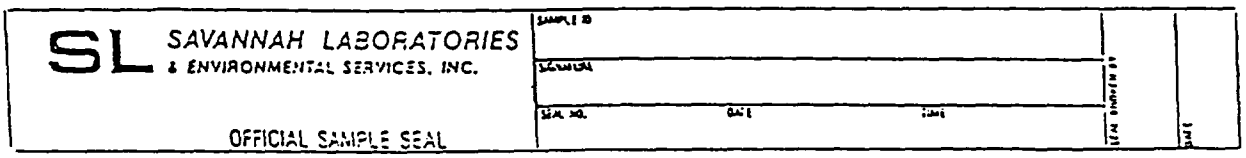
FIGURE 7.3

SL CONTAINER PREPARATION LOG

Container Type	Container Size	Container Aperture	Batch Number	Preservative Added	Preservative Lot Number	SL Project Manager	SL Project Number	QA Officer		Corrective Action Report Number
								Accept	Reject	

CONTPREP.LOG:09.10.92.1

FIGURE 7.4


SL
SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.
OFFICIAL SAMPLE SEAL

SL SAMPLE CUSTODY EXCURSION

SL Project/SDG # _____

Sample Description	Date Sampled	Date Received	Arrival Temp.	Inappropriate Container	Container Breakage	Container Leakage	Container Label Discrepancy	Comments	Initials

CLIENT NOTIFICATION

SL Contact	Notification Date	Via Phone/Fax	Client Contact	Resolution

FIGURE 7.5

TUT 006 0018

If shipping containers arrive intact, they are immediately opened by the sample receipt custodian 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 7.6), or if requested by the client, documented on the chain-of-custody form.

7.3.3 Field Custody

When sample collection is performed by SL, Savannah Laboratories' 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 completely filled out upon sampling. Each sample is identified in the field by a unique alphanumeric designation on the label.

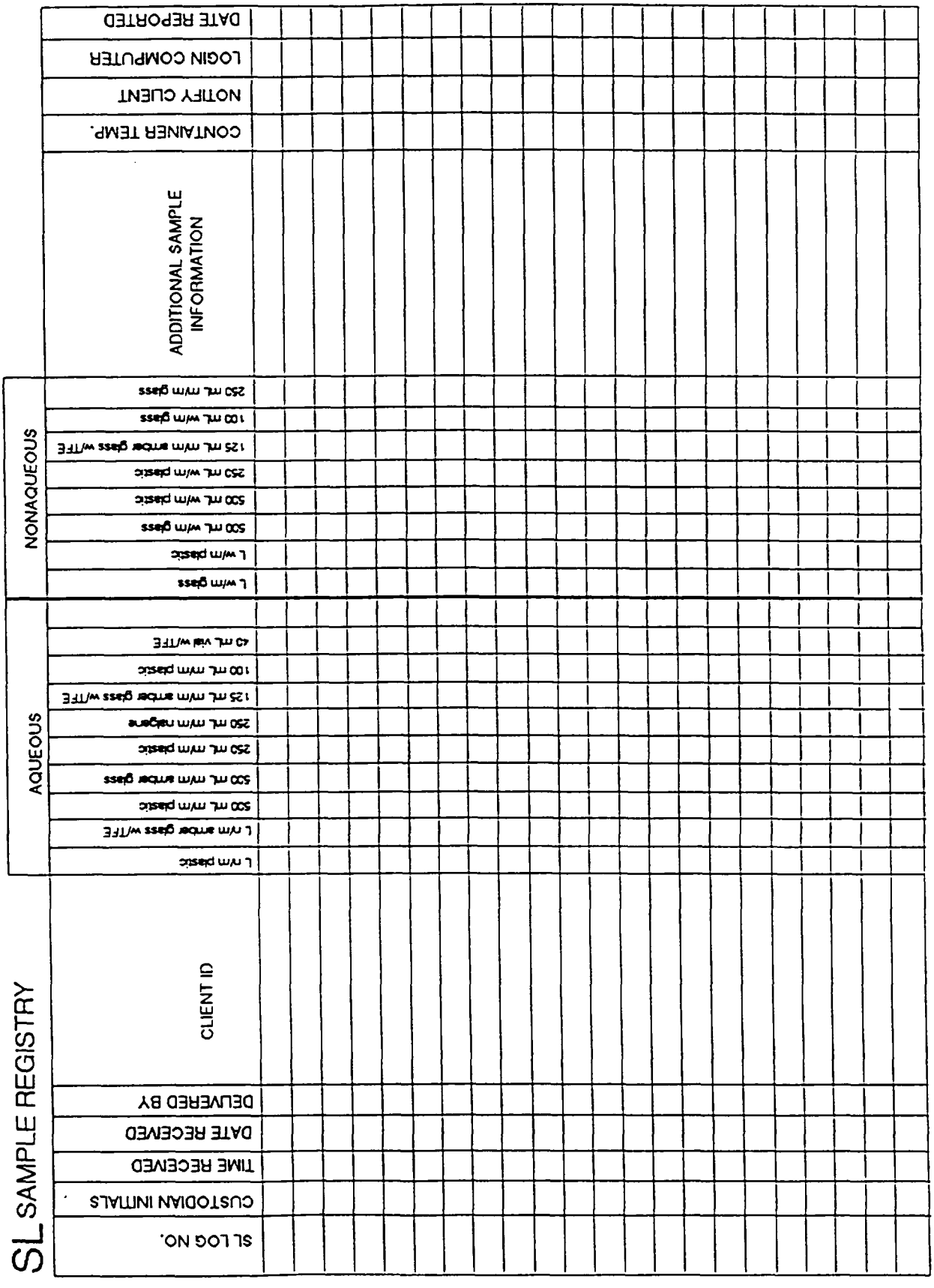
All information included on each container label must be included on all field-generated records including: permanent field notebook, individual well log, groundwater elevation form, and chain-of-custody form. This field documentation demonstrates traceability of the containers and samples and links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

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. Each set of sample containers with the same sample identity is placed together in plastic bags and sealed. When more than one set of sample containers (different sample identities) are placed in the sample cooler, each set must be sealed in a separate plastic bag. All VOA sample vials are wrapped twice in bubble wrap and each set is sealed in a separate plastic bag. Sufficient ice is placed in sealed plastic bags to maintain the sample at 4° C until sample receipt by the laboratory. Additional information regarding sampling can be found in Section 6.0.

Ten percent of samples collected by the SL field sampling team will consist of quality control samples for pH, specific conductivity, temperature, or other client specified parameters per site to satisfy DQO project requirements.

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.

FIGURE 7.6


SL SAMPLE REGISTRY
SL LOG NO.
CUSTODIAN INITIALS
TIME RECEIVED
DATE RECEIVED
DELIVERED BY
CLIENT ID
AQUEOUS
L r/m plastic
L r/m amber glass w/TFE
500 mL r/m plastic
500 mL r/m amber glass
250 mL r/m plastic
250 mL r/m nalgene
125 mL r/m amber glass w/TFE
100 mL r/m plastic
40 mL vial w/TFE
NONAQUEOUS
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 r/m amber glass w/TFE
100 mL w/m glass
250 mL r/m glass
ADDITIONAL SAMPLE INFORMATION
CONTAINER TEMP.
NOTIFY CLIENT
LOGIN COMPUTER
DATE REPORTED
SAMPREG 09 01 92 2

Site location
Date/time of sampling
Sample identification (including specific location)
Sample sequence number
Site conditions
Weather conditions
Purging equipment used
Description of QC samples collected
Names of personnel/visitors
Sampling 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 seven-character project code is assigned by division and sequentially in order of sample receipt, recorded on the chain-of-custody form and each sample container submitted with the project and recorded in the bound Sample Registry. Proper 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 sample receipt custodian. 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 acknowledgement for each project.

Once the chain of custody is verified, the project identified by this unique number is logged into the computerized LIMS (Figure 5.1) to disburse the desired work order request to the laboratory. The sample receipt custodian 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 sample receipt custodian also inspects all samples for leakage or obvious seal tampering (if provided). All samples are unpacked in a well-ventilated sample receipt area. Personal respirators are provided 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 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.

Discrepancies noted from the custody staff are transmitted to the project and sample manager and are resolved with the client prior to laboratory work assignment. The project manager or the sample manager 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.

7.3.5 Sample Preservation

After addition of the project sequential identification number, the samples are dispersed to the appropriate laboratory section sample storage areas. Color-code dots and unique sample bottle types correspond to specific analysis 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 in the Sample Container Request Form which is submitted by a client requesting sample containers. This two-sided form is shown in Figures 7.7 and 7.8.

All sample containers used by the SL field sampling team contain premeasured portions of preservatives. Additional preservatives are obtained prior to each sampling event from parent stocks maintained by the shipping department. Documentation is kept for all additional preservatives used in the field. 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.

FIGURE 7.7

SAMPLE CONTAINER REQUEST FORM

The number, color-code preservative and container description for the analyses as requested are listed below. A summary of sampling instructions for general analysis categories is referenced on the reverse side.

AQUEOUS											NONAQUEOUS								
																			COLOR PRESERVATIVE CODE
L n/m plastic	L n/m glass w/TFE	500 mL m/m plastic	500 mL n/m glass	250 mL m/m plastic	250 mL m/m nalgene	125 mL m/m amber glass w/TFE	100 mL m/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 m/m plastic	125 mL m/m amber glass w/TFE	100 mL w/m glass		Lab Pk Prep. by: _____ Lab Pk checked by: _____ Quantity of Lab Pks. Shipped: _____ SL Project Mgr.: _____ Sample Coordinator: _____ Comments: _____ _____ Temperature Container _____
																			NO. OF CONTAINERS SHIPPPED
																			NO. OF CONTAINERS/SAMPLE
																			NO. OF TRIP BLANKS
																			NO. OF FIELD BLANKS
																			NO. OF EQUIPMENT BLANKS
																			GENERAL PARAMETERS

Lab Pack Shipping Address _____

_____

_____

_____

Phone No: _____

Date of Shipment: _____ Method of Shipment: _____

Account No: _____ Project: _____

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.
PURPLE	(P)	No preservative added.
ORANGE	(O)	No preservative 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, always wash hands IMMEDIATELY.

SAMPCONT.DRW:09.03.92:3

FIGURE 7.8

GENERAL SAMPLING INSTRUCTIONS

DO NOT PRE-RINSE CONTAINERS. These containers have been specially prepared for specific analyses (See Preservative 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

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

LITER GLASS

Purple n/m:	Extractable Organics (BNAs, Pesticides/PCBs, MBAS, Herbicides)
Orange n/m	Dioxin/Dibenzofurans
Green n/m:	Total Recoverable Phenolics
Purple w/m: (Nonaqueous)	All Organics (excluding Volatiles), Inorganics, Physical Properties, General

500 PLASTIC

Purple m/m:	Physical Properties, Miscellaneous General
Red m/m:	Metals with Mercury
Purple w/m: (Nonaqueous)	Inorganics, Physical Properties

500 ML GLASS W/TFE

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

250 ML PLASTIC

Purple 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

Green m/m:	TOC. Fill to capacity.
Purple m/m: (Nonaqueous)	Volatiles. Fill to capacity - no headspace.

100 ML PLASTIC

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

100 ML GLASS

Purple 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.
Purple n/m:	EDB, Volatile Halocarbons. Fill as referenced above.
Yellow n/m:	Trihalomethanes (THM). Fill as referenced above.

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 o acceptable field substitution, please contact your project manager or sample coordinator for assistance at (912) 354-7858 or FAX (912) 352-0165.

Thank you for your patronage.

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 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 sample access is possible. Sample storage areas are designed to segregate volatile and nonvolatile samples. Standards and extracts are also departmentally controlled and stored in segregated facilities.

The set of analyses required for a group of samples is project-dependent. After sample login and verification, samples are relinquished from the receiving area to the appropriate sample preparation 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 (Cyanide Distillation 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 (Cyanide Analysis) is shown in Figure 7.10.

For projects where in-laboratory custody records are required by the client, the SL project manager should inform the custodian and sample manager to coordinate custody activities prior to sample receipt. For those samples, department-specific in-laboratory sample tracking forms are executed by department staff. An example of a form of this type (Semivolatile Extract Custody Log) is shown in Figure 7.11. Samples and sample preparations are stored in a secure (locked) sample storage area. When samples or sample preparations are removed from or returned to designated storage areas, the form is signed and dated by the analyst.

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 when applicable as an integral part of the raw data. Upon the analysis of each parameter, the date of analysis is entered into the LIMS and can be compared to the date sampled to validate that holding times have not been compromised.

FIGURE 7.9

CYANIDE DISTILLATION LOG

Method CLP

Spike Level _____ Date _____
Date Stock CN Prepped _____ Analyst _____
Check Standard _____ Batch # _____
Final Volume _____

#	SL Log #	Sample Description	Wet Weight
	Blank		
	ERA		

Cyanide.Dis:06.25.92:1

FIGURE 7.10

CYANIDE ANALYSIS LOG

Method CLP

STANDARD CURVE

mg/L	Å
0.50	
0.30	
0.10	
0.070	
0.040	
0.010	

Date _____

Analyst _____

Batch # _____

Correlation Coefficient _____

QC Check True Value _____

Spike Level _____

#	SL Log #	Sample Description	Sample Dilution	Volume or Wet Weight	Sample Å	Result mg/L	Dry Weight	Result mg/kg

Cyanide.CLP:06.25.92:1

SL SEMIVOLATILE EXTRACT CUSTODY LOG

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

FIGURE 7.11

7.3.7 Sample Disposition

After analysis completion, custody of unused sample portions, extracts, or digests is relinquished to the central secured storage area. 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 will usually 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.

Prior to report submission, the project manager reviews all analytical results, and if the results reveal that a sample is hazardous per 40 CFR Part 261 characteristics or contains 50 ppm or greater PCBs; or if client-supplied information (chain-of-custody forms, etc.) states that the sample is hazardous; or if client's instructions or a contract requires all samples be treated as hazardous waste, the project manager will arrange for samples to be returned to the client or disposed of per client's instructions at the client's expense. Tracking and disposal of hazardous samples is accomplished and documented via the LIMS system.

7.3.8 Interdivisional Custody

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, or if instrument failure occurs, 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 determination codes specific to each laboratory location are entered into the LIMS 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 preparations. This material includes dates of sample preparation and requested analyses. Upon sample receipt at the other division laboratory, standard custody procedures are followed.

7.4 Electronic Data Records

By careful assignment of user passwords and file access/lock codes, Savannah Laboratories maintains a high level of data security for the LIMS. Thus, only authorized SL personnel can access client files to view

data. In addition, data entry and editing is restricted to highly trained data management personnel.

If requested, data can be electronically transferred to the client via modem. To insure data integrity, the specific client's data are first downloaded to an off-line PC and then electronically transferred to the client. Access to the PC via modem is controlled by assignment of a confidential password to the client.

Signed hard copies of reports and not electronic or diskette deliverables are the official report and are always submitted to clients who request electronic data transfer, which allows verification of downloaded information. SL is not responsible for electronic transfer or diskette errors and maintains that it is the client's responsibility to check all electronic or diskette data against the hard copy. A download information file is maintained by the LIMS manager.

Internal documentation is maintained by the LIMS manager for all LIMS programs. This documentation includes descriptions of any program additions, deletions, or modifications, the date of revision, and the initials of the responsible programmer. To verify proper program functioning of the hardware and software, a simulation account is maintained. When hardware/software modifications are made, this account uses actual data to model an account in order to verify the modifications are functioning as anticipated. Antivirus software serves the LIMS as a protective measure.

At present, laboratory instrumentation is not interfaced directly to the LIMS and thus, no instrument-LIMS data transfer step requires verification. All instrument data is verified by chemists or analysts as described in Section 12.5.2.

Entry of data into the LIMS from chemists' worksheets is performed three times weekly by data entry technicians. Immediately following data entry, approval sheets are printed with the entered data as it appears in the LIMS. Assistant project managers compare all data on the approval sheets, versus the chemists' worksheets for data transcription errors.

7.5 Verification of Hard Copy Records

Forms that are routinely printed for verification and signatures include data worksheets, data approval forms, and final reports. 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 in files alphabetically by client and chronologically within each client folder.

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. When EPA approved methods do not exist or project protocols require alternative methods, these methods must be approved by the client and the appropriate regulatory agency.

Tables 5.1 and 5.2 list Savannah Laboratories' routine laboratory parameters with their respective method numbers. Table 5.3 lists field parameters with their respective method numbers.

A detailed SOP has been prepared for each routine analytical method. Copies of SOPs are kept at the respective analytical benches, or by each department/section supervisors, and the QA manager or laboratory director.

In cases where GC, LC, or GC/MS methods are used to determine compounds not included in the actual method list, these unlisted parameters are flagged in the tables with a triple asterisk (***) and method validation data are included in Appendix A.

For those cases where no specific soil or sediment method exists, water methods are adapted. These adaptations are described in Section 8.2, and validation data are presented in Appendix A. Unless indicated in the appropriate SOP, all parameters listed in Tables 5.1 through 5.3 are analyzed by the methods referenced, without modifications. Interpretation of ambiguous method requirements is accomplished by consulting with regulatory agencies and EPA laboratory/QA personnel.

8.1 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

Prerinse each item with the solvent to be used in it. As soon as possible after use, rinse with lab-grade acetone. Wash with hot water and a nonphosphate detergent such as Alconox, scrubbing thoroughly with a brush. Rinse thoroughly with tap water at least three times. Rinse inside surface with Nochromix solution, catching rinsate for re-use. Rinse again with tap water, followed by pesticide-grade acetone. Rinsing with hexane is avoided to minimize the possibility of contamination of glassware used for total petroleum hydrocarbon determination. Air dry when possible, and do not bake Class A volumetric glassware. Store glassware inverted or cap openings with foil to exclude dust and other contaminants. Because of possible damage, caps, septa, and plastic items are not rinsed with Nochromix.

Volatile Organics

Wash with tap water and Alconox or Liquinox, then rinse thoroughly with organic free water. Oven dry at 110°- 120°C for at least two hours. Do

not bake Class A volumetric glassware. Glassware is usually stored in the oven until use. Caps and septa are washed in the same manner, but caps are not oven-dried. Highly contaminated glassware is allowed to soak in Nochromix solution overnight, then washed as above.

General Chemistry, Microbiology, Nutrients, Demands

Wash with hot tap water and Liquinox, rinse thoroughly with tap and deionized water, and air dry. Store glassware inverted or cap openings with foil. Autoclave bacteriological laboratory glassware and collection bottles as described in analytical procedures. 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 Liquinox, and rinsed with tap water, Nochromix, and deionized water.

Metals/Radionuclides

Wash glass, plastic, and Teflon items in hot tap water and Alconox. Rinse with tap water, 1:1 nitric acid, tap water, and deionized water. Teflon beakers used for sample digestion are further decontaminated by adding 20 mL nitric acid and 12 mL hydrochloric acid, covering with a watch glass, and digesting 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.

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

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. Alpha and Beta Radioactivity: Method 9310/900

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 9251/407A

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

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

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. Surfactants: Method 425.1

Sample (10-20 g) is weighed out exactly into a 500-mL screw-cap bottle. A volume of water equivalent to 20 times the sample weight 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.

8.3 Deviations from Referenced Analytical Methods

In the determination of sulfide in liquid samples containing turbidity or color and in all soil or sediment samples, samples are distilled as per SW-846 method 9030. Upon distillation of the sample, the trapping solution is analyzed colorimetrically as a clear liquid sample as per EPA method 376.2.

8.4 Reagent Storage and Documentation

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

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 in 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 in air conditioned areas.

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

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

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

All waste disposal is carried out in accordance to Savannah Laboratories' Waste Disposal SOP. 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 disposed of prior to accumulation of 1,000 kg (approximately 5 drums) of hazardous waste or 100 kg (0.5 drums) of acutely hazardous waste (261.33 (a) - (e) - P list).

-- Be generated at a rate of less than 100 kg of total hazardous waste per facility per month (or 1 kg of acutely hazardous waste).

-- 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 with the date that the period of accumulation began on each container and 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.

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, then in drums	Reclaimed by HW contractor
Mixed Solvents (Flammable & nonhalogenated)	VOC Standards, Herbicides, Pesticides	Store in glass bottles, then in drums	Disposal by HW Contractor
All neat standards and mixes over 100 ppm	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 glass bottles, then in drums	Disposal by HW contractor
Acid Solutions	Metals, General Inorganics, Extractions	Store in glass bottles or add to neutralizing chambers	Neutralize; sanitary sewer
Alkaline Solutions	General Inorganics, Extractions	Store in glass bottles	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.

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 four types of waste are stored in 55-gallon drums.

1. Halogenated solvents (methylene chloride and others) -- Store in closed cap metal drum)

2. Freon -- Store in closed cap metal drum

3. Nonhalogenated flammable solvents -- Store in closed cap metal drum

4. Heavy metals or other aqueous wastes (except cyanide) -- Store in 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.)

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 and 5.2 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 mixes designed for the specific methods or as neat compounds. Certificates of analysis are shipped with each ampule by the vendor. The standards are certified to meet or exceed the criteria established by the U.S. EPA.

Upon receipt, dates are placed on all standard materials. Standard logbooks are maintained by all sections of the laboratory to document the traceability of working standards back to neat materials or prepared stock mixes. All standards are assigned a lot number that provides a unique identification as well as identifying the type of standard (i.e., working). This unique lot number is documented in a laboratory notebook along with date of preparation, initials of preparer, concentration, expiration date (if applicable), and solvent (if applicable). A standard preparation narrative is also provided in this notebook to detailing the preparation steps for each standard.

9.3 Standard Sources and Preparation

Savannah Laboratories maintains an inventory of materials to produce stock standards or purchases stock standards from commercial vendors. Laboratory preparation of all lab-prepared stock, intermediate, and working standards is documented by the responsible analysts. 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 given below meet or exceed EPA method requirements.

Any method calibration requirements which are more stringent than these procedures will be used.

TABLE 9.1

MAJOR LABORATORY INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
6	ICP Units	1-Jarrell Ash 61	1-Jarrell Ash 61	1-Jarrell Ash 61 1-Jarrell Ash Enviro 36	1-Jarrell Ash 61E	1-Jarrell Ash 61E
5	Mercury Cold Vapor Units	1-Varian VGA/AA20	1-Varian VGA-76/AA20	1-Varian VGA-76/AA20	1-Perkin Elmer 5000	1-Coleman 50B
15	Atomic Absorption Furnace/Flame	1-Varian 400Z 1-Perkin Elmer 2380	2-Varian 400Z 1-Varian AA 20	2-Varian 400Z 2-Jarrell Ash 22/4000 1-Perkin Elmer 2380	1-Varian 400Z 1-Perkin Elmer 5000	1-Varian 400Z 1-Varian AA 20
10	GC/MS Semivolatiles	1-HP 5970	2-HP 5970	5-HP 5970	1-HP 5970	1-HP 5971A
10	GC/MS Volatiles	1-HP 5970	2-HP 5970	3-HP 5970 2-HP 5971	1-HP 5970	1-HP 5971A
32	Gas Chromatography Semivolatiles	3-Varian 3400 with dual ECD 3-Varian 3400 with dual FID	1-Varian 3400 with NPD/ECD 1-Varian 3400 with dual NPD 2-Varian 3400 with dual FID 3-Varian 3400 with dual ECD 1-Shimadzu 9AM with dual ECD 1-HP 5880 with FID	1-Varian 3400 with dual FID 1-Varian 3400 with quad FID 1-Varian 3400 with dual NPD 2-Varian 3400 with dual ECD 2-Varian 3700 with dual ECD 1-Varian 3700 with ECD	2-Varian 3400 with dual ECD 1-Varian 3300 with dual FID 1-Varian 3300 with dual NPD	2-Varian 3400 with dual ECD 2-Varian 3300 with dual FID
24	Gas Chromatography Volatiles/P&T	1-Varian 3600 with PID/Hall 3-Varian 3300 with PID/Hall 1-Varian 3300 with PID/FID 1-Varian 3300 with FID/Hall	1-Varian 3700 with Hall/FID 1-Varian 3300 with Hall/FID 1-Varian 3300 with PID/Hall 1-Varian 3300 with PID/FID 1-Varian 3400 with PID/Hall 1-Varian 3600 with PID/Hall	1-Varian 3700 with Hall/PID 1-Varian 3700 with Hall/FID 1-Varian 3600 with Hall/PID 1-Varian 3400 with PID/FID 2-Varian 3300 with Hall/FID	1-Varian 3300 with Hall/FID 1-Varian 3300 with Hall/PID	1-Varian 3300 with FID/Hall 1-Tracor 540 with PID/Hall 1-Varian 3600 with PID/Hall 1-Varian 3400 with FID/PID
3	TOC Analyzers	1-OI 524		1-Dohrmann DC80	1-OI 524	

TABLE 9.1

MAJOR LABORATORY INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
6	IR Spectrophotometers	1-Perkin Elmer 710	1-Perkin Elmer 727	1-Perkin Elmer 710 1-Buck Scientific HC-404	1-Buck Scientific HC-404	1-Buck Scientific HC-404
7	UV-VIS Spectrophotometers	1-B&L 21	1-Milton Roy 301 1-B&L 21	1-Milton Roy 301 1-Perkin Elmer 35 1-B&L 88	1-Sequoia Turner 340	1-Milton Roy 301
3	Nutrient Autoanalyzers			3-Technicon Traacs 800		
4	HPLC Units	1-Waters 501/481	1-Waters 484 1-Kratos 980 1-Waters 490E			
1	Alpha/Beta					1-Tennelec 5100
1	Scaler					1-Ludlam Measurements 2000
1	Radon Flask Counter					1-Ludlam Measurements 182
1	Ion Chromatograph			1-Dionex 2010		
4	DO Meters	1-YSI 50B	1-YSI 50B	1-YSI 50B	1-YSI 58	1-YSI 50B
5	Turbidimeters	1-Orbeen-Hallige	1-Hach 1680D	1-Hach 2100A	1-Hach 2100A	1-Hach 1680D
2	TOX Analyzers			2-Dohrmann MC-3		
2	Conductivity Meters	1-YSI 35	1-YSI 33	1-YSI 35	1-YSI 32	
1	Bomb Calorimeter			1-Parr 1341		
15	pH/ISE Meters	Various Orion and Fisher Meters	Various Orion and Fisher Meters	Various Orion and Fisher Meters	Various Orion and Fisher Meters	Various Orion and Fisher Meters
7	Analytical Balance	1-Mettler AE163	1-Mettler AE160	1-Mettler ME160 1-Mettler AE200	1-Mettler AE160 1-Sartorius 1602	1-Mettler AE100

TABLE 9.1

MAJOR LABORATORY INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
18	Top Loading Balance	2-Sartorius	1-Mettler PE1600 1-Sartorius L2200-S 1-Sartorius PT1200	1-Mettler PM 2000 2-Sartorius GMBM 2-Mettler 1600 PE 1-Fisher XL500 1-Sartorius 1202	1-SP DTL4100 1-Sartorius B3100P 1-Sartorius FT600	3-Mettler PM3000
5	Autoclave	1-Napco 8000-DSE	1-Napco 9000D	1-Napco 9000D	1-Napco 9000D	1-Napco 9000D
15	Waterbath	2-Fisher Versabath	2-Fisher 1-Baxter	1-C-M Equatherm 2-Fisher Versabath 1-Fisher 20L	1-Fisher Scientific 1-Baxter Durabath 1-Blue M Magi-Whirl 1-SPB7001-2	1-Branson 3200 1-Baxter Durabath
6	Biological Incubator	1-Baxter Tempcon	1-Blue M Stabil-Therm	1-Lab-Liner 3554-17	1-Fisher 630D 1-Precision Coliform	1-Blue M
6	BOD Incubator	1-Westinghouse 16.8	1-Precision 815	1-Precision Lo-Temp	2-Precision Lo-Temp	1-Fisher 307
20	Drying Oven	1-Fisher Isotemp 500	1-Fisher Isotemp 500 3-Blue M 2-Fisher Isotemp 655G 1-Tempcon	4-Fisher Isotemp 500 1-Tempcon N8620-1 1-Blue M	3-Blue M 1-Precision Scientific	3-VWR 13054
8	Block Digestor	1-Hach	1-Thermolyne Dri-Bath	2-Technicon BD-40 1-Thermolyne Dri-Bath 1-Lab-Line Multiblank 2093	1-Techni: Dri-Block DB-3H	1-Thermolyne
5	TCLP (nonvolatile)	SL Custom	SL Custom	SL Custom	SL Custom	SL Custom
2	TCLP (ZHE)			1-ATCS ZHE	1-ATCS ZHE	

TABLE 9.2

MAJOR FIELD INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
4	pH/SC/DO/T° Meters	1-Corning Checkmate 90	1-Corning Checkmate 90	1-Corning Checkmate 90		1-Corning Checkmate 90
3	pH/Temp Meters		1-Orion 23A	1-Orion SA-230	1-Orion 23A	1-Orion 23A
3	Conductivity Meters	1 YSI 33	1-YSI 33	1-YSI 33	1-YSI 33	
2	DO Meters		1-YSI 51B	1-YSI 51B	1-YSI 50B	
2	Turbidimeters		1-Hach 16800	1-DRT 15C		
2	Water Level Meters		1-Slope 51453	1-Fisher		

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
ICP	Baker/Spex	Stock 1,000 or 10,000 ppm solutions	Room temp	Working std prepped directly from stock	Room temp	Quarterly or as needed
AA	Baker/Spex	Stock 1,000 ppm solutions	Room temp	Intermediate stds prepped from stocks. Working stds prepped from intermediates.	Room temp Room temp	Biweekly Weekly
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	Monthly Daily or as needed Daily or as needed
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	Monthly Daily or as needed Daily or as needed
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	Monthly Daily or as needed Daily or as needed
IR Spectrophotometer	Fisher	Neat liquids	Room temp	Stock std prepped from neat liquid. Working stds from stock.	Refrigerator Refrigerator	Monthly 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
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	Monthly As needed
pH Meter	Fisher	Calibration buffer solutions	Room temp	Used as is.	----	----
ISE	Baker	Neat material	Room temp	Stock std from source. Intermediate std from stock. Working std from intermediate.	Refrigerator Refrigerator Used immediately	Monthly Monthly or as needed As needed
TOX	Fisher	Neat material	Room temp	Std from source.	Room temp	Monthly
Bomb Calorimeter	Parr	Neat tablets	Room temp	Used as is.	----	----

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
Gas Chromatographs and GC/MS (Volatiles)	Supelco, Ultra, Accustandard, ChemService, Baxter, Aldrich	Neat Solutions (50-2000 ppm)	Freezer	Stock stds from neat sources. Intermediate stds from stocks. Working standards from intermediates and/or purchased solutions.	Freezer Freezer Freezer	Annually or as noted by manufacturer expiration date. Semiannually -- (2 months or sooner for gases, styrene, 2-chloroethylvinyl ether) Weekly
Gas Chromatographs and GC/MS (Semivolatiles)	Restek, ChemService, Crescent Chemical, Aldrich, Ultra	Neat Solutions (50-10000 ppm)	Refrigerator	Stock stds from neat sources. Intermediate stds from stocks. Working standards from intermediates.	Refrigerator or freezer Refrigerator or freezer Refrigerator or freezer	Semi-annually or annually as required Semi-annually or annually as requied Semiannually or as needed
High Performance Liquid Chromatographs	ChemService, Crescent Chemical, Supelco	Neat Solutions > 1000 ppm	Refrigerator	Stock stds from neat sources. Intermediate stds from stocks and/or purchased solutions. Working standards from intermediates.	Refrigerator Refrigerator Refrigerator	Semi-annually Monthly Weekly

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	Mallinockrodt	With each batch
Alkalinity	Sulfuric acid	Na_2CO_3	Mallinckrodt	With each batch
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 (Soil)	Ferrous sulfate	$I_2/Na_2S_2O_3$	VWR/Baker	With each batch

9.4.1 Metals

ICP

The inductively coupled plasma atomic emission spectrophotometer is standardized daily with single concentration standard solution containing metals of interest and a blank. After calibration, ICV standards are analyzed and must agree within ± 10% of true value. A blank is then run and must be below the PQL. A 2-5XIDL solution is then analyzed. This is followed by interference check standards A and AB which must be within ± 20% of true values. CCV standards are run after every 10 samples and sample data must be bracketed by calibration verification standards that are ± 10% of true values in order for data to be acceptable. Duplicate lab control standards are digested and analyzed with each batch of sample to determine accuracy and precision, and must be recovered 80-120% for liquid samples and 70-130% for soil samples.

AA

Furnace atomic absorption spectrophotometers are calibrated daily with a minimum of three standards and a blank. An initial calibration verification standard is analyzed immediately upon calibration, and must meet accuracy criteria of 90-110%. The initial calibration blank is analyzed, and must be less than the PQL. Lab control standards (digested standards) are analyzed in duplicate for every batch of 20 samples and must be recovered within 80-120% for liquids and 70-130% for soils for the batch to be acceptable. Calibration verification standards are analyzed after every 10 samples and must be recovered within 80-120% for bracketed data to be acceptable.

9.4.2 General Chemistry

Autoanalyzer

A calibration curve containing a minimum of five points is analyzed at least daily. The correlation coefficient from application of linear regression to these points must be ≥ 0.995. Independent calibration verification standards and blanks are analyzed immediately following the calibration standards and thereafter, after every 10 samples. The initial calibration verification must be within accuracy control criteria given in Table 5.1 or 5.2 for any data to be acceptable. All data must be bracketed by calibration verification standards that meet all criteria given in Table 5.1 or 5.2 for that data to be acceptable.

Ion Chromatograph

For initial validation of the method and to determine linearity of the calibration curve, three to five standards are analyzed. Either linear regression or quadratic curve fitting is used, depending on analyte. The linear regression correlation coefficient must be > 0.990 for any analyte to be considered as giving a linear response. After initial validation, for linear analytes, the instrument is standardized daily with a single point standard. Calibration verification standards are analyzed immediately upon calibration and thereafter, after every 10 samples. The

calibration verification standards must be within control criteria given in Tables 5.1 or 5.2 to be acceptable.

UV-VIS Spectrophotometer

The spectrophotometer is calibrated at least daily with a minimum of five standards. Linear regression is used to find the calibration curve. The correlation coefficient must be > 0.995 in order for the curve to be acceptable. Calibration verification standards are analyzed immediately following the calibration standards and after every 10 samples. The calibration verification standards must meet control criteria given in Tables 5.1 or 5.2 in order for bracketed data to be acceptable.

IR Spectrophotometer

The infrared spectrophotometer is calibrated daily with a minimum of five standards. The curve is found by linear regression, and the correlation coefficient must be > 0.995. A calibration verification standard is analyzed immediately upon calibration, and after every 10 samples. Calibration verification standards must meet control criteria given in Tables 5.1 or 5.2 in order for bracketed data to be acceptable.

Turbidimeter

Gelex solid standards are calibrated against formazin standards initially and then quarterly. Then, the instrument is calibrated daily with one Gelex standard for each range of interest. A mid-range calibration verification is analyzed for every 10 samples and must meet control criteria specified in Table 5.1.

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. The calibration verification standard must meet criteria given in Table 5.1 in order for bracketed data to be acceptable. Manual or automatic temperature compensation is performed, depending on the meter.

TOC

A single point standard is used to calibrate the instrument daily. A calibration verification standard is analyzed immediately upon calibration

and after 10 samples. The calibration verification standards must meet control criteria given in Table 5.1 in order to accept bracketed data.

ISE

Ion selective electrodes are calibrated with a minimum of five standards. Linear regression applied to a plot of the log of the standard concentrations versus potential must result in a correlation coefficient > 0.995. Calibration verification standards are analyzed immediately upon calibration and after every 10 samples, and must meet control criteria given in Tables 5.1 or 5.2 in order for bracketed data to be acceptable.

TOX

Although the TOX instrument provides an "absolute" measurement, and is not subject to calibration, a check standard is analyzed daily immediately after the blank, and must meet control criteria given in Tables 5.1 or 5.2 in order for data to be acceptable.

Bomb Calorimeter

The energy equivalent of the bomb calorimeter is determined quarterly by bombing six standard benzoic acid tablets. A fuel oil standard is analyzed in duplicate for every batch of samples, and must meet control criteria given in Table 5.2 in order for data to be acceptable.

DO Meter

DO meters are calibrated prior to use either by Winkler titration or the air calibration technique, and annually by Winkler titration.

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 Chromatographs

Volatiles

Initial calibration is performed upon instrument startup and whenever continuing calibration fails the acceptance criteria. A five-point standard curve is prepared using all target compounds. The low standard concentration is near the PQL, and the high standard defines the usable linear range of the detector. After the five standards are purged and analyzed, a calibration curve is generated using internal standard methodology. If the internal standard exhibits matrix interference in sample, external standard methodology may be used; however, an internal standard is preferred for purge-and-trap methods. Ideally, all volatile compounds should exhibit enough linearity to use a straight line fit forced through the origin. However, some compounds may exhibit true non-linearity but consistent performance using a quadratic fit. A quadratic

fit curve may be used. The analyst should visually inspect the curves before proceeding with sample analysis.

An alternative to quantitation from a calibration curve is quantitation from an average response factor (RF). This is an acceptable technique for all SW-846 8000-series methods, all 40 CFR 136 600-series methods, and all 500-series drinking water methods. For the 8000-series methods, if the % RSD is < 20%, the average RF may be used. For the 500- and 600-series methods, if the % RSD is < 10%, the average RF may be used. Quantitation from the curve is preferred.

Continuing calibration check (CCC) standards are analyzed at the intervals specified in the methods. The CCC standard concentration is normally the mid-point of the five-point calibration curve, and must be at the level specified in the method "Q-tables" for the 600- and 8000-series methods. The 500- and 600-series methods specify a mid-level CCC at the beginning of each working day. The 8000-series methods specify a mid-level standard at the beginning of each working day and after every ten samples thereafter if needed for further sample analyses. The acceptance criteria for the 600- and 8000-series methods for volatiles are listed in each method's "Q-table." The analyzed value of each standard component must fall within the range of values given in the table. For compounds not present on the Q-table, the analyzed value must fall within 15% of the true value, or the laboratory may generate internal acceptance ranges based on a minimum of thirty data points. The acceptance limits for the 500-series methods are ± 20% of the true value.

If the CCC standard fails acceptance criteria, another CCC standard may be analyzed. If the second standard also fails, the initial calibration must be repeated.

2-Chloroethyl vinyl ether exhibits erratic chromatographic behavior. The Supelco, Inc. Purgeable A Mixture footnotes 2-chloroethyl vinyl ether with the following: "Due to instability of 2-chloroethyl vinyl ether, we cannot guarantee the concentration of this component." These problems with 2-chloroethyl vinyl ether impact the ability of SL to consistently analyze for this compound within the method requirements or PQL. If the requirements or PQL cannot be met for 2-chloroethyl vinyl ether, the appropriate flag should accompany the data for this compound in the report.

Semivolatiles/Pesticides/Herbicides

Initial calibration is performed upon instrument startup and whenever a CCC standard fails the acceptance criteria. A five-point standard curve is prepared using all target compounds. The low standard concentration is near but above the MDL and the high standard defines the usable linear range of the detector.

After the five standards are injected, the computer software generates a calibration curve using either internal standard or external standard methodology. The analyst chooses the best fit type for each compound, either linear or quadratic. The analyst should inspect the curves before proceeding with sample analysis. An alternative to quantitation from a calibration curve is quantitation from an average response factor as long as the minimum %RSD criterion is met. The %RSD criteria are as follows:

1. < 10% for 600-series methods.
2. < 20% for 8000-series methods.
3. ≤ 20% for 500-series methods, except Method 504 must be < 20%.

CCC standards are analyzed at the intervals specified in the methods. The 8000-series methods specify a CCC standard at the beginning of each working day and after every 10 samples thereafter if needed for further sample analyses. The 600-series methods specify a CCC standard at the beginning of each working day. The 8000- and 600-series methods CCC standard acceptance criteria are ± 15% difference from the true value. The 500-series methods specify a CCC standard at the beginning of each work day. An additional CCC standard, different in concentration from the initial standard, must be run at the end of the work day when using the external standard calibration technique for methods 507, 508, and 515.1. The acceptance criteria for these CCC standards is ± 20% difference from the true value. The 500-series methods allow a single point calibration as an alternative as long as the response produced by an unknown in the sample extract is ± 20% of the standard response.

If the CCC standard fails acceptance criteria, another CCC standard may be analyzed. If the second standard also fails, the initial calibration must be repeated.

The above calibration procedures meet or exceed EPA method requirements.

The CLP protocol differs from the other EPA methodologies. Calibration curves with a minimum of three points are kept on record at the lab. The CLP statements of work for 2/88 and 3/90 (OLM01.6) are followed as written.

9.4.4 GC/Mass Spectrometer

Hardware tuning is performed on each GC/MS prior to calibration as specified in the applicable EPA methods. Ion abundance acceptance criteria for semivolatile GC/MS tuning with DFTPP and volatile tuning with BFB are given below. Mass calibration is performed as an integral part of tuning. Tuning is performed at the beginning of each 12-hour clock for each GC/MS in accordance with EPA methods.

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION (DFTPP)	
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

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION BROMOFLUOROBENZENE (BFB)	
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 at instrument startup and whenever a CCC standard fails acceptance criteria. A five-point standard curve is prepared containing all target compounds. Concentrations are those defined by CLP, which are also appropriate for other EPA methodology.

Response factors are generated for each compound. The acceptance criteria used to assess the calibration are those specified in SW-846 for the 600- and 8000-series methods and in the various CLP SOWs for CLP analyses. These are as follows:

Semivolatiles		
	Initial Calibration	Continuing Calibration Check
625 and 8270	< 30% RSD for CCCs	≤ 30% difference for CCCs
Semivolatile CLP 2/88 SOW	< 30% RSD for CCCs	≤ 25% difference for CCCs
625, 8270, CLP 2/88 SOW	≥ 0.050 SPCCs	≥ 0.050 for SPCCs
CLP 3/90 SOW	As specified in 6/91 Revision of Method (OLM01.6)	
525	≤ 30% RSD or alternatively generate linear, 2nd order, or 3rd order calibration curve	≤ 30% difference or alternatively (using analyst discretion), all analytes fall on the curve from the initial calibration

Volatiles		
	Initial Calibration	Continuing Calibration Check
624	< 30% RSD for CCCs	20 ug/L standard meets limits specified in Q Table
8240 + CLP 2/88 SOW	< 30% RSD for CCCs	≤ 25% difference for CCCs
624, 8240, CLP 2/88 SOW	≥ 0.300 for SPCCs (except Bromoform ≥ 0.250)	≥ 0.300 for SPCCs (except Bromoform ≥ 0.250)
CLP 3/90 SOW	As specified in 6/91 Revision of Method (OLM01.6)	
524.2	≤ 20% RSD or alternatively generate linear, 2nd or 3rd order curve	± 30% difference or alternatively) using analyst discretion), all analytes must fall on the curve from the initial calibration

CCC standards are analyzed at the intervals specified in the methods. These intervals are as follows:

1. 500-series -- every 8 hours
2. 600-series -- every working day
3. CLP & 8000-series -- every 12 hours.

If the CCC standard fails acceptance criteria, another CCC standard may be analyzed. If the second standard also fails, the initial calibration must be repeated.

Sample quantitation is based on the average RF or curve (when RTE data systems are not available) from the initial calibration for 500-, 600-, and 8000-series methods and the single point RF from the continuing calibration standard for CLP.

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.

2-Chloroethyl vinyl ether exhibits erratic chromatographic behavior. The Supelco, Inc. Purgeable A Mixture footnotes 2-chloroethyl vinyl ether with the following: "Due to instability of 2-chloroethyl vinyl ether, we cannot guarantee the concentration of this component." These problems with 2-chloroethyl vinyl ether impact the ability of SL to consistently

analyze for this compound within the method requirements or PQL. If the requirements or PQL cannot be met for 2-chloroethyl vinyl ether, the appropriate flag should accompany the data for this compound in the report.

9.4.5 High Performance Liquid Chromatographs

Initial calibration is performed at instrument startup, following instrument maintenance or change in conditions, and whenever CCC fails acceptance criteria.

A three-point curve is prepared for 500- and 600-series methods. Five points are used for 8000-series methods. The low standard is near the PQL and the high standard defines the usable linear range of the detector.

After the three- or five-point standards are analyzed, response factors are generated by the data systems or manually. Due to limited data system capabilities, RSD criteria of 10% for the 600-series methods and 20% for the 500- and 8000-series methods are applied. If the maximum RSD criteria are met, the average RF is used for quantitation.

A CCC using a mid-level standard is performed at the beginning of each working day and after every ten samples. Acceptance criteria are less than or equal to 10% difference from the average RF for the 600-series methods, $\leq$ 20% D for the 500-series methods, and $\leq$ 15% D for the 8000-series methods.

If the CCC standard fails acceptance criteria, another CCC standard may be analyzed. If the second standard also fails, the initial calibration must be repeated.

9.5 Field Instrument Calibration

Calibration of field instrumentation (conductivity meters, pH meters, DO meters, and turbidimeters) is performed in the field prior to use, in accordance with the DER *Calibration and Use of Field Meter SOP*, revised Oct. 18, 1991. All calibration data are documented in a bound field notebook.

9.6 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.

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 any malfunction and the steps taken to correct the problem. 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. The frequencies of routine maintenance procedures for Savannah Laboratories' field instrumentation are given in Table 10.2.

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.

Equipment such as refrigerators, ovens, and incubators are not calibrated per se, but are periodically checked with calibrated thermometers. Refrigerators and incubators are checked twice daily and the temperatures documented in a notebook. Sample storage refrigerators must be 4 ± 2° C. All thermometers are calibrated annually against an NIST-certified thermometer.

Electronic analytical balances are calibrated daily with internal mechanisms if available. Calibration checks are performed and documented on all balances at least weekly with Class S weights and must meet the criteria given in Table 10.3.

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 instrument 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	A	
ICAP						
Profile	X					Profile on a daily basis.
Nebulizer	X					Inspect and clean. Replace tubing daily. Check flow rate.
Filters		X				Inspect and clean.
Spray Chamber			X			Inspect and clean.
Quartz Torch			X			Clean and realign.
D-Shaped Mirrors				X		Inspect mirror surface and replace if necessary.
SMITH-HIEFTJE FURNACE AA SPECTROPHOTOMETER						
Sapphire Window	X					Remove and clean with N-Propanol.
Flow Rate	X					Place 10 mL DI water in a 10-mL cylinder. Push Neb. Air button and run one minute. Flow should be 2.0 to 2.5 mL.
Graphite Tube	X					Replace if necessary and condition before use.
Quartz Windows	X					Clean window with lint-free cloth and distilled water.
Contact Rings and Plates				X		Replace contact rings if they are worn.
Filters		X				Remove filter from instrument, clean with water and mild soap.
ZEEMAN FURNACE AA SPECTROPHOTOMETER						
Check sampler syringe for air	X					Flush syringe if necessary.
Graphite Tubes	X					Replace if necessary and condition before use.
Graphite Electrodes				X		Replace contact rings if they are worn.
Quartz Windows	X					Remove and clean with lint-free cloth and DI water and/or alcohol.
CONTINUUM FURNACE AA SPECTROPHOTOMETER						
Quartz Windows	X					Remove and clean with lint-free cloth and DI water.
Graphite Tubes	X					Replace if necessary and condition before use.
Contact Rings and Plates				X		Replace contact rings if they are worn.
Filters		X				Remove filter from instrument, clean with water and mild soap.
D2 Arc Lamp				X		Check lamp. Adjust or replace as necessary.
TURBIDIMETER			X			Focus optics.
CONDUCTANCE METER				X		Inspect and replatinize cell as necessary.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
pH METER	X					Inspect probe membrane, filling solution level.
DRYING OVEN	X					Verify correct temperature with calibrated thermometer.
ANALYTICAL BALANCE		X				Check calibration with class S standard metric weights. Annual inspection.
TOP LOADER BALANCE		X				Check calibration with class S standard metric weights. Annual inspection.
ION CHROMATOGRAPH						
AS3 Column				X		Inspect quarterly or as required.
AS3 Guard Column				X		Inspect quarterly or as required.
Pump Pistons					X	Inspect annually.
AUTOANALYZER						
Pump Platen		X				Inspect weekly and replace as required.
Pump Tubes	X					Inspect and replace as needed.
Flow Cell		X				Inspect and clean.
BLOCK DIGESTOR				X		Check calibration against thermometer.
UV/VIS SPECTROPHOTOMETER					X	Semiannual check for wavelength verification.
IR SPECTROPHOTOMETER		X				Inspect and clean exposed optics weekly, if necessary.
ION SELECTIVE ELECTRODE			X			Inspect and polish electrode.
BOMB CALORIMETER		X				Inspect seals, replace if necessary.
DISSOLVED OXYGEN METER	X					Check probe membrane for deterioration. Replace as necessary.
BOD INCUBATOR	X					Temperature checked twice daily.
BACTERIOLOGICAL INCUBATOR	X					Temperature checked twice daily.
AUTOCLAVE		X				Seals inspected and replaced as necessary.
WATERBATH	X					Temperature checked twice daily.
TCLP EQUIPMENT				X		Check rotation rate quarterly.
GAS CHROMATOGRAPH - SEMIVOLATILES						
Autosampler System	X					Check daily for correct operation. Syringe and tubing solvent cleaned daily. Needles and tubing replaced as needed.
Septa	X					Replace autosampler septa daily and injector as needed.
GC Columns (Packed)		X				Change glass wool plugs at front of column.
GC Capillary Columns	X					Inspect daily. Change glass sleeve insert as needed and cut front of column if necessary.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
ECD					X	Semiannually cleaned and leak tested by service technician.
FID					X	In-house cleaning as needed.
Carrier Gases		X				Tanks are changed when pressure reads 500 to ensure purity.
Oxygen Trap				X		Inspect and replace as necessary.
GAS CHROMATOGRAPH - VOC						
Column	X					Checked daily. Repack glass wool and replace column as needed.
Septum	X					Checked daily. Replace as necessary.
Gas Tank	X					Levels checked daily. Replace when pressure < 500 psi.
Oxygen/Moisture Trap				X		Inspect and replace as necessary.
Particulate Trap					X	Checked and replaced if problem in GC flow rate.
Hall Detector	X					Checked daily for proper operation and response.
FID	X					Checked daily for proper operation and response.
PID	X					Checked daily for proper operation and response.
GC/MS						
Column	X					Front portion of column checked/maintained daily for contamination; replace every 1 month or as needed.
Septum	X					Changed daily.
Injection Port Liner	X					Changed daily.
Splitless Disc	X					Changed daily.
Autosampler	X					Checked daily for proper function.
Rough Pump				X		Oil changed to ensure proper operation.
Turbo Pump				X		Turbo molecular pump oiled as needed by instrument service representative.
Mass Spectrometer				X		Cleaning of source every 1 month or as needed.
Tape Head					X	Cleaned after each tape.
Tape Drive					X	Cleaned annually.
PURGE AND TRAP						
Sorbent Trap	X					Checked daily. Replace and condition as necessary.
Purge Flow	X					Checked daily, adjust as needed.
Gas Tank	X					Check daily.

TABLE 10.1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
TOC ANALYZER						
Pump Tubes		X				Inspect and replace if necessary.
Flow rate			X			Check and adjust if necessary.
Detector Windows					X	Check and clean if necessary.
TOX ANALYZER						
Pyrolysis Tube		X				Inspect and clean or replace if necessary.
Electrodes		X				Inspect and clean if necessary.
Electrolyte	X					Replace as necessary.
HPLC SYSTEMS						
Pumps	X					Filter all solvents, water, and extracts if pressure buildup occurs. Visual leak check. Prime pumps at startup.
Pumps				X		Inspect seals, replace as needed.
Columns	X					Check for pressure buildup; store with ends capped in appropriate mobile phase. Visual leak check.
Detector fittings	X					Visual leak check.
Detector optics	X					Inspect removable filters for dust, fingerprints. Clean as needed.
Detector optics					X	Replace lamps as needed.
Autosampler	X					Checked daily for proper operation. Clean, lubricate moving parts as needed.
Gases for sparging and autosampler operation		X				Change tanks when pressure reads 500 psi.
TENNELEC LB5100						
Sample changer				X		Inspect moving parts, lubricate as needed.
Detector	X					Checked daily for proper operation and response. Serviced by manufacturer only.
Detector gas			X			Change tank when pressure reads 500 psi. Allow new tanks to dissipate radon for two weeks before use.
Flow meter	X					Checked daily for proper operation.

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 and replace cell as needed.
CONDUCTANCE METER YSI 33				X		Inspect and replatinize cell as necessary.
FISHER AND ORION pH METERS	X					Inspect probe membrane, filling solution level.
YSI MODEL 50B/51B DISSOLVED OXYGEN METER	X					Check probe membrane for deterioration. Replace as necessary.
CORNING CHECKMATE 90 pH/SC/DO/T° METER	X					Check probe, call, membrane.
FISHER/SLOPE WATER LEVEL METERS	X					Check probe cord for integrity/cleanliness, meter for response.

TABLE 10.3

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	± 0.10 g

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 analyses; and validation and reporting of results. Field and laboratory quality control checks are part of each sampling trip and laboratory analysis and meet or exceed all FL DER requirements. Without the proper quality control procedures, analyst and method performance cannot be measured.

11.1 Field QC Checks

Savannah Laboratories recommends to their clients that proper control procedures meet or exceed FL DER field QC requirements. If particular field method QC requirements are more stringent than the general procedures given below, the method QC requirements are followed.

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 <u>minimum</u> field blank requirements necessary to assure the validity and integrity of any sampling episode.

If the client requires or submits field QC check samples, these will be analyzed for the same parameters as the accompanying samples (or per 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. Unless requested by clients or required by a project specific QA plan, lab QC deliverables are not provided for field QC check samples.

11.1.1 Trip Blanks

PURPOSE: The trip blank is to be used when sampling for volatile organics and other sensitive parameters. 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 transport and accompany the samples to the laboratory. Subsequent blanks (field and equipment) for volatile organics should use the same source water as the trip blanks, unless the water used for field and equipment blanks can be proven equivalent.

FREQUENCY: One trip blank for each volatile organic analysis (601, 602, 624, etc.) shall 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).

NOTE: The water for VOA field blanks should be equivalent to the trip blank water (see Trip Blank Preparation).

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 required 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 are recommended for all parameter groups and matrices to be collected and analyzed.

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.

NOTE: The water used for volatile equipment blanks should be from the same or equivalent source as the trip blank water.

FREQUENCY: When less than five samples of a similar matrix are taken, one equipment blank prepared on-site for precleaned or field-cleaned equipment must be collected and analyzed for each parameter.

When five to ten samples of a similar matrix are taken, one equipment blank must be collected on field-cleaned equipment or one on-site blank must 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 must 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 must 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 when requested by the client or specified by a project specific QA plan. Savannah Laboratories recommends that a minimum of one duplicate or 10% of samples be taken for all parameter groups and matrices to be collected and analyzed.

11.1.5 Field QC Summary

The 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*	Not required	One
< 5	One*	One*	Not required	Not required

* Note: For nine or fewer samples, one equipment blank is required from either precleaned or field-cleaned equipment.

If any equipment is cleaned in the field, the blank is to 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 sample. The acceptance criteria for each type of control sample are defined in the appropriate SOP. These acceptance criteria are determined from historical data, and meet the EPA CLP acceptance criteria as a minimum. The control samples are analyzed in the same manner as the field samples. QC check samples are analyzed on an analytical batch frequency unless otherwise stated. An analytical batch is defined as a group of samples which are processed as a unit. If the number of 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. Blind QC check samples are analyzed at a minimum in duplicate and at least semiannually. Results of any unacceptable QC check sample results obtained during DER-reportable project analysis are submitted to DER QAS in the project report as discussed in Section 15.

If particular laboratory method QC requirements are more stringent than the general procedures given below, the method QC requirements are followed.

11.2.1 Organics

Method Blanks: A method blank will be run for each batch of samples. A blank is a clean sample (containing no reportable analyte).

Lab Control Standards: Blank spikes or lab control standards will be run with each batch of samples processed.

Surrogates: Appropriate surrogates (see Tables 5.1 and 5.2) will be added to all samples, standards and blanks.

Matrix Spikes: Matrix spikes will be run with each batch at a frequency of 5% of samples. The CLP matrix spiking compounds will be used for all GC/MS semivolatile, volatile and chlorinated pesticides/PCB analyses (by GC). Appropriate matrix spikes will be used for other chromatographic methods.

Matrix Spike Duplicates/Sample Duplicates: Duplicate samples or matrix spikes will be run with each batch or 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.

11.2.2 Inorganic and General Chemistry

Calibration Blanks: Calibration blanks are nondigested blanks which are run at a frequency of 10% of samples.

Method Blanks: Method blanks should be run with each batch at a frequency of 5% of samples of the same matrix.

Lab Control Standards: Blank spikes or lab control standards will be run with each batch of samples processed.

Matrix spikes: Matrix spikes will be run at a frequency of 5% of samples.

Duplicates: Duplicate samples or duplicate matrix spikes will be run at a frequency of 5% of samples.

In cases where batch QC is sufficient, the matrix spike/duplicate will be on a field replicate (if available) or a laboratory provided sample of the same matrix. In the case of nonliquid inorganics, the digestion blank or extraction blank will be spiked.

Cost for analyses of batch QC matrix spikes/duplicates, laboratory blanks and blank spikes (lab control standards) are included in the individual costs for analysis.

For CLP protocols or other cases where "sample specific" (non-batch) QC is required, matrix spike/duplicates will be conducted on replicate samples provided by the client. In this case, matrix spikes/duplicates analysis will be invoiced as samples. If the client does not provide sufficient sample replicates for matrix spikes/duplicates, laboratory generated samples will be provided.

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, <0.1 mg/L; trace metals (total Cd, Cr, Cu, Ni, Pb, Zn), annually, < 1.0 mg/L; conductivity, daily < 1.0 umho/cm; heterotrophic plate count, monthly, < 1000 CFU/mL; and suitability (inhibiting residue), annually or for each new lot of detergent, ratio between 0.8 and 3.0.

Other laboratory QC practices are utilized to provide accurate microbiological results. These include the use of autoclave tape to insure 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. Positive controls are analyzed in association with ONPG-MUG analyses for total coliform monthly or upon receipt of a new lot of reagents.

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 blank is added to a lauryl tryptose broth tube for a blank for each analytical run.

11.3 Routine Method Used to Assess Precision and Accuracy

Control charts (Figures 11.1 and 11.2) for precision and accuracy are setup for each parameter immediately after the method is validated. Control charts are based on procedures in *The Handbook for Analytical Quality Control in Water and Wastewater Laboratories* (EPA, 1979) and contain both "Warning Limits" ($\pm$ 2 standard deviations) and "Control Limits" ($\pm$ 3 standard deviations). The initial limits used for a parameter are the values obtained from the method validation procedure (*40 CFR Part 136*). Control limits are updated annually for all parameters. A minimum of ten data points is used to update these limits. Formulas used for calculations of precision and accuracy are provided in Section 5.0.

Accuracy and precision limits are established for a specified concentration range. Concentration is divided into three ranges: low, mid, and high. Low level is defined as concentrations from the minimum detection limit to a level five times the MDL. Mid level is defined as the mean level between the minimum detection level and the upper and of the linear range. High level is defined as the concentration at the upper end of the linear range. Further information on these ranges is found in Section 9. The procedures used to determine the precision and accuracy targets in Section 5 are given in Table 11.1.

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 prepared spikes or standards in reagent water at levels 3-5 times the estimated detection limit. The standard deviation of the seven replicate measurements is calculated, and the MDL is computed by multiplying this standard deviation by 3.14 (the Student's t value appropriate for a 99% confidence level with seven replicates).

The method detection limit (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 confidence that the analytical concentration is greater than zero.

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 are not useful in reporting data for most environmental samples. Thus, practical quantitation limits (PQLs) are used for reporting a non-detected parameter. PQLs are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

The new term from SW-846, Estimated Quantitation Limits (EQL) is used interchangeably with PQL. In all cases, PQLs are greater than MDLs. When PQLs are defined in SW-846 or the CLP protocols (CRDLs), these defined PQLs are generally used in data reporting provided they are achievable and within the range of 10 times the standard deviation used in determining the MDL and 10 times the MDL.

FIGURE 11.1

EXAMPLE OF CONTROL CHART FOR % RECOVERY

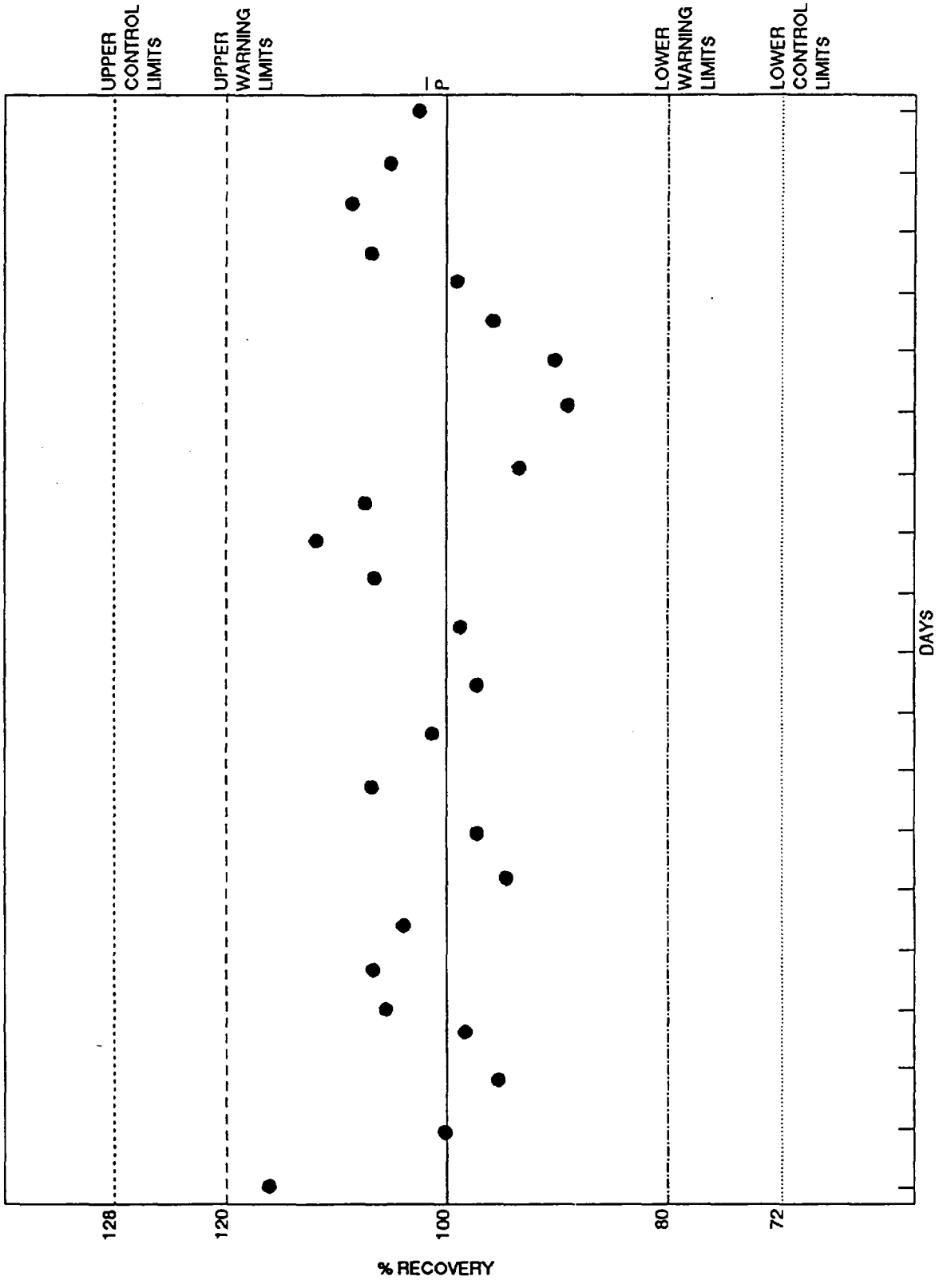


FIGURE 11.2

EXAMPLE OF CONTROL CHART FOR % RPD

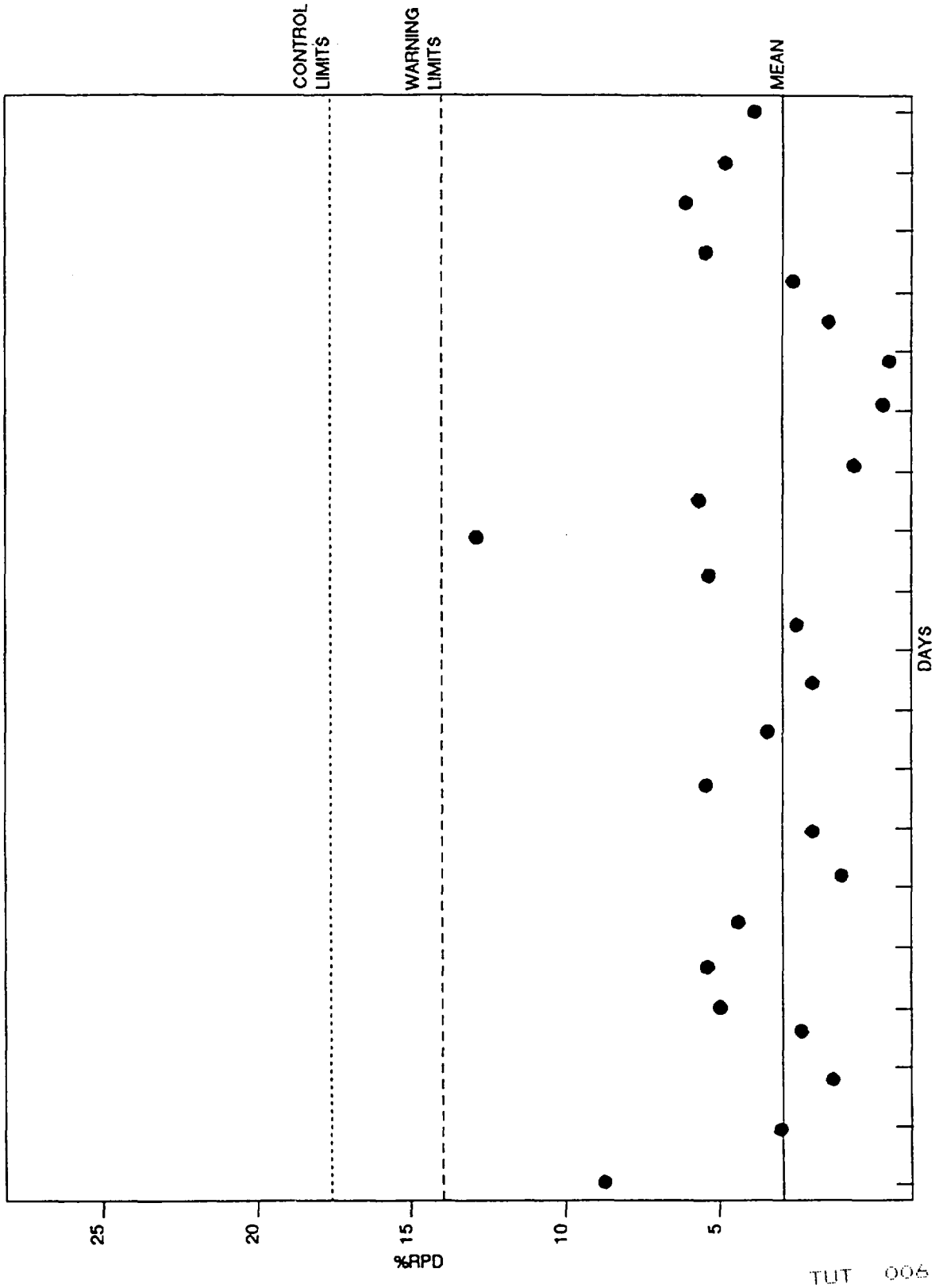


TABLE 11.1

Methods used to Generate Accuracy and Precision Targets

Method	Purpose	Concentration Level	Method References
Quality Control Check Standards (QCCS)	Accuracy	Mid Level	All metal, general, and organic methods for which a QCCS is available.
Quality Control Check Standards (QCCS)	Precision	Mid Level	All metal, general, and organic methods for which a QCCS is available.
Duplicate Samples	Precision	Mid Level	All methods for which a QCCS is not available
Matrix Spikes	Accuracy	Mid Level	Methods for project- or agency-specific requirements.
Matrix Spike Duplicates	Precision	Mid Level	Methods for project- or agency-specific requirements.

12.0 DATA REDUCTION, REVIEW, AND REPORTING

12.1 Introduction

In order to provide the highest quality data possible, an extensive system for 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 sample custodians, 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. The data manager or the project manager then notifies the client 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 twice daily for temperature.

12.3 Organization and Initiation of Sample Analyses

The key to Savannah Laboratories' sample flow, analysis, data and QA review and 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.

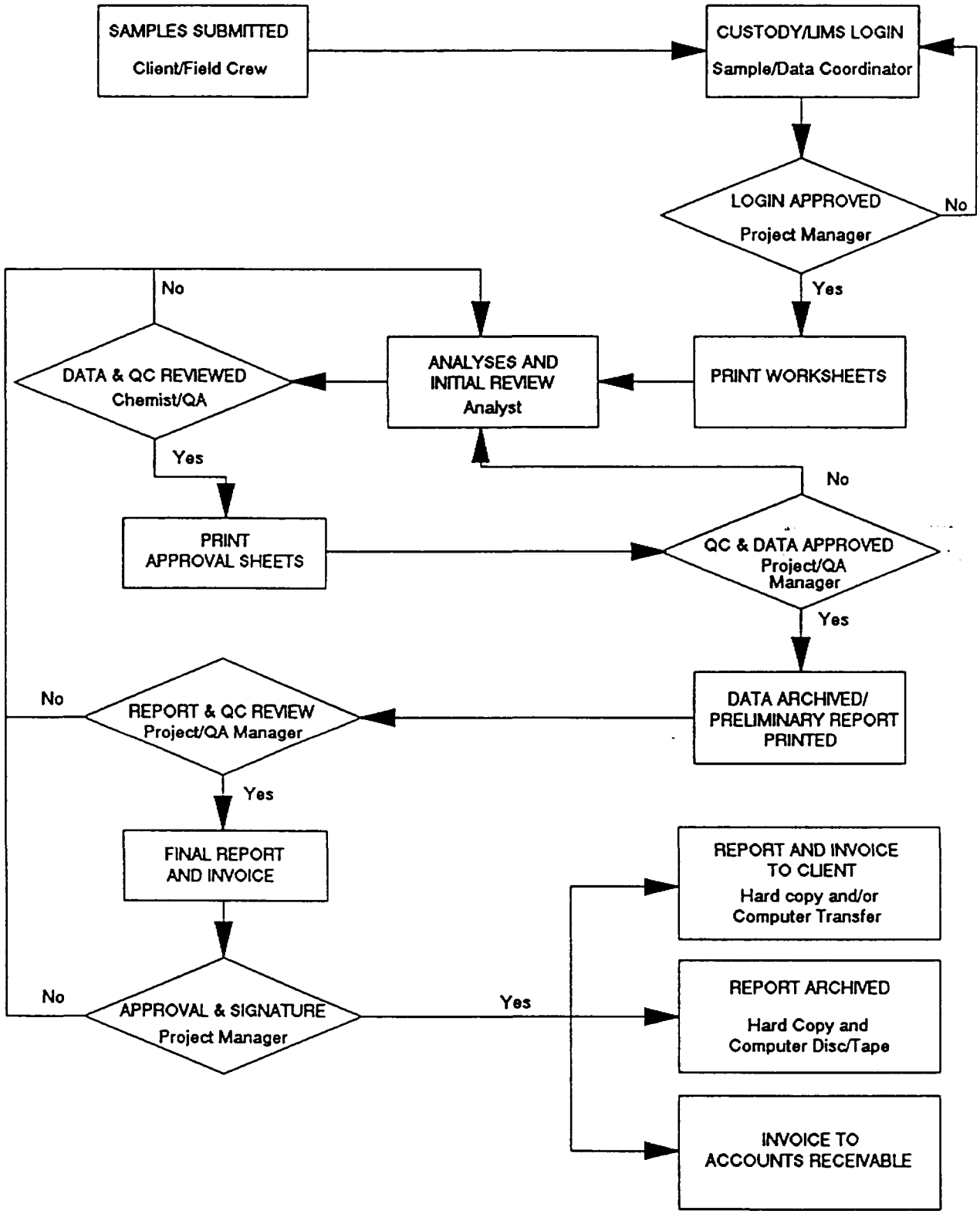
Upon receipt of custody forms, the project manager instructs data management personnel to log the sample analysis request and identification into the LIMS. The LIMS is based on an ADDS Mentor 7000 computer (NCR) which links the Tallahassee, Mobile, Deerfield Beach, Tampa, and Savannah facilities via telephone multiplex. This enables any project manager, section manager, QA manager, laboratory director, or chemist with authority to access projects to check the status of a project.

If special handling or data packaging is required, the QA department receives copies of the custody forms and computer acknowledgement and then initiates a QA project file and determines the sample batching. A sample delivery group (SDG) sheet is established and distributed to all affected departments including the various laboratory chemists, 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 three times weekly.

Figure 12.1

FLOW CHART OF SL COMPUTERIZED LABORATORY INFORMATION MANAGEMENT SYSTEM (LIMS)



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 bound 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. All soil/solid waste concentration results for all laboratory sections must be calculated on a dry weight basis prior to reporting by dividing the instrument result by the dry weight fraction.

Other than the cases discussed above, data obtained by the following method/instrument are directly reportable: volatile GC, volatile GC/MS, semivolatile GC/MS, metals ICP, metals AA, general chemistry automated colorimetry, TOC, DO, turbidity, and pH.

Methods data requiring reduction prior to reporting include semivolatile GC, titrimetric methods, BOD, COD, conductivity, manual UV/VIS/IR, residue, and TOX.

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.

All laboratory pH meters are temperature compensated. Laboratory conductivity is always measured at 25°C.

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 field pH and conductivity meters are temperature compensated. Cell constants for field conductivity meters are determined by laboratory personnel annually as given in Section 9.4.2. 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.

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
BN/A Extractables by GC/MS [Internal Standard Method (625 and 8270)]	**Water**	**Solid***
Response Factor (RF) = $\frac{As \times Cis}{Ais \times Cs}$ As = area of the characteristic ion of standard Ais = area of the characteristic ion of internal standard Cs = concentration of standard (ug/L) Cis = concentration of the internal standard (ug/L) Water Conc., ug/L = $\frac{As}{Ais} \times \frac{Cis}{RF}$ As = area of the characteristic ion (sample) Ais = area of the characteristic ion (internal standard) Cis = concentration of the standard (ug/L) RF = response factor Sediment Conc., ug/kg = $\frac{\text{ug of internal standard}}{\text{(kg of sample)(\% solids x .01)}} \times \frac{As}{Ais} \times \frac{1}{RF}$ As = area of the characteristic ion (sample) Ais = area of the characteristic ion (internal standard) RF = response factor	ug/L (or mg/L)	ug/kg (or mg/kg)
VOC by GC/MS [Internal Standard Method - See section on BN/A]		
VOCs by GC		
Response Factor (RF) = $\frac{\text{ug/L of compound to be measured}}{\text{peak height}}$ Water Conc., ug/L = RF x peak height x dilution factor Sediment Conc., ug/L = RF x $\frac{\text{peak height x liter equivalent of std. volume}}{\text{(kg of sample)(\% solids x .01)}}$	ug/L (or mg/L)	ug/kg (or mg/kg)
Pesticides/PCBs and Other GC Procedures		
Response Factor (RF) (Standard) = $\frac{\text{ug of analyte}}{\text{peak area}}$ Water Conc., ug/L = RF x peak area x $\frac{\text{extract volume in uL}}{\text{(liters of sample extracted)(injection volume in uL)}}$ Sediment Conc., ug/kg = RF X peak area x $\frac{\text{extract volume in uL}}{\text{(kg of sample extracted)(\% solids x .01)(injection volume in uL)}}$	ug/L (or mg/L)	ug/kg (or mg/kg)

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
Metals	**Water**	**Solid***
Calibration curve construction $y = mx + b$ y = absorbance m = slope = $\frac{\text{absorbance}}{\text{concentration}}$ x = concentration (mg/L) b = y intercept Calculation of water sample concentration Water Conc., ug/L = $\frac{y - b}{m}$ x dilution factor Sediment Conc., mg/kg = mg/L x dilution factor x $\frac{\text{final volume (liters) of digest}}{\text{(kg of sample)(\% solids x .01)}}$	ug/L (or mg/L)	ug/kg (or mg/kg)
UV/VIS and IR Procedures		
Calibration curve construction (see metals) Water Conc., mg/L = $\frac{y - b}{m}$ x dilution factor Sediment = mg/L x $\frac{\text{liters of leachate (or digest)}}{\text{(kg of sample)(\% solids x .01)}}$ Conc.	mg/L	mg/kg
General Titrimetric Procedures		
Analyte, mg/L = $\frac{N_{titrant} \times \text{Titer}}{\text{Vol. of sample titrated}} \times \text{eq. wt.} \times 1000$	mg/L	
BOD		
BOD, mg/L = $\frac{\text{(Int. DO - Final DO) - Seed Correction Factor}}{\text{Vol. fraction of sample}}$	mg/L	
COD		
COD, mg/L = $\frac{\text{(Blk titer - sample titer)} \times N_{FAS} \times 8000}{\text{Vol. of sample, mL}}$	mg/L	

TABLE 12.1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

Equations	Reporting Units	
Conductivity	**Water**	**Solid***
Cell constant = $\frac{1000}{\text{Observed conductivity of 1000 - } \mu\text{S/cm std.}}$	µS/cm	
Residue		
Residue, mg/L = $\frac{\text{Total wt. - Wt. of dish or filter}}{\text{Vol. of sample, L}}$	mg/L	
TOX		
TOX, µg/L = (C1 + C2 - 2C3) X $\frac{1000\ \text{mL}}{\text{Vol. of sample}}$ TOX, mg/kg = $\frac{\text{instrument reading}}{\mu\text{L injected}}$ X $\frac{5}{\text{dry wt. fraction}}$	mg/L	mg/kg

* Data for solid or semisolid sample are reported on a dry weight basis.

12.4.2 Chromatographic and Data File Identification

Chromatograms and data files are given a unique alphanumeric identification by the chemists 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 sectional worksheets after review. The worksheet data are entered into the LIMS by the data entry technicians.

After the data are entered into the LIMS, project manager approval sheets are printed and the project managers and one of the data managers check each worksheet against the information entered into the LIMS for transfer errors and anomalies.

12.5.2 Data Review

Laboratory analytical results are reviewed by the chemist responsible for the analysis and/or a peer chemist 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 chemist 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.

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 5.3, and that field data are entered accurately on worksheets.

For reports on which QA deliverables are required, data flags are used 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 the data qualifiers 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 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, the QA department also reviews the project report and the raw data. This includes checking to ensure that holding time requirements are met, reviewing internal chain of custody, recalculating results and detection limits, checking calibrations, reviewing all quality control data and/or control charts, and initiating any corrective action or reanalyses that might be appropriate.

If requested, the data packages are paginated, copied, and bound by the QA staff.

12.6 Reporting

The final report is printed and signed by the project manager after all review has been completed.

Figures 12.2 - 12.5 are examples of RESULTS ONLY SL Level 0, SL Level 1, SL Level 2, and SL Level 3 (CLP equivalent) typical reports for liquids samples. For CLP parameters, the CLP forms from the CLP SOW are generated by instrument software and are submitted to the client. If requested by the client or a project specific QA Plan, hybrid/custom reports or CLP data packages with diskette deliverables can be provided. All LIMS reports can be downloaded onto diskettes or most client's computers.

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 data packaging is requested, a paginated, copied, and bound 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.

12.7 Data Storage

The raw data are stored in metal filing cabinets at each work station until the cabinets are filled to capacity. The data are then transferred to a secured area and filed chronologically by laboratory section in banker's boxes for a period of 3-5 years. 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.

Hard copies of all reports are maintained for 3-5 years in client file. All LIMS reports and associated QC data are kept for a minimum of three years on the LIMS hard discs or magnetic tape. All data on the LIMS are backed up daily on magnetic tape.

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.

Keys to the data storage areas are retained by the QA staff and the section/department managers.

FIGURE 12.2

EXAMPLE OF RESULTS ONLY REPORT

LOG NO: SE-00010

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL 0 (Results only) Report
Sampled By: Client

REPORT OF RESULTS Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00010-1	Water Sample 1 (Collected 2-21-91)

PARAMETER	00010-1
Purgeable Halocarbons (601/8010)	
Bromodichloromethane, ug/l	<1.0
Bromoform, ug/l	<1.0
Bromomethane, ug/l	<1.0
Carbon Tetrachloride, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
Chloroethane, ug/l	<1.0
2-Chloroethylvinyl Ether, ug/l	<1.0
Chloroform, ug/l	<1.0
Chloromethane, ug/l	<1.0
Dibromochloromethane, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Dichlorodifluoromethane, ug/l	<1.0
1,1-Dichloroethane, ug/l	<1.0
1,2-Dichloroethane, ug/l	<1.0
1,1-Dichloroethene, ug/l	<1.0
Trans-1,2-Dichloroethylene, ug/l	<1.0
1,2-Dichloropropane, ug/l	<1.0
Cis-1,3-Dichloropropene, ug/l	<1.0
Trans-1,3-Dichloropropene, ug/l	<1.0
Methylene Chloride, ug/l	<1.0
1,1,2,2-Tetrachloroethane, ug/l	<1.0

LOG NO: SE-00010

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL 0 (Results only) Report
Sampled By: Client

REPORT OF RESULTS Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00010-1	Water Sample 1 (Collected 2-21-91)

PARAMETER	00010-1
Tetrachloroethene, ug/l	<1.0
1,1,1-Trichloroethane, ug/l	<1.0
1,1,2-Trichloroethane, ug/l	<1.0
Trichloroethene, ug/l	<1.0
Trichlorofluoromethane, ug/l	<1.0
Vinyl Chloride, ug/l	<1.0
Purgeable Aromatics (602/8020)	
Benzene, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Ethylbenzene, ug/l	<1.0
Toluene, ug/l	<1.0
Xylenes, ug/l	<1.0
Lead , ug/l	<5.0

Methods: EPA 40 CFR Part 136

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FIGURE 12.3

EXAMPLE OF SL LEVEL I REPORT

LOG NO: SE-00011

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL I Report
Sampled By: Client

REPORT OF RESULTS Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00011-1	Water Sample 1 (Collected 2-20-91)

PARAMETER	00011-1
Purgeable Halocarbons (601/8010)	
Bromodichloromethane, ug/l	<1.0
Bromoform, ug/l	<1.0
Bromomethane, ug/l	<1.0
Carbon Tetrachloride, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
Chloroethane, ug/l	<1.0
2-Chloroethylvinyl Ether, ug/l	<1.0
Chloroform, ug/l	<1.0
Chloromethane, ug/l	<1.0
Dibromochloromethane, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Dichlorodifluoromethane, ug/l	<1.0
1,1-Dichloroethane, ug/l	<1.0
1,2-Dichloroethane, ug/l	<1.0
1,1-Dichloroethene, ug/l	<1.0
Trans-1,2-Dichloroethylene, ug/l	<1.0
1,2-Dichloropropane, ug/l	<1.0
Cis-1,3-Dichloropropene, ug/l	<1.0
Trans-1,3-Dichloropropene, ug/l	<1.0
Methylene Chloride, ug/l	<1.0
1,1,2,2-Tetrachloroethane, ug/l	<1.0

LOG NO: SE-00011

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL I Report
Sampled By: Client

REPORT OF RESULTS Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00011-1	Water Sample 1 (Collected 2-20-91)

PARAMETER	00011-1
Tetrachloroethene, ug/l	<1.0
1,1,1-Trichloroethane, ug/l	<1.0
1,1,2-Trichloroethane, ug/l	<1.0
Trichloroethene, ug/l	<1.0
Trichlorofluoromethane, ug/l	<1.0
Vinyl Chloride, ug/l	<1.0
Purgeable Aromatics (602/8020)	
Benzene, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Ethylbenzene, ug/l	<1.0
Toluene, ug/l	<1.0
Xylenes, ug/l	<1.0
Lead , ug/l	<5.0

LOG NO: SE-00011

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL I Report
Sampled By: Client

REPORT OF RESULTS Page 3

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
00011-2	Method Blank
00011-3	Laboratory Control Standard (LCS) % Recovery
00011-4	Precision (% RPD from LCS)

PARAMETER	00011-2	00011-3	00011-4
Purgeable Halocarbons (601/8010)			
Bromodichloromethane, ug/l	<1.0	---	---
Bromoform, ug/l	<1.0	---	---
Bromomethane, ug/l	<1.0	---	---
Carbon Tetrachloride, ug/l	<1.0	---	---
Chlorobenzene, ug/l	<1.0	97 %	4.7 %
Chloroethane, ug/l	<1.0	---	---
2-Chloroethylvinyl Ether, ug/l	<1.0	---	---
Chloroform, ug/l	<1.0	---	---
Chloromethane, ug/l	<1.0	---	---
Dibromochloromethane, ug/l	<1.0	---	---
1,2-Dichlorobenzene, ug/l	<1.0	---	---
1,3-Dichlorobenzene, ug/l	<1.0	---	---
1,4-Dichlorobenzene, ug/l	<1.0	---	---
Dichlorodifluoromethane, ug/l	<1.0	---	---
1,1-Dichloroethane, ug/l	<1.0	---	---
1,2-Dichloroethane, ug/l	<1.0	---	---
1,1-Dichloroethene, ug/l	<1.0	99 %	2.9 %
Trans-1,2-Dichloroethylene, ug/l	<1.0	---	---
1,2-Dichloropropane, ug/l	<1.0	---	---
Cis-1,3-Dichloropropene, ug/l	<1.0	---	---
Trans-1,3-Dichloropropene, ug/l	<1.0	---	---

LOG NO: SE-00011

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL I Report
Sampled By: Client

REPORT OF RESULTS Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

00011-2 Method Blank
00011-3 Laboratory Control Standard (LCS) % Recovery
00011-4 Precision (% RPD from LCS)

PARAMETER	00011-2	00011-3	00011-4
Methylene Chloride, ug/l	<1.0	---	---
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---
Tetrachloroethene, ug/l	<1.0	---	---
1,1,1-Trichloroethane, ug/l	<1.0	---	---
1,1,2-Trichloroethane, ug/l	<1.0	---	---
Trichloroethene, ug/l	<1.0	101 %	1.3 %
Trichlorofluoromethane, ug/l	<1.0	---	---
Vinyl Chloride, ug/l	<1.0	---	---
Purgeable Aromatics (602/8020)			
Benzene, ug/l	<1.0	99 %	1.4 %
Chlorobenzene, ug/l	<1.0	---	---
1,2-Dichlorobenzene, ug/l	<1.0	---	---
1,3-Dichlorobenzene, ug/l	<1.0	---	---
1,4-Dichlorobenzene, ug/l	<1.0	---	---
Ethylbenzene, ug/l	<1.0	---	---
Toluene, ug/l	<1.0	103 %	2.7 %
Xylenes, ug/l	<1.0	---	---
Lead , ug/l	<5.0	100 %	10 %

Methods: EPA 40 CFR Part 136

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FIGURE 12.4

EXAMPLE OF SL LEVEL II REPORT

LOG NO: SE-00012

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL II Report
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
00012-1	Water Sample 1 (Collected 2-20-91)	02-20-91

PARAMETER	00012-1
Purgeable Halocarbons (601)	
Bromodichloromethane, ug/l	<1.0
Bromoform, ug/l	<1.0
Bromomethane, ug/l	<1.0
Carbon Tetrachloride, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
Chloroethane, ug/l	<1.0
2-Chloroethylvinyl Ether, ug/l	<1.0
Chloroform, ug/l	<1.0
Chloromethane, ug/l	<1.0
Dibromochloromethane, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Dichlorodifluoromethane, ug/l	<1.0
1,1-Dichloroethane, ug/l	<1.0
1,2-Dichloroethane, ug/l	<1.0
1,1-Dichloroethene, ug/l	<1.0
Trans-1,2-Dichloroethylene, ug/l	<1.0
1,2-Dichloropropane, ug/l	<1.0
Cis-1,3-Dichloropropene, ug/l	<1.0
Trans-1,3-Dichloropropene, ug/l	<1.0
Methylene Chloride, ug/l	<1.0
1,1,2,2-Tetrachloroethane, ug/l	<1.0

LOG NO: SE-00012

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL II Report
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
00012-1	Water Sample 1 (Collected 2-20-91)	02-20-91

PARAMETER	00012-1
Tetrachloroethene, ug/l	<1.0
1,1,1-Trichloroethane, ug/l	<1.0
1,1,2-Trichloroethane, ug/l	<1.0
Trichloroethene, ug/l	<1.0
Trichlorofluoromethane, ug/l	<1.0
Vinyl Chloride, ug/l	<1.0
Surrogate - Bromochloromethane, ug/l	94 %
Date Analyzed	02.22.91
Purgeable Aromatics (602/8020)	
Benzene, ug/l	<1.0
Toluene, ug/l	<1.0
Ethylbenzene, ug/l	<1.0
Total Xylenes, ug/l	<1.0
Methyl-Tert-Butyl-Ether (MTBE), ug/l	<1.0
Total Volatile Organic Aromatics, ug/l	<1.0
Surrogate - a,a,a-Trifluorotoluene , ug/l	97 %
Date Analyzed	02.22.91
Lead	
Lead , ug/l	<5.0
Date Analyzed	02.22.91

LOG NO: SE-00012

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL II Report
Sampled By: Client

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

00012-2 Method Blank
00012-3 Laboratory Control Standard (LCS) % Recovery
00012-4 Precision (% RPD from LCS)

PARAMETER	00012-2	00012-3	00012-4
Purgeable Halocarbons (601)			
Bromodichloromethane, ug/l	<1.0	---	---
Bromoform, ug/l	<1.0	---	---
Bromomethane, ug/l	<1.0	---	---
Carbon Tetrachloride, ug/l	<1.0	---	---
Chlorobenzene, ug/l	<1.0	108 %	2.2 %
Chloroethane, ug/l	<1.0	---	---
2-Chloroethylvinyl Ether, ug/l	<1.0	---	---
Chloroform, ug/l	<1.0	---	---
Chloromethane, ug/l	<1.0	---	---
Dibromochloromethane, ug/l	<1.0	---	---
1,2-Dichlorobenzene, ug/l	<1.0	---	---
1,3-Dichlorobenzene, ug/l	<1.0	---	---
1,4-Dichlorobenzene, ug/l	<1.0	---	---
Dichlorodifluoromethane, ug/l	<1.0	---	---
1,1-Dichloroethane, ug/l	<1.0	---	---
1,2-Dichloroethane, ug/l	<1.0	---	---
1,1-Dichloroethene, ug/l	<1.0	100 %	1.8 %
Trans-1,2-Dichloroethylene, ug/l	<1.0	---	---
1,2-Dichloropropane, ug/l	<1.0	---	---
Cis-1,3-Dichloropropene, ug/l	<1.0	---	---
Trans-1,3-Dichloropropene, ug/l	<1.0	---	---

FIGURE 12.5

EXAMPLE OF SL LEVEL III REPORT

LOG NO: SE-00012

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL II Report
Sampled By: Client

REPORT OF RESULTS Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

00012-2 Method Blank
00012-3 Laboratory Control Standard (LCS) % Recovery
00012-4 Precision (% RPD from LCS)

PARAMETER	00012-2	00012-3	00012-4
Methylene Chloride, ug/l	<1.0	---	---
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---
Tetrachloroethene, ug/l	<1.0	---	---
1,1,1-Trichloroethane, ug/l	<1.0	---	---
1,1,2-Trichloroethane, ug/l	<1.0	---	---
Trichloroethene, ug/l	<1.0	93 %	1.3 %
Trichlorofluoromethane, ug/l	<1.0	---	---
Vinyl Chloride, ug/l	<1.0	---	---
Surrogate - Bromochloromethane, ug/l	98 %	97 %	4.5 %
Date Analyzed	02.22.91	---	---
Purgeable Aromatics (602/8020)			
Benzene, ug/l	<1.0	99 %	4.5 %
Toluene, ug/l	<1.0	102 %	6.7 %
Ethylbenzene, ug/l	<1.0	---	---
Total Xylenes, ug/l	<1.0	---	---
Methyl-Tert-Butyl-Ether (MTBE), ug/l	<1.0	---	---
Total Volatile Organic Aromatics, ug/l	<1.0	---	---
Surrogate - a,a,a-Trifluorotoluene , ug/l	99 %	104 %	5.9 %
Date Analyzed	02.22.91	---	---
Lead			
Lead , ug/l	<5.0	90 %	10 %
Date Analyzed	02.22.91	---	---

Methods: EPA 40 CFR Part 136
Case Narrative - No QC problems were encountered.

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TUT 006 0094

LOG NO: SE-00015

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL III Report (CLP Type)
Sampled By: Client

REPORT OF RESULTS Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00015-1	Water Sample 1 (Collected 2-20-91)

PARAMETER	00015-1
Purgeable Halocarbons (601)	
Bromodichloromethane, ug/l	1.0U
Bromoform, ug/l	1.0U
Bromomethane, ug/l	1.0U
Carbon Tetrachloride, ug/l	1.0U
Chlorobenzene, ug/l	1.0U
Chloroethane, ug/l	1.0U
2-Chloroethylvinyl Ether, ug/l	1.0U
Chloroform, ug/l	1.0U
Chloromethane, ug/l	1.0U
Dibromochloromethane, ug/l	1.0U
1,2-Dichlorobenzene, ug/l	1.0U
1,3-Dichlorobenzene, ug/l	1.0U
1,4-Dichlorobenzene, ug/l	1.0U
Dichlorodifluoromethane, ug/l	1.0U
1,1-Dichloroethane, ug/l	1.0U
1,2-Dichloroethane, ug/l	1.0U
1,1-Dichloroethene, ug/l	1.0U
Trans-1,2-Dichloroethylene, ug/l	1.0U
1,2-Dichloropropane, ug/l	1.0U
Cis-1,3-Dichloropropene, ug/l	1.0U
Trans-1,3-Dichloropropene, ug/l	1.0U
Methylene Chloride, ug/l	1.0U
1,1,2,2-Tetrachloroethane, ug/l	1.0U

LOG NO: SE-00015

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL III Report (CLP Type)
Sampled By: Client

REPORT OF RESULTS Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
00015-1	Water Sample 1 (Collected 2-20-91)

PARAMETER	00015-1
Tetrachloroethene, ug/l	1.0U
1,1,1-Trichloroethane, ug/l	1.0U
1,1,2-Trichloroethane, ug/l	1.0U
Trichloroethene, ug/l	1.0U
Trichlorofluoromethane, ug/l	1.0U
Vinyl Chloride, ug/l	1.0U
Surrogate - Bromochloromethane, ug/l	94 %
Date Analyzed	02.22.91
Purgeable Aromatics (602/8020)	
Benzene, ug/l	1.0U
Toluene, ug/l	1.0U
Ethylbenzene, ug/l	1.0U
Total Xylenes, ug/l	1.0U
Methyl-Tert-Butyl-Ether (MTBE), ug/l	1.0U
Total Volatile Organic Aromatics, ug/l	1.0U
Surrogate - a,a,a-Trifluorotoluene , ug/l	97 %
Date Analyzed	02.22.91
Lead	
Lead , ug/l	5.0U
Date Analyzed	02.22.91

LOG NO: SE-00015

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL III Report (CLP Type)
Sampled By: Client

REPORT OF RESULTS Page 3

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES
00015-2	Method Blank
00015-3	Laboratory Control Standard (LCS) % Recovery
00015-4	Precision (% RPD from LCS)

PARAMETER	00015-2	00015-3	00015-4
Purgeable Halocarbons (601)			
Bromodichloromethane, ug/l	1.0U	---	---
Bromoform, ug/l	1.0U	---	---
Bromomethane, ug/l	1.0U	---	---
Carbon Tetrachloride, ug/l	1.0U	---	---
Chlorobenzene, ug/l	1.0U	108 %	2.2 %
Chloroethane, ug/l	1.0U	---	---
2-Chloroethylvinyl Ether, ug/l	1.0U	---	---
Chloroform, ug/l	1.0U	---	---
Chloromethane, ug/l	1.0U	---	---
Dibromochloromethane, ug/l	1.0U	---	---
1,2-Dichlorobenzene, ug/l	1.0U	---	---
1,3-Dichlorobenzene, ug/l	1.0U	---	---
1,4-Dichlorobenzene, ug/l	1.0U	---	---
Dichlorodifluoromethane, ug/l	1.0U	---	---
1,1-Dichloroethane, ug/l	1.0U	---	---
1,2-Dichloroethane, ug/l	1.0U	---	---
1,1-Dichloroethene, ug/l	1.0U	100 %	1.8 %
Trans-1,2-Dichloroethylene, ug/l	1.0U	---	---
1,2-Dichloropropane, ug/l	1.0U	---	---
Cis-1,3-Dichloropropene, ug/l	1.0U	---	---
Trans-1,3-Dichloropropene, ug/l	1.0U	---	---

LOG NO: SE-00015

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL III Report (CLP Type)
Sampled By: Client

REPORT OF RESULTS Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

00015-2 Method Blank
00015-3 Laboratory Control Standard (LCS) % Recovery
00015-4 Precision (% RPD from LCS)

PARAMETER	00015-2	00015-3	00015-4
Methylene Chloride, ug/l	1.0U	---	---
1,1,2,2-Tetrachloroethane, ug/l	1.0U	---	---
Tetrachloroethene, ug/l	1.0U	---	---
1,1,1-Trichloroethane, ug/l	1.0U	---	---
1,1,2-Trichloroethane, ug/l	1.0U	---	---
Trichloroethene, ug/l	1.0U	93 %	1.3 %
Trichlorofluoromethane, ug/l	1.0U	---	---
Vinyl Chloride, ug/l	1.0U	---	---
Surrogate - Bromochloromethane, ug/l	98 %	97 %	4.5 %
Date Analyzed	02.22.91	---	---
Purgeable Aromatics (602/8020)			
Benzene, ug/l	1.0U	99 %	4.5 %
Toluene, ug/l	1.0U	102 %	6.7 %
Ethylbenzene, ug/l	1.0U	---	---
Total Xylenes, ug/l	1.0U	---	---
Methyl-Tert-Butyl-Ether (MTBE), ug/l	1.0U	---	---
Total Volatile Organic Aromatics, ug/l	1.0U	---	---
Surrogate - a,a,a-Trifluorotoluene , ug/l	99 %	104 %	5.9 %
Date Analyzed	02.22.91	---	---
Lead			
Lead , ug/l	5.0U	90 %	10 %
Date Analyzed	02.22.91	---	---

LOG NO: SE-00015

Received: 21 FEB 91

Example Client
333 Main St.
Savannah, GA 31404

Project: SL III Report (CLP Type)
Sampled By: Client

REPORT OF RESULTS Page 5

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES		
00015-5	Matrix Spike (% Rec)		
00015-6	Matrix Spike Duplicate (% Rec)		
PARAMETER		00015-5	00015-6
Purgeable Halocarbons (601)			
	Chlorobenzene, mg/l	98 %	100 %
	1,1-Dichloroethene, mg/l	104 %	102 %
	Trichloroethene, mg/l	95 %	98 %
	Surrogate - Bromochloromethane, mg/l	99 %	98 %
Purgeable Aromatics (602/8020)			
	Benzene, ug/l	94 %	96 %
	Toluene, ug/l	99 %	101 %
	Surrogate - a,a,a-Trifluorotoluene , ug/l	102 %	103 %
Lead			
	Lead , ug/l	98 %	100 %

Methods: EPA 40 CFR Part 136
See attached data package.

J. W. Andrews, Ph. D.

TUT 006 0099

CLP EQUIVALENT SUPPLEMENTAL DATA PACKAGE INCLUDES

1. Run sequence log

2. Five-point curves or data with chromatograms or instrument printouts

3. Daily check standard/continuing calibration form and standard chromatograms or instrument printouts

4. Sample spike, (LCS and matrix), method blank chromatograms, quant reports, and/or instrument printouts

5. Project narrative

13.0 CORRECTIVE ACTION

Corrective action will be initiated when data are determined to be questionable or QC criteria are out of control. For routine operational problems, the analysts correct the problem and note the problem/corrective action on the run log or bench data sheet. A Corrective Action Report (CAR) is not necessary unless the problem is recurring.

When formal corrective action is required, a Corrective Action Report (CAR) is prepared on the CAR form (Figure 13.1). CAR are required for:

1. Chronic problems which could affect data quality or production and are due to equipment or facility disrepair or inadequacy, improper training, employee attitude or ineptness, supply, reagent or standard quality, SOP inadequacy or error, or any other problems which could be corrected by management. CARs for this type of problem should be prepared by the analyst and channelled through the department manager/lab manager to the laboratory director. The box by "Request Lab Director's Attention" should be checked and final action should be taken by the lab director.

2. For uncorrectable nonconformance problems which are noted by an asterisk (*) in Table 13.1 which could affect the quality of report data, corrective action is initiated by the analyst or department manager. Before a CAR is prepared, the analyst/department manager will review raw data calculations, procedures, methods, operating conditions of the instrument and all data available. If this does not resolve the problem, analysis of the batch (samples plus QC samples) is repeated provided sufficient sample is available. If data are submitted in cases where QC is not in compliance, this is documented in a case narrative which is part of the data reports. The action must be approved by the project manager who submits the report.

3. When QA problems are discovered during data review, system audits, performance audits, audit sample results, client inquiries, external data review or validation, or audits, a CAR is prepared by the QA manager, and is filed for use in QA reports to management.

4. When QA data exceed the criteria in Table 13.2, the analyst or department manager initiates a CAR.

All CARs are filed in the departmental corrective action notebook which has a pending and completed section. Follow-up is checked weekly by the department manager and monthly by the QA manager.

If warning limits are exceeded, the department manager/supervisor points this out to the respective supervisors or chemists who attempt to define and correct the problem.

Savannah Laboratories will abide by any corrective action deemed necessary by all pertinent agencies.

FIGURE 13.1

CORRECTIVE ACTION REPORT (CAR)

Date Prepared: _____ Sample ID:)_____ SL Project ID:_____

Analysis: _____ Date of Analysis:_____

Analyst: _____ Department Manager: _____ Project Manager: _____

Description of Nonconformance/Condition:_____

_____

_____

_____

_____

_____

_____

_____

_____

Corrective Action Implemented: _____

_____

_____

_____

_____

_____

_____

_____

QA Manager's Initials: _____ Date of Approval: _____

☐ Request Lab Director's attention LD Initials: _____ Date: _____

☐ Request Project Manager's attention PM Initials: _____ Date: _____

Date Corrective Action Implemented: _____ By: _____

Corrective Action Follow-up/Comments: _____

_____

_____

_____

Corrective Action Completed: Department Manager's initials: _____ Date: _____

QA Manager's Initials: _____ Date: _____

Copies of this report should be filed in the laboratory Corrective Action Notebook.

TABLE 13.1

CORRECTIVE ACTION

	QC Activity	Acceptance Criteria	Recommended Corrective Action
*	GC/MS tuning or ICP/AA	Per SOPs or Chapter 9.0	Do not analyze samples unless criteria are met.
*	Initial calibration standards	Per SOPs or Chapter 9.0	Reanalyze standards. If still unacceptable, remake standards or instrument corrections.
*	QC check/continuing calibration standard	Per SOPs, See Chapter 9.0	Reanalyze standard. If still unacceptable, remake standards, or recalibrate.
*	Method blank	< PQL (for CLP procedures, use SOW guidelines)	Reanalyze blank. If problem, determine source of contamination. If necessary or possible, redigest/extract batch and reanalyze.
*	Surrogate recovery (GC/MS semivolatiles)	Tables 5.1 and 5.2. One acid and one base may be out of criteria.	Follow SW-846 method or CLP guidelines.
*	Surrogate recovery (GC/MS volatiles)	0 outside criteria in Tables 5.1 and 5.2	Follow SW-846 method or CLP guidelines.
	Surrogate recovery GC or LC	Tables 5.1 and 5.2	Criteria advisory only; check for possible matrix interferences or other causes.
	Matrix spike recoveries	Tables 5.1 and 5.2	Criteria advisory only; check for possible matrix interferences or other causes.
*	Lab control standard recoveries	Tables 5.1 and 5.2	Check calculations, reanalyze standards, and if necessary or possible, redigest or extract batch and reanalyze.

* If criteria cannot be met, a corrective action report (CAR) must be prepared and approved by QA manager and project manager.

TABLE 13.2

Corrective Action Report Criteria for Control Charts

Criteria	Corrective Action
A point outside ± 3 standard deviations	Check calculations. Report the deviation and results of preliminary investigation to the division manager, and the QA manager, who will decide jointly what action to take. Complete the Corrective Action Report and submit it to the department manager and QA manager for approval.
Obvious shift in the mean	Check calculations, data entry, standards, instrument, calibrations, etc. Document results in a Corrective Action Report.
Any 8 consecutive points are on the same side of the mean	Check accuracy of data entry and calculations. Document results in a Corrective Action Report. Have the report approved by the department, QA, and project managers.
Any 6 consecutive points are such that each point is larger (smaller) than its immediate predecessor	Check accuracy of data entry and calculations. Document results in a Corrective Action Report. Have the report approved by the department, QA, and project managers.
Any obvious cyclic pattern is seen in the points	Check accuracy of data entry and calculations. Document results in a Corrective Action Report. Have the report approved by the department, QA, and project managers.

14.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits are performed in each laboratory throughout the year.

14.1 Internal System Audits

14.1.1 Annual Corporate Audits

On an annual basis, an on-site systems audit is conducted on all aspects of the laboratory and field operations at each facility. This audit is coordinated by the president and is conducted by a multiperson audit team made up of individuals with expertise in the organic, inorganic, QA, project custody, data management, and field sampling areas, the corporate safety director, and a representative from the business office. This on-site audit may be supplemented by review of reports and QA data in the LIMS network and review of selected data packages. An audit report is issued by the team, to the president within two weeks of completion of the audit and a copy is provided by the QA manager to the lab director.

The annual system audits consist of an examination of laboratory procedures and documentation to ensure that the entire laboratory is being operated according to established protocol. The auditors will ensure that the proper frequency of quality control standards, spikes, duplicates, etc., are incorporated with each sample analytical run, and all results are documented, up to date, and accessible for review. Control charts are checked to ensure their proper maintenance. Calculations are spot checked and data procedures are reviewed to ensure SOPs are being followed, and special attention is given to calibration procedures. The systems audit check also ascertains whether proper documentation exists to trace working analytical standards back to stock standards. Finally, analysts' techniques are evaluated against techniques as defined in the SOPs, the SL Training SOP, and recognized good laboratory practices.

The QA manager and lab director respond to the audit and are responsible for following up on required corrective action.

14.1.2 Quarterly Internal Audits

Quarterly audits are conducted by lab QA managers. Results of these audits are used in preparation of quarterly reports to management. Responses and follow-up corrective actions are addressed by department managers and monitored by the lab QA manager.

14.1.3 Internal Systems Audit Checklist

Figure 14.1 is a page from a laboratory checklist used to conduct an internal systems audit at Savannah Laboratories. This particular example contains quality assurance questions directed to the custody section of the laboratory.

FIGURE 14.1

LABORATORY INTERNAL SYSTEMS AUDIT CHECKLIST		
	Yes	No
I. CU (Custody) Section Contacts: _____ _____		
A. Are comprehensive, up-to-date SOPs available for this section? Comments: _____ _____		
B. Are custody logbooks properly maintained? Comments: _____ _____		
C. Is sample preservation checked and documented on arriving samples? Comments: _____ _____		
D. Is the temperature of each lab pack recorded and documented upon arrival? Comments: _____ _____		
E. Are sample custody excursion forms used if required? Comments: _____ _____		
F. Are chain-of-custody forms properly filed? Comments: _____ _____		

14.2 External System Audits

Each laboratory is certified by several state agencies and governmental or private certification programs. The laboratories submit to external on-site audits by these certifying agencies or organizations.

Field system audits are performed periodically by various federal and state regulatory agencies. Field sampling and documentation procedures are examined to insure sampling is performed according to the protocols established in this document.

14.3 Performance Audits

14.3.1 Internal Performance Audits

The laboratory QA manager periodically schedules blind audit samples into the work flow. Major methods are tested by at least two internal audit samples annually. Audit samples are treated as actual samples and are logged into the LIMS. Results are entered into the LIMS and summarized by the QA manager and presented to the department managers, lab manager, and lab director. Problem results are addressed in corrective action and/or quarterly QA reports to management.

14.3.2 External Performance Audit

All facilities participate in the following performance evaluation audits quarterly:

1. U. S. EPA Water Supply Study (WS Series).
2. U. S. EPA Water Pollution Study (WP Series).

Additionally, the laboratories participate in several regulatory agency, certifying group, or client requested performance audits. Results from these performance audits are included in quarterly QA reports to management.

15.0 QUALITY ASSURANCE REPORTS

A summary report of the performance of the QA monitoring system is prepared by the QA manager on a quarterly basis. The report is due at the end of the calendar quarter, and copies of this report are distributed to the lab managers, lab director, and president. The lab director's copy should circulate to project managers, the lab manager's copy to department managers, and the president's copy to other corporate officers. A file copy is kept by the QA manager.

The QA summary report should contain, but is not limited to, the following:

- A one-page executive summary provides copies of uncompleted corrective actions which are more than one month old.
- Summaries of external system audits and any responses/corrective action to problems noted.
- Results of internal performance evaluation and corrective action.
- Results of external performance evaluation sample analyses and any responses/corrective action to deficiencies.
- Summaries of internal system audits and response/corrective action.
- Significant QA problems which may impact data quality or production (based on daily observations, external and internal data reviews and validations, and quarterly internal QA audits) and recommended solutions.
- Recommendations for changes in the standard laboratory operating procedures.

Also, reports of external audits and responses should be prepared by the QA manager as soon as possible and given to the appropriate project manager, lab director, and president if a significant QA problem is encountered. In this case, these external audit results need not be included in the quarterly QA summary report.

An annual QA assessment report is prepared by the QA manager and lab manager. This report is due October 31, addresses precision and accuracy limits, MDLs, PQLs, and major QA problems along with recommendations for improvement, and is submitted to the lab director and president for use in the updating of the QA plan.

External QA reports are submitted to DER QAS as provided for in Table VI, Appendix D of DER-QA-001/90. Each project-specific report is submitted at the recommended frequency, and includes a title page, a table of contents,

specific information for either the performance or systems audits, significant QA/QC problems, and corrective action status as described in Appendix D. If no project audits are performed and no significant QA/QC problems occur for the duration of a project requiring a DER QA report, a letter stating these facts will be submitted in lieu of the QA report.

16.0 PERSONNEL QUALIFICATIONS

Listing of Technical Employees:

SAVANNAH DIVISION

EMPLOYEE	DEGREE	TITLE
James W. Andrews	Ph.D.	President
Janette D. Long	BS	Vice President/Lab Director
Jay W. Andrews	BS	Controller/Secretary/Treasurer
Alan C. Bailey	Ph.D.	Quality Assurance Manager
Steven J. White	BS	Project Manager
Linda A. Wolfe	BS	Project Manager
Beverly Hughes	BS	Project Manager
Larry E. Phillips	BS	Computer Manager
Wayne Robbins	BS	Air Analysis Manager
Penny Carter	BS	Computer Programmer
Sheila B. Hoffman	BS	Data Manager
Virginia Baisden	MS	Field Sampling Manager
Derrick M. Simons	BS	Laboratory Manager
Ernest B. Walton	BS	Corporate Inorganic Manager
Karla J. Bier	BS	SG Manager
Karri L. Derr	BS	VG Manager
Mike Salum	BS	Organic Extraction Manager
Myron J. Young	BS	VM Manager
Paul E. Meyers	BS	Chemist/Corporate Safety Director
Kenneth R. Aegan	BS	Chemist
Lisa D. Aegan		Technician
Robert Bearden		Analyst
Jesse B. Blackwell, Jr.	BS	Analyst
Bernetha Brayboy	BS	Analyst
Nancy Brown	BS	Analyst
Laura R. Bulluck	BS	Analyst
Hsaio Lan Chang	MS	Analyst
Glen A. Coder	BA	Analyst
Katherine M. Cook	BS	Chemist
Nannette H. Dasher	BS	SM Supervisor
Kelly T. Durden	BS	Analyst
Dagmar Goley	BS	Inorganic CLP Coordinator
Sandra Grovenstein	BS	SM Supervisor
Robert K. Hamilton	BS	Chemist
Phillip S. Harvey	BS	Chemist

SAVANNAH DIVISION
(Continued)

EMPLOYEE	DEGREE	TITLE
Reginald H. Hendrix		Technician
Theresa Hornsby	BS	Analyst
Daphne Hughes	BS	Analyst
James Johnson		Analyst
Bernard Kirkland	BS	Chemist
G. Anthony Lowman	BS	Analyst
Carl E. Manning	BS	Chemist
Deborah McDonald		Analyst
Sarah A. McMillan	BA	Analyst
Kimberley D. McNeill	BS	Analyst
Michael W. Mullenix		Analyst
Susan K. Norwood	BS	Metals ICP/AA Supervisor
Everett W. Owens	BS	Chemist
J. Robert Paddison, Jr.	MS	VM Supervisor
Ruth D. Rankin	BS	Digestion Supervisor
Lorene E. Reeves	BS	Chemist
Michelle L. Long	BS	Chemist
Cynthia E. Schlag	BS	Chemist
Charles W. Schuman	BS	Analyst
Elizabeth R. Sicay	BA	Analyst
Julie L. Silvey	BS	Chemist
Angela F. Stewart	BS	Chemist
Melanie T. Walsh	BS	Chemist
Ashton A. Waters	BS	Analyst
Angela M. Weimerskirk	BS	General Lab Supervisor
Barry L. Williams	BA	Analyst
Millicent A. Williams	BS	Analyst
Laura Willman	BS	Chemist
Jeff Wilmoth	BS	Analyst
Angela Zealy	BS	Chemist

TALLAHASSEE DIVISION

EMPLOYEE	DEGREE	TITLE
Thomas L. Stephens	BS	Vice President/Project Manager
Janet B. Pruitt	MS	Lab Director/Project Manager
Wayne Word	BS	Project Manager
C. Henry Beauchamp	BS	Laboratory Manager
Elizabeth L. Schneider	BS	Quality Assurance Manager
Todd A. Baumgartner	BS	Inorganic Section Manager
David A. Karns	BS	GC/MS Manager
Bernard Ash	BS	Chemist
Brian Corbin	BS	Chemist
Robert D. Driver	BS	Analyst
Susan Harrison	BS	Chemist
D. Wayne Higgins	BS	Analyst
Mavis LaBounty	BS	Analyst
Andre Miley	BS	Analyst
Richard Orr	BA	Chemist
Tim Preston	BS	Chemist
Paul Rygiel	BS	Chemist
Deborah Sherwin	BS	Biological/General Supervisor
Richard Stephens	BS	Volatiles Section Manager
Martin Thomas		Technician
Dana B. Till	BS	Chemist

MOBILE DIVISION

EMPLOYEE	DEGREE	TITLE
Jesse L. Smith	BS	Lab Director/Project Manager
James M. Nance, Jr.	MS	Project Manager
Michele H. Lersch	BS	Quality Assurance Manager
Van Pham	Ph.D.	Laboratory Manager
Cora Mae Pate	BS	Volatiles Supervisor
Bruce H. Barrett	BS	Chemist
Rebecca Bowen	Ph.D.	Analyst/Chemical Hygiene Officer
Panda W. Carter	BS	Metals Analyst
Chris Cook	BA	Field Manager
Cedric Crawley		Technician/Extraction Group Leader
Sheryl S. Fuller	BS	Chemist
Stephanie Jones	BS	Field Scientist
Shao-Wei Li	Ph.D.	Chemist
Katherine W. Morgan	BS	Sample Coordinator
Edward Oetken	BS	Analyst
Tracy Owens	BS	Metals Supervisor
Michael Reardon		Technician
Sonya Reynolds	BS	Analyst
Letitia Saunders	BA	Analyst
Nan Scarbrough	BS	Analyst
John Shoemaker		Technician
John Sims	BS	Analyst
David Sweet		Technician
Rhoda L. Smith		Data Coordinator
Virginia Vasquez	BS	Chemist
Cynthia Wilson	BS	Chemist
Joyce Zatarain		Technician

DEERFIELD BEACH DIVISION

EMPLOYEE	DEGREE	TITLE
Paul K. Canevaro	BS	Lab Director/Project Manager
Marianne J. Walker		Sample/Data Manager
Rhonda Moll	BS	Project Managaer
Kathy C. Irminger	BA	Quality Assurance Manager
Phill Taylor, Jr.		Field Coordinator
Kimberly L. Ambrisco-Kostzer	BS	SG Manager
Linda Backus	BS	Chemist
David Graham	BA	Analyst
Therona James	BA	Chemist
Catherine Katsikis	BS	Chemist
Nanette Kendall	BA	Chemist
Kim Puhl	BS	Chemist
Eric Schinsing	AA	Technician
Alicia Stewart	AA	Technician
Lawrence Teich	BS	Chemist
Mary Valest	BS	Chemist
Carol-Ann Vassell	BS	Chemist
Janice Wiltshire		Data Coordinator

TAMPA BAY DIVISION

EMPLOYEE	DEGREE	TITLE
Kathy Sheffield	BS	Lab Director/Project Manager
Andre Rachmaninoff	BA	Project Manager
Dominic Fralli	MS	Project Manager
Inas M. Sobky	BS	Quality Assurance Manager
Tracy Botto	BS	Inorganics Section Manager
Linda Dowd	BS	Analyst
Chris E. Harris		Field Coordinator
Carl John Hoover, Jr.	BS	Chemist
Cheryl L. Howard	BA	Chemist
Antonius Lebrun	BS	Chemist
Marsha Martinovich	BA	Analyst
Natalie Park	BS	Analyst
Talicia C. Smith	BS	Chemist
Tayseer Zayan	BS	Chemist

Resumes of professional personnel are included in the following pages.

JAMES W. ANDREWS

President - Project Manager, Savannah Division

Dr. Andrews holds a B.S. degree in chemistry and an M.S. and Ph.D. in nutritional physiology from the University of Georgia. Dr. Andrews' specialty is aquatic chemistry and biochemical and physiological effects of chemicals on animals.

In 1962, Dr. Andrews began his professional career as an environmental chemist with the research division of Continental Forest Industries. During this employment, his duties involved developing techniques for reducing water and air pollution from pulp and paper mills and water quality evaluations of streams.

From 1963 to 1968, he was a research assistant and lecturer at the University of Georgia. As part of this work, he was assigned to special projects at the Hormel Institute in Austin, Minnesota, and at INCAP in Guatemala City, Guatemala.

In 1968, he became one of the initial scientists at the Skidaway Institute of Oceanography in Savannah, Georgia. During his tenure at Skidaway Institute, he was the principal investigator of many biological, physiological and fish cultural studies. Dr. Andrews is the author of more than 70 research papers in the aquatic field. In 1976, he was selected to be a member of a National Academy of Sciences subcommittee on aquatic nutrition.

For several years, Dr. Andrews has worked as a volunteer with the Community Cardiovascular Council of Savannah and Dr. Curtis Hames of the Evans Cardiovascular Project. In this capacity, he has become involved in several multi-national research projects which were designed to relate environmental and dietary exposure to cardiovascular health. This work has lead to several scientific publications on the effect of environmental exposure to heavy metals on human health in the high cardiovascular disease area of the southeastern United States.

Dr. Andrews has been a private consultant on environmental and water quality aspects of the coastal southeast since 1969. Since 1975, he has been the President of Savannah Laboratories and Environmental Services, Inc. His primary functions at Savannah Laboratories are the evaluation and interpretation of data and responding to the advisory needs of engineers, environmental specialists, legal experts, and production personnel, as well as supervising bioassay/bioaccumulation and environmental studies.

JANETTE D. LONG

Vice President - Project Manager/Laboratory Director, Savannah Division

Ms. Long has a B.S. degree in chemistry and 16 years experience in the analysis and data review of water, soil, biological and other environmental matrices. Prior to her association with Savannah Laboratories and Environmental Services, Inc., she was a research chemist with the University of Georgia Experiment Station evaluating biological tissues, enzymes and water samples. During her involvement with the Experiment Station, she co-authored several research papers in the aquatic field.

For several years, she assisted the Community Cardiovascular Council of Savannah as a volunteer research chemist. During this time, she assisted in the research effort as well as co-authored several publications concerning the epidemiological aspects of heavy metal exposure on human health in the southeastern United States. Ms. Long has been active in the American Chemical Society activities in the environmental area. She has held several offices in the organization, including President of the Coastal Empire Region.

Ms. Long began her association with Savannah Laboratories in 1975, and as a project manager, has worked closely with clients to review site-specific project plans, generic QA project plans, project regulatory concerns and to ensure that the analyses recommended will provide the desired data and QA/QC requirements requested by the client. She has been responsible for proposal preparation and project management for numerous RCRA, NPDES, environmental impact assessments and other related projects.

STEVEN J. WHITE

Project Manager, Savannah Division

Mr. White has a B.S. degree in chemistry and seven years of experience with Savannah Laboratories and Environmental Services, Inc. As a project manager, he serves as a point of contact for clients needing technical support in the areas of sampling, analysis, and the evaluation of laboratory results. He has extensive experience in the analysis of environmental pollutants using gas chromatography, GC/MS, and atomic absorption techniques. He possesses comprehensive knowledge of EPA procedures for the determination of pesticides, herbicides, PCBs, PAHs, base/neutral and acid extractable organics in various sample matrices.

Prior to his association with Savannah Laboratories in 1984, he pursued graduate studies at the Institute of Paper Chemistry and the University of Georgia. He has participated in EPA-sponsored workshops for pesticide residue analysis and has attended seminars on numerous topics in environmental analysis. Mr. White is an active member of the American Chemical Society.

LINDA A. WOLFE

Project Manager, Savannah Division

Ms. Wolfe has a B.S. degree in chemistry and a B.S. degree in biology with four years laboratory experience in the determination of metals and one year in semivolatiles GC section in the analysis of samples for pesticides, PCBs, and herbicides.

Prior to her association with Savannah Laboratories and Environmental Services, Inc., Ms. Wolfe was production specialist and wastewater lab specialist at SCM Corporation for two years. She joined Savannah Laboratories in 1985 as a laboratory metals analyst, and has done extensive work with inductively coupled plasma (ICP) spectroscopy and atomic absorption furnace and flame spectroscopy. Ms. Wolfe is trained in clean room techniques and trace level extractions. She is experienced with all inorganic methods contained in EPA 600/4-79-020, SW-846, and CLP documents.

In her current role, Ms. Wolfe provides assistance for clients in areas of analysis and evaluation of laboratory results.

BEVERLY HUGHES

Project Manager, Savannah Division

Ms. Hughes has a B.S. degree in biology/natural sciences and seven years experience in the analysis of environmental pollutants by gas chromatography. Prior to her association with Savannah Laboratories and Environmental Services, Inc. in 1987, she was an environmental specialist at the SCM Corporation.

Since joining Savannah Laboratories, Ms. Hughes has worked extensively with semivolatile gas chromatography overseeing pesticides, PCBs, herbicides, and other semivolatile organic compounds. Her work has given her extensive experience with SW-846, 40 CFR, and CLP protocols.

In her current role, Ms. Hughes provides assistance to clients in the areas of analysis and evaluation of laboratory results.

ALAN BAILEY

Laboratory QA Manager, Savannah Division

Dr. Bailey holds a B.S. degree in chemistry and biology from the University of Georgia and a Ph.D. in analytical chemistry from Clemson University. Between his undergraduate and graduate studies, he worked as a chemist at Union Carbide Agricultural Products Company.

Dr. Bailey's graduate research involved new approaches to the study of chemical exchange across the sediment water interface in both marine and freshwater systems. As a graduate student, he worked two summers in collaborative research in Environmental Research Division at Argonne National Laboratories. Also, while at Clemson, he taught laboratories in freshman chemistry, quantitative analysis, and instrumental analysis, devising and implementing several new experiments for the analytical teaching laboratories. Dr. Bailey is a member of the American Chemical Society and the International Association for Great Lakes Research.

Dr. Bailey began his association with Savannah Laboratories in 1989. As manager of the General Laboratory section of the Savannah Division, Dr. Bailey is responsible for personnel management, production, and quality control for a wide variety of analyses. The General Laboratory section includes nutrients, cyanide, microbiological parameters, BOD, COD, TOC, TOX, and many other physical and chemical parameters.

Currently, he is QA manager and, among other duties, is responsible for internal systems audits and performance evaluations, certifications, and updates/revisions to Savannah Laboratories' QA plan. Dr. Bailey is a member of the American Chemical Society and the International Association for Great Lakes Research.

DERRICK M. SIMONS

Lab Manager, Savannah Division

Derrick M. Simons obtained a B.S. degree from the University of Florida in 1982, with majors in both chemistry and microbiology & cell science. While an undergraduate at the University of Florida, Mr. Simons worked as a research assistant in natural products chemistry.

From 1982 to 1986, Mr. Simons served as a chemist in a commercial environmental testing laboratory, where his duties included the determination of Pesticides, PCBs, Herbicides, Volatile and Semivolatile Organic Compounds by GC and GC/MS methodologies.

Mr. Simons was promoted in 1986 to GC and GC/MS group leader for both Volatile and Semivolatile Organic departments. In 1987, he was promoted to organics lab manager, supervising all GC, GC/MS, and organic extraction personnel where he obtained extensive knowledge of SW-846, 40 CFR, and CLP protocols.

Mr. Simons joined Savannah Laboratories in 1990 as Corporate Organic Manager and Savannah Division Organic Manager. His duties included responsibility for GC, GC/MS, and the organic extraction sections. As well, he was responsible for organic analytical method development, overseeing the training of new personnel, and supervising the maintenance and troubleshooting of GC and GC/MS instrumentation. He was promoted to Lab Manager in the summer of 1992. Additional responsibilities of this position include overall administrative responsibility for all technical lab personnel. As Corporate Organic Manager, he is responsible for preparing SOPs, establishing analytical and QA procedures, evaluating instrumentation, and coordinating production among the organic departments.

LARRY E. PHILLIPS

Corporate Computer Manager, Savannah Division

Mr. Phillips attended Armstrong State College where he received a B.S. degree in computer science. He has two years experience with Armstrong State College where he was responsible for maintaining system communications in addition to hardware maintenance and system backups.

Mr. Phillips joined Savannah Laboratories and Environmental Services, Inc. in 1988. He is responsible for maintaining all software and hardware associated with Savannah Laboratories' Laboratory Information Management System (LIMS). In addition, Mr. Phillips is responsible for new software development and testing along with maintaining data communications between Savannah Laboratories Corporate Headquarters and Tallahassee, Mobile, Tampa Bay, and Deerfield Beach divisions.

WAYNE ROBBINS

Air Analysis Manager, Savannah Division

Mr. Robbins has a B.S. degree in chemistry and has been trained in analytical and quality control techniques for a wide variety of procedures. He is thoroughly familiar with EPA approved procedures and has attended several EPA training schools on analytical techniques. He is currently in charge of implementing protocols for the analysis of ambient air samples and is responsible for coordinating production, preparing SOPs, and evaluating methodology for this section.

Mr. Robbins has ten years experience in the analysis of environmental samples by EPA procedures.

ERNEST WALTON

Corporate Inorganic Manager/Inorganic Manager, Savannah Division

Mr. Walton has a B.S. degree in chemistry from Mercer University and began his association with Savannah Laboratories in 1983. His major area of concentration is the analysis of metals in ground water, biological tissues, sediments and estuarine water. He has been trained in clean room sample preparation techniques and has participated in various training courses of metal analysis utilizing inductively coupled plasma spectroscopy and atomic absorption methodology. He also has experience with various automated, semiautomated, and manual nutrient analysis systems.

Mr. Walton has been trained in quality control procedures for evaluating laboratory data and has attended the Waste Testing and Quality Assurance symposium in Washington, DC. He was responsible for the initial implementation of CLP protocol for the laboratory's inorganic section. Mr. Walton also pioneered the use of software by the laboratory for the production of CLP deliverables. As well as being thoroughly experienced with CLP protocol, Mr. Walton is knowledgeable in all the inorganic methods contained in EPA 600/4-79-020 and SW-846 documents. As Corporate Inorganic Manager, he is responsible for preparing SOPs, establishing analytical and QA procedures, evaluating instrumentation, and coordinating production among the inorganic departments.

SHEILA B. HOFFMAN

Data Manager, Savannah Division

Ms. Hoffman has a B.S. degree from Georgia Southern University and began her career with Savannah Laboratories and Environmental Services, Inc. in 1982 as a sample coordinator.

She has been responsible for the development of the data management coordination of the laboratory as well as sample custodial responsibilities. Ms. Hoffman coordinates all project orders from the sample login to the computer project login. She interfaces with the clients and project managers to facilitate the data flow through the laboratory and coordinates client sample container requests. Ms. Hoffman has extensive experience with chain of custody for CLP projects and other client specific QA requirements.

VIRGINIA BAISDEN

Field Sampling Manager, Savannah Division

Ms. Baisden has B.S. and M.S. degrees in biology and more than 12 years experience in field sampling and biological and chemical analyses of samples.

Prior to her association with Savannah Laboratories and Environmental Services, Inc. in 1986, Ms. Baisden was employed by the Georgia Department of Natural Resources, Coastal Resources Division, where she was project leader of the Commercial Fisheries Program. While associated with the Coastal Resources Division, she authored several reports and publications of fisheries assessment studies. Ms. Baisden has worked with the Game and Fish Division where she identified zooplankton. She was a research assistant for the Environmental Protection Division on an estuarine water quality monitoring project.

Ms. Baisden's primary duties at Savannah Laboratories include responsibility for all biological and microbiological analyses and coordinating and supervising field sampling.

MYRON J. YOUNG

Volatiles GC/MS Manager, Savannah Division

Mr. Young has a B.S. degree in chemistry and an A.S. degree in electronic engineering. Prior to his employment at Savannah Laboratories and Environmental Services, Inc. in 1987, he was employed as a chemist with Southeast Laboratories of Atlanta, Georgia.

Mr. Young manages the GC/MS volatiles section at Savannah Laboratories and is responsible for coordinating all QA/QC requirements for that department. He is thoroughly familiar with techniques for performing analyses on many different compounds and the operation of the GC and GC/MS instrumentation used to perform such analyses. He is familiar with SW-846, 40 CFR, and CLP protocols for data evaluation.

KARLA BIER

Semivolatiles GC Manager, Savannah Division

Ms. Bier has a B.S. degree in chemical engineering and two years experience in the analysis of environmental pollutants by gas chromatography. Prior to her association with Savannah Laboratories, she was a polymer chemistry research assistant at the University of Missouri-Rolla.

As manager of the semivolatile GC section of Savannah Laboratories, Ms. Bier has primary responsibility for overseeing the analysis of samples for pesticides, PCBs, herbicides, and other semivolatile organic compounds by GC. In addition, she is responsible for the implementation of new analytical procedures, training new personnel, and supervising maintenance and troubleshooting of semivolatile GC instrumentation. Her duties have given her extensive experience in SW-846, 40 CFR, and CLP protocols for data evaluation.

KATHERINE M. COOK

Semivolatiles GC/MS Chemist, Savannah Division

Ms. Cook has a B.S. degree in chemistry from the University of Georgia and four years of experience in the analysis of organic substances using HPLC, FTIR, GC, and GC/MS methods. Her background includes research and development for a pharmaceutical company, technical and chemical support for law enforcement agencies, and oceanographic research.

Ms. Cook began her career with Savannah Laboratories in 1990 as a GC/MS chemist. In this capacity, she is responsible for the operation and maintenance of two RTE/A GC/MS systems and determining the concentration of semivolatile organic compounds in extracts prepared from sample matrices using CLP, 8270, and 625 methodology.

KENNETH R. AEGAN

Chemist, Savannah Division

Mr. Aegan has a B.S. degree in chemistry and an Associates degree in management and logistics from Georgia Southern University. He began his career with Savannah Laboratories in 1987. His work as both GC and GC/MS chemist has provided him with extensive knowledge of SW-846, 40 CFR, and CLP protocols.

HSIAO-LAN CHANG

Analyst, Savannah Division

Ms. Chang received a B.S. in horticulture in 1964 from National Taiwan University and an M.S. in plant sciences in 1972 from the University of Georgia.

From 1965 to 1968, Ms. Chang was a research assistant at Taiwan Agricultural Research Institute. From 1968 to 1969, she was laboratory technician for Naval Medical Research in Taipei.

Ms. Chang served as a laboratory technician at the U.S. Department of Agriculture's Stored Products Insects Research and Development Laboratory from 1980 to 1982 and again from 1987 to 1989.

Ms. Chang joined Savannah Laboratories in 1990 and is currently responsible for TOX determinations.

NANNETTE H. DASHER

Semivolatiles GC/MS Supervisor, Savannah Division

Ms. Dasher has a B.S. degree in chemistry with six years of laboratory experience. She joined Savannah Laboratories and Environmental Services, Inc. in 1985, and gained experience in sample preparation and determination of metals by inductively couples plasma (ICP) spectroscopy and organic sample preparation and analysis by IR and GC.

She has performed analyses by GC/MS for three years and is familiar with all SW-846 and CLP methodology.

In her current role, Ms. Dasher supervises the analysis of samples for semivolatile organic compounds. She is responsible for the training of new personnel for this section, implementing new analytical procedures, and supervising maintenance and troubleshooting of semivolatile GC/MS instrumentation.

KARRI DERR

Volatiles GC/Manager, Savannah Division

Ms. Derr has a B.S. degree in animal science from Iowa State University. She was a research assistant for two years at Iowa State University Veterinary College, Large Animal Resources division.

She began her association with Savannah Laboratories in 1988, at which time she was responsible for performing determinations of metals utilizing inductively coupled plasma (ICP) emission spectroscopy and atomic absorption and flame spectroscopy.

Ms. Derr's current responsibilities include personnel, production, and quality control management of a GC/MS volatile group.

DAGMAR I. GOLEY

Inorganic CLP Coordinator, Savannah Division

Ms. Goley has an A.S. degree in chemical technology from Heinrich-Lanz-Schule II, in Mannheim, Germany. She began her association with Savannah Laboratories in 1987, and has gained experience in numerous inorganic preparation procedures.

Her duties at Savannah Laboratories include supervising sample preparation for all metals sample determinations and assisting in the computer generation of CLP forms for inorganic data packages. She is trained in total digestion, dissolved sample preparation, and inorganic extraction/concentration procedures as well as proper sample handling. She has been trained in clean room techniques and is familiar with EPA 600/4-79-020 SW-846 and CLP protocols.

SANDRA GROVENSTEIN

GC/MS Semivolatiles Supervisor, Savannah Division

Ms. Grovenstein received her B.S. degree in biology from Auburn University in 1978. She gained extensive experience in toxicology after graduation, working in several hospitals and laboratories. In 1986, she joined Laucks Testing Laboratories in Washington State where she was responsible for analysis and interpretation of GC/MS data relating to CLP 40 CFR and SW-846 protocols.

In 1990, Ms. Grovenstein joined Savannah Laboratories and is responsible for the supervision and analyses of samples and reporting of data for semivolatiles by GC/MS utilizing SW-846, 40 CFR and CLP protocol.

SUSAN NORWOOD

ICP/AA Production Supervisor, Savannah Division

Ms. Norwood has a B.S. degree in chemistry from Armstrong State College and a B.A. degree in marketing from Georgia Southern College. She began work at Savannah Laboratories in 1988 in the inorganic section of the laboratory.

After working briefly in the determination of nutrients and general parameters, Ms. Norwood transferred to the metals section where she has worked extensively with both ICP, flame and furnace AA instrumentation. As well, she has been involved with sample preparation procedures for metals determinations. Ms. Norwood is currently responsible for supervision of ICP analyses, associated data handling, and maintenance and troubleshooting for this instrument. She has extensive experience with EPA 600/4-79-020, SW-846, and CLP protocols.

G. ANTHONY LOWMAN

Analyst, Savannah Division

Mr. Lowman has a B.S. degree in geology from Georgia Southern University. He has worked in the hydrology departments with both the U.S. Army Corps of Engineers and the Georgia Geological Survey and with the Skidaway Institute of Oceanography in Savannah, Georgia conducting research in coastal sedimentology.

Mr. Lowman joined Savannah Laboratories and Environmental Services, Inc. in 1989. He performs trace metal analyses of samples utilizing the ICP, Perkin Elmer HGA-400 Graphite Furnace and the SpectrAA-400 Zeeman Spectrophotometer as well as sample preparation by MIBK extraction and analysis, and back up for other trace metal work. He is familiar with EPA 600/4-79-020 and SW-846 and CLP protocols.

PAUL E. MEYERS

Chemist/Corporate Safety Director, Savannah Division

Mr. Meyers obtained his B.S. in chemistry in 1953 from Marshall University. While still in school, he worked as a laboratory technician for Allied Chemical in South Point, Ohio. Within three years of his graduation from Marshall, he held the position of Senior Chemist with Allied.

From 1956 to 1969, he was successively plant superintendent, plant manager, and manager of manufacturing for Kaiser Agricultural Chemicals and Southern Nitrogen Company in Savannah, Georgia. His responsibilities at these companies included startup and operation of a fertilizer manufacturing complex. As manager of manufacturing, he was responsible for the manufacturing process at several locations.

From 1969 to 1970, he was Vice President of Valley Nitrogen Products in Fresno, California where he was responsible for startup and operation of what at that time was the largest fertilizer manufacturing complex west of the Mississippi River.

From 1970 to 1988, Mr. Meyers served as Vice President of System Services and Industrial Corporation where his responsibilities included plant maintenance, engineering, and consulting with clients.

In 1988, Mr. Meyers joined Savannah Laboratories. His initial responsibilities provided him with experience in sample preparation for metals determinations and ICP operation. He has worked with and supervised extraction, preconcentration, and other sample preparation techniques for dioxin samples. Mr. Meyers currently is responsible for nutrient analysis employing the TRAACS autoanalyzer system as well as acting Corporate Safety Director for Savannah Laboratories.

RUTH D. RANKIN

Digest Supervisor, Savannah Division

Ms. Rankin has a B.S. degree in biology. She has five years laboratory experience with Southeast Labs in Atlanta, Georgia, where she performed various general chemistry determinations, sample digestions, and metals and mercury determinations by atomic absorption spectroscopy.

Ms. Rankin began her career with Savannah Laboratories in 1987. Her duties include supervising the atomic absorption section of the laboratory. She is responsible for organizing the sample load, recording results on the worksheets, and performing analyses using the Perkin Elmer, Jarrell Ash, and Varian atomic absorption spectrophotometers. Her work has provided her with an extensive knowledge of EPA 600.4-79-020, SW-846, and CLP protocols.

J. ROBERT PADDISON, JR.

Volatiles GC/MS Supervisor, Savannah Division

Mr. Paddison has a B.S. degree in chemistry from the Georgia Institute of Technology and a M.S. degree in biochemistry from the University of Wisconsin - Madison. He began his association with Savannah Laboratories in 1990.

Mr. Paddison started his career at the University of Wisconsin Clinical Cancer Center isolating and quantitating amino biphenyl-DNA adducts using HPLC, LC, and scintillation counting. Most recently, he has worked as an analyst to perform isomer specific quantitation of PCBs in sediment samples from Green Bay, Wisconsin, using GC and GC/MS techniques. This work was conducted in the Water Chemistry Program, U.S. - Madison, as part of the EPA-directed Green Bay Mass Balance Study.

Mr. Paddison's current responsibilities at Savannah Laboratories are supervision of a GC/MS volatiles section utilizing 40 CFR, SW-846, and CLP protocols.

MICHAEL J. SALUM

Organic Extraction Manager, Savannah Division

Mr. Salum has a B.S. degree in agronomy with a specialization in soil science from the University of Georgia. Mr. Salum spent over two years as an on-site contractor at the U.S. EPA Region IV Laboratory in Athens, Georgia, performing and supervising semivolatile organic extractions. He was also responsible for the preparation of blind QA samples for all PRP and CLP laboratories in Region IV. His background includes research in soil conversation and soil chemistry at the University of Georgia.

Mr. Salum began his association with Savannah Laboratories in 1990 as a GC pesticide residue chemist. He is currently responsible for the operation of the organic extraction/GC screening laboratory. His duties include personnel, production, and quality control management of the extraction lab for all organic parameters.

ANGELA F. STEWART

Chemist, Savannah Division

Ms. Stewart has a B.S. degree in chemistry from Armstrong State College. She joined Savannah Laboratories in 1989. She initially worked in the extraction and concentration of samples for semivolatile GC/MS analysis.

Ms. Stewart is currently responsible for the determination of semivolatile organic compounds by GC/MS. Her work has provided her with extensive experience employing SW-846, 40 CFR, and CLP protocols.

ANGELA M. WEIMERSKIRK

General Laboratory Supervisor, Savannah Division

Ms. Weimerskirk has a B.S. degree in chemistry. She began her career with Savannah Laboratories in 1986, at which time she was responsible for the determination of trace metals by ICP and the determination of mercury by cold vapor AAS. She has extensive experience in ion selective electrode determinations of fluoride, ammonia, and TKN, and several years experience with the determination of ions utilizing ion chromatography.

Ms. Weimerskirk is responsible for the organization, coordination, and operation of the Traacs 800 autoanalyzer, the ion chromatograph, and ion selective electrode instrumentation section of the laboratory. She has been involved in method development of cyanide and phenolics by autodistillation/autoanalysis. In addition, her work has improved the efficiency and accuracy of sulfide determinations. She is familiar with EPA 600/4-79-020, SW-846, and CLP protocols.

ANGELA ZEALY

Chemist, Savannah Division

Ms. Zealy has a B.S. degree from Armstrong State College with a major in biology and a minor in chemistry. She joined Savannah Laboratories in 1988.

Ms. Zealy began her tenure with Savannah Laboratories performing microbiological determinations. Since that time, she has gained extensive experience in the extraction, clean-up, dilution, and preconcentration of samples for the determination of pesticides, herbicides, and PCBs. Her current position is GC chemist in the semivolatiles section of Savannah Laboratories.

Ms. Zealy's responsibilities include GC/FID determination of phenolic compounds, phthalate esters, and PAH compounds. In addition, she is experienced in petroleum product identifications. Her work has given her experience with both SW-846 and 40 CFR methodologies.

THOMAS L. STEPHENS

Vice President/Project Manager, Tallahassee Division

Mr. Stephens has a B.S. degree in chemistry and 20 years experience in analyses of pollutants in groundwater, sediments, tissues, agricultural products, wastewater, drinking water and hazardous wastes utilizing GC, GC/MS and HPLC analytical techniques. Prior to his association with Savannah Laboratories in 1985, he was supervisor of the organic section of the Florida Department of Environmental Regulation (DER) laboratory in Tallahassee and supervisor of the Florida Department of Agriculture Pesticide Residue Laboratory. In these capacities, he has gained an enormous amount of experience in laboratory management, quality assurance, method development, mass spectrometry interpretation and verification of results. He has attended several regulatory training schools and presented technical presentationsa at several pesticide residue conferences and regional meetings in the southeast.

Mr. Stephens is thoroughly familiar with DER specific regulatory sampling procedures, analytical quality assurance and reporting requirements for hazardous and solid waste, air quality, groundwater, wastewater, and drinking water. His technical background enables him to provide accurate and cost effective assistance for the environmental and regulatory needs of Florida clients. He is a member of the Florida Society of Environmental Analysts, the Florida Association of Environmental Professionals, the Florida Environmental Auditors Association, and the Florida Air and Waste Management Association.

JANET PRUITT

Laboratory Director/Project Manager, Tallahassee Division

Ms. Pruitt has a B.S. degree in chemistry and a Master of Public Health degree. Her 25 years experience in the environmental field began with the South Carolina Department of Health and Environmental Control (SCDHEC) where she supervised the Environmental Chemistry Section. After nearly thirteen years with SCDHEC, she joined the United States Geological Survey (USGS) National Water Quality Laboratory in Atlanta, Georgia.

At the USGS laboratory, she was responsible for the analyses of water, sediment, and fish tissues for various organic parameters utilizing gas chromatography, mass spectrometry and computer data systems. She also served as quality assurance officer for the organic chemistry section.

In 1984, Ms. Pruitt transferred to the Tallahassee office of USGS where she was responsible for appraising water resources and providing basic hydrologic data on both surface and ground water in Florida. She was project chief of three investigative hydrologic studies, assisted with three water quality studies, and coauthored an indexing and classification system for earth-science data bases. She also served as technical advisor in the field of analytical organic chemistry for district, regional and headquarters personnel in the Water Resources Division.

Ms. Pruitt joined Savannah Laboratories in 1987 as laboratory manager/QA manager. In her current position as laboratory director/project manager, she is responsible for the operation of the Tallahassee Division, and provides clients with assistance in field and analytical requirements.

WAYNE WORD

Project Manager, Tallahassee Division

Mr. Word has a B.S. degree in chemistry and 16 years experience in the environmental field. He began his career with Technical Services, Inc. (TSI) in Jacksonville, Florida, where he was organics department manager responsible for general analysis and performing and instituting instrumental methods for new clients. After 10 years with TSI, Mr. Word joined OHM Corporation where he began as a project chemist and worked his way up to laboratory manager within four years.

Mr. Word has experience in most major analytical techniques including: GC, GC/MS, HPLC, FTIR, UV/VIS, TOC, TOX, ICP, AA, and manual and automated potentiometric and spectrophotometric methods. He also has extensive experience with SW-846 and EPA approved methods. In addition, Mr. Word has received specialized training from Hewlett-Packard, Varian Associates, Jarrell-Ash, Perkin Elmer, and the American Chemical Society on instrumental and management techniques.

Mr. Word joined Savannah Laboratories as project manager. In this position, he is able to provide technical assistance and support to clients for field and analytical services.

HENRY BEAUCHAMP

Laboratory Manager, Tallahassee Division

Mr. Beauchamp holds a B.S. degree in chemistry from the University of Florida and has completed postgraduate course work in biochemistry. Prior to his association with Savannah Laboratories in 1989, he worked for the Florida Department of Agriculture and the University of Florida in biochemical laboratory analysis.

Mr. Beauchamp has supervised all volatile organic compound determinations by GC and GC/MS, and has been actively involved in GC/MS analysis, spectral interpretation, data reporting, and instrument maintenance.

In his current role at Savannah Laboratories, Mr. Beauchamp is responsible for the management of technical personnel, overseeing all method development and adherence to the Comprehensive QA Plan, coordinating all analyses with section managers, as well as handling all requests for laboratory supplies and instrument repairs.

ELIZABETH SCHNEIDER

Quality Assurance Manager, Tallahassee Division

Ms. Schneider has a B.S. degree in biology and over 17 years experience with gas chromatography and high performance liquid chromatography analyses. At Savannah Laboratories, Ms. Schneider is responsible for ensuring that method QA requirements are met, issuing and evaluating in-house check samples, and analyst training in safety, QA procedures, and analytical methodology. Ms. Schneider has a thorough knowledge of QA requirements, procedures, and evaluation as they apply to EPA-approved methodology. She is responsible for research into new methodologies and has developed several procedures now in use at Savannah Laboratories. She also supervises analyses of ordinance and explosives according to USATHAMA methods.

Prior to her association with Savannah Laboratories in 1987, Ms. Schneider was lead technician in the quality assurance department for the Olin Corporation. There she supervised a staff of professionals in areas such as chemical, raw materials, water and waste treatment, ballistics and instrumental training. She is highly skilled in the operation and repair of gas chromatographs and high performance liquid chromatography systems.

DANA TILL

Chemist, Tallahassee Division

Ms. Till holds a B.S. degree in chemistry from Pembroke (NC) State University. Prior to coming to Savannah Laboratories, she was employed by the City of Raeford and Berry College.

During her employment with the City of Raeford, Ms. Till was responsible for the supervision of all daily laboratory activities, training of laboratory personnel, purchasing of equipment for the plant and laboratory, and performing wastewater analysis. She established a quality assurance program to test laboratory procedures, techniques, and methodology. She also was responsible for bringing the wastewater treatment laboratory into compliance with the State of North Carolina's standards, as well as publishing an operations manual for the laboratory.

Her current responsibilities at Savannah Laboratories include the analysis of samples for polynuclear aromatic hydrocarbons and pesticides by GC.

BERNARD ASH

Chemist, Tallahassee Division

Mr. Ash has a B.S. degree in chemistry from Florida A&M University and has completed Medical Laboratory Specialist Training in the U.S. Air Force. Prior to joining Savannah Laboratories, he was employed as a medical technologist in the Air Force as well as with Gadsden Memorial Hospital and Tallahassee Memorial Regional Medical Center.

Mr. Ash's duties at Savannah Laboratories include performing analyses of metals in environmental matrices employing ICP and AA furnace techniques.

TODD BAUMGARTNER

Inorganic Section Manager, Tallahassee Division

Mr. Baumgartner holds a B.S. degree in chemistry and has completed one year of postgraduate course work. He began his career with Savannah Laboratories in 1985. His training since joining Savannah Laboratories has been broad, encompassing sampling as well as nutrient, volatile, organic compounds, and metal determinations.

Mr. Baumgartner's current duties as manager of the inorganic section include overseeing all aspects of analysis from digestion to data reporting for metals, general (wet chemistry), and bacteriological parameters. He is responsible for ensuring adherence to QC procedures and method requirements, instrument troubleshooting and maintenance, and ordering of lab supplies. He is especially experienced in metal determination by ICP, furnace AA, and cold vapor AA.

ROBERT D. DRIVER

Analyst, Tallahassee Division

Mr. Driver has a B.S. degree in business administration and two years experience as a laboratory analyst. He has experience over a wide variety of chemical analyses including general chemistry, bacteriology, extractions, metals, IR, and digestion.

Currently, Mr. Driver's primary responsibility is HPLC analyses of pesticides and related compounds.

D. WAYNE HIGGINS

Analyst, Tallahassee Division

Mr. Higgins has a B.S. degree in nutritional science with a minor in chemistry from Florida State University. Prior to coming to Savannah Laboratories, he was employed by Florida State University Chemistry Department.

Mr. Higgin's duties include the analysis of samples for metals by ICP and furnace AA methodologies. He also checks data entered on worksheets for his section making sure QA/QC requirements are met and all data is entered correctly.

DAVID KARNS

Semivolatiles Organic Manager, Tallahassee Division

Mr. Karns holds a B.S. degree in chemistry from the University of South Florida. His experience includes analysis of semivolatile organic compounds by GC/MS, spectral interpretation, and adherence to SW-846, 40 CFR, and CLP methodologies.

Mr. Karns' has extensive knowledge of semivolatile method requirements, data reporting, and QC requirements. His duties as manager consist of installing new software updates on Hewlett-Packard GC/MS systems, advising and training on all systems, scheduling workloads, maintaining and troubleshooting instruments, and providing technical information to the laboratory director regarding new instrumentation and method requirements. Mr. Karns is experienced in review of CLP data packages.

JOSEPH B. NORTH

Analyst, Tallahassee Division

Mr. North holds a B.S. degree in biology from Florida State University. Prior to his employment with Savannah Laboratories, he worked for Environmental Planning and Analysis, Inc. as a laboratory technician.

Mr. North's duties include the analysis of samples for biological parameters, including BOD, COD, bacteria, and other biological laboratory duties.

TIMOTHY PRESTON

Chemist, Tallahassee Division

Mr. Preston holds a B.S. degree in chemistry with a minor in mathematics from Florida State University and also has an AA degree in liberal arts from Miami-Dade Community College. He is a member of Alpha Chi Sigma Chemistry fraternity.

Mr. Preston is a GC/MS chemist and is responsible for analyzing environmental samples for volatile organic compounds using packed and capillary column GC/MS. He is also responsible for the review and interpretation of spectral data and review and analysis of CLP data packages.

PAUL RYGIEL

HPLC/IR Manager, Tallahassee Division

Mr. Rygiel has a B.A. degree in biochemistry from Florida State University. Prior to joining Savannah Laboratories, he was employed as a chemist at the Florida Department of Business Regulation where he gained two years experience in gas and liquid chromatography.

Mr Rygiel's current responsibilities include overseeing the analysis of soil and water samples by EPA methods 632, 531, 8320, and other methods for explosives, formaldehyde, and water soluble pesticides and herbicides by HPLC, and the IR analysis of soil and water samples for oil and grease and total petroleum hydrocarbons.

DEBORAH SHERWIN

Biological/General Lab Supervisor, Tallahassee Division

Ms. Sherwin is a graduate of Florida State University where she obtained a B.S. degree in biological science. Her educational background includes completion of the Liberal Studies Honors program and memberships in Phi Eta Sigma National Honor Society and Golden Key National Honor Society.

Ms. Sherwin joined Savannah Laboratories as an analyst in the Biological/General Lab section. Her current duties as supervisor include analysis and supervision in all areas of bacteriology and general chemistry. She is involved in analyses of coliforms, titrations, BODs, solids determinations, and determinations of physical parameters using EPA approved methodologies.

RICHARD A. STEPHENS

Volatiles Organics Manager, Tallahassee Division

Mr. Stephens holds a B.S. degree and Postgraduate Certificate of Education from the University of Wales. His studies were in biology and zoology, and prior to his employment at Savannah Laboratories, he was a science educator.

Mr. Stephens' duties at Savannah Laboratories include supervision of analyses by GC and GC/MS of volatile organic compounds, data interpretation and reporting, instrument maintenance and troubleshooting, review of CLP data packages, and ordering of gases and lab supplies for the volatiles section.

MARTIN THOMAS

Technician, Tallahassee Division

Mr. Thomas came to Savannah Laboratories with more than 16 years experience. His duties at Savannah Laboratories have included supervision of the extraction laboratory as well as performance of extractions for all organic parameters. He has also been responsible for analysis of samples for petroleum hydrocarbons by IR techniques. At the present time, he analyzes all water samples for EDB following EPA methodology.

JESSE L. SMITH

Laboratory Director/Project Manager, Mobile Division

Mr. Smith has a B.S. degree and has successfully completed the majority of graduate course work in a masters program in chemistry.

Mr. Smith is the laboratory director of Savannah Laboratories, Mobile, Alabama Division and is responsible for overall management of this laboratory. He supervises project managers, QA and department managers, and ensures departments have adequate laboratory equipment and personnel to perform their jobs. He provides oversight in developing new laboratory methods and analytical techniques to meet client needs as regulatory programs change.

Mr. Smith also functions as project manager and is the primary contact for his clients. He is responsible for assisting clients with pre-sampling discussions, suggesting analytical approaches, meeting regulatory agency requirements, and developing special analytical and treatability techniques. He is thoroughly familiar with EPA methods and QA/QC requirements for RCRA, NPDES, SDWA, and other EPA regulatory programs.

Mr. Smith is an active member of the American Chemical Society and has attended ACS-sponsored courses in gas chromatography and atomic absorption spectroscopy. He has attended numerous continuing education courses covering new EPA regulatory programs.

Mr. Smith joined Savannah Laboratories and Environmental Services, Inc. in 1987, as a project manager and was promoted to laboratory director of the Mobile, Alabama Division when it opened in 1988. Prior to joining Savannah Laboratories, he had fifteen years consulting laboratory experience as a bench chemist, supervisor, and laboratory manager for Southeast Laboratories, Inc. in Atlanta, Georgia. He has extensive experience in gas chromatography analysis of pesticide residue/PCBs and volatiles, metals by atomic absorption spectroscopy including graphite furnace analyses, and general chemistry laboratory experience. He has a broad base of experience in a variety of analytical chemistry and microbiological methods including: EPA, ASTM, NIOSH, AOAC, FDA, and USDA.

J. MICHAEL NANCE

Project Manager, Mobile Division

Mr. Nance has a B.S. degree from the University of North Alabama and an M.S. degree in environmental science from the University of South Alabama.

Mr. Nance's primary responsibility with Savannah Laboratories is project management of permitted wastewater and drinking water and RCRA projects as required by EPA and state regulatory programs. Mr. Nance provides oversight and supervises the field activities of the Mobile Division sampling team. He is highly skilled at coordinating and conducting field investigations.

Mr. Nance has kept current with changes and refinements in existing regulatory programs through continuing education courses in Hazardous Waste/Land Disposal Bans, Reauthorized RCRA, Superfund (SARA), and NPDES storm water regulations. He has completed the forty-hour "Hazardous Assessment and Response Management" training program (20 CFR 1910.120). This certification is kept current through annual update courses.

Mr. Nance has seventeen years experience in a wide variety of industrial laboratory and field investigations. Project experience includes: hazardous waste characterization, sediment and water quality studies, remedial investigations, and groundwater monitoring projects.

MICHELE H. LERSCH

Laboratory QA Manager, Mobile Division

Ms. Lersch has a B.S. degree in medical technology with concentrations in chemistry and microbiology from the University of South Alabama. She has taken postgraduate courses in management and business law.

Ms. Lersch is responsible for managing the quality assurance program for the Mobile Division laboratory. She initiates certifications with state and federal agencies, renews certifications, conducts internal audits, works with external auditors, edits QA plans and SOPs, and reviews project files. Her duties include initiating and maintaining training files for the technical staff and maintaining technical information resources and methods.

Prior to her employment with Savannah Laboratories, Ms. Lersch was employed as metals analyst with Thompson Engineering Testing. She specialized in trace metals determinations using flame and graphite furnace AAS techniques. She also became experienced in inorganic analyses using wet chemical methods.

When Ms. Lersch joined Savannah Laboratories in 1988, she was promoted to Inorganic Laboratory Manager. She gained extensive experience using inductively coupled plasma (ICP) techniques for metals determinations. She was responsible for instrument maintenance and trouble-shooting as well as day-to-day implementation of QC for the inorganic section. She became thoroughly familiar with EPA methods and reporting and QC requirements for environmental samples requiring metals and wet chemistry analyses.

Ms. Lersch has ten years of laboratory experience, seven of which have been directly related to the chemical and biological analysis of water, wastewater, soils/sediments, and hazardous waste samples. She is familiar with SW-846 and 40 CFR methods, protocols, and QC requirements for both organic and inorganic analysis.

VAN PHAM

Laboratory Manager, Mobile Division

Dr. Pham has a Ph.D. in organic chemistry from Georgia Institute of Technology and a B.S. degree in chemistry from Saigon University.

Dr. Pham joined Savannah Laboratories in 1990 as a GC/MS chemist. She was responsible for the analysis of base/neutral and acid semivolatile organics in environmental samples. In 1991, Dr. Pham was promoted to department manager and QC coordinator of the organic and extraction sections and to laboratory manager in 1992. She is responsible for the organic analytical method development, supervising, training new personnel, and maintaining and troubleshooting the GC/MS, GC, IR, ICP and AA/GF instruments.

Dr. Pham is an active member of the American Chemical Society. She has attended several ACS-sponsored seminars on a variety of topics including GC and GC/MS techniques and methods. She took the quality assurance course offered by the EPA as part of its Seventh Annual Waste Testing and Quality Assurance Symposium held in Washington, D.C.

Prior to joining Savannah Laboratories, Dr. Pham was employed with Eagle-Picher Environmental Service. She performed a variety of organic and air pollutant analyses for volatile compounds, pesticides, herbicides, PCBs, PAHs, phenols, and dioxins. From 1987 to 1989, Dr. Pham was a postdoctoral associate with the University of Georgia, Department of Chemistry. She worked on enzymatic synthesis and reaction, and authored and co-authored a number of publications in the *Journal of the American Chemical Society*.

Dr. Pham has extensive knowledge of EPA SW-846, 40 CFR, NIOSH, and ASTM methods and CLP protocols. She has several years of experience working with GC, GC/MS, FT-NMR, UV-VIS spectroscopy, and HPLC instruments. She is familiar with several instrument data systems including PE-Nelson, Maxima 280, and ChemStation. She is well-versed in the use of Lotus 1-2-3 and Quatropro as part of the organic lab information management systems.

CORA M. PATE

Volatiles Manager, Mobile Division

Ms. Pate has a B.S. degree in biology and a minor in chemistry from the University of South Alabama.

Ms. Pate is responsible for supervising the volatiles laboratory. Her duties include training analysts, instrument maintenance and data review as well as the analysis of environmental samples for volatile organic compounds by GC/MS according to EPA methods 624 and 8240. Ms. Pate has previously analyzed volatile organic compounds by gas chromatography using Hall, Photo Ionization (PID), and Flame Ionization (FID) detectors according to EPA methods 501.1, 502.2, 601/602, and SW-846 8010/8020. She interprets chromatograms, calculates and reports results and checks QC on these instruments.

Ms. Pate has attended seminars and courses on gas chromatography involving column maintenance and operation according to new methods and techniques.

Ms. Pate previously worked as an office manager before obtaining her degree. Her duties included training and maintaining the office staff as well as being a personal assistant to the company president. She was responsible for implementing new computer programs and updating and efficiently utilizing existing programs and hardware.

Ms. Pate has three years experience in an analytical and consulting laboratory atmosphere with two years of this in a supervisory position. She is familiar with SW-846 and 40 CFR methods, protocols, and QC requirements for the volatiles GC section.

BRUCE H. BARRETT

Chemist, Mobile Division

Mr. Barrett has a B.S. degree in chemistry from Wittenberg University in Springfield, Ohio. He has done biochemical research of photophosphorylaton mechanisms in single celled algae at Kettering Memorial Laboratories in Yellow Springs, Ohio.

Mr. Barrett joined Savannah Laboratories in 1990 as a chemist in the general laboratory. He is the senior level chemist for this department and performs cyanide, nutrient, titrimetric and demand analyses. Mr. Barrett possesses considerable problem solving skills for troubleshooting methods and dealing with difficult sample matrices. He is well versed in computer programming and practical computer applications.

Mr. Barrett previously worked as a research lab technician with the Institute of Paper Chemistry studying reaction experiments on terpene hydrocarbons using gas-liquid chromatography and IR and NMR. He worked four years as senior chemist for Ventron Corporation troubleshooting products. He spent four years working for Lincoln Pulp and Paper as technical director and six years in the same capacity at Boise Cascade Corporation. As technical director, he was responsible for environmental and water plant operations as well as quality control of pulp and paper.

Mr. Barrett has twenty-five years of analytical experience in industrial, environmental, and chemical analyses. He is thoroughly familiar with EPA, ASTM, TAPPI, and NIOSH methods for wet chemical testing of a variety of sample matrices including: waters, wastewaters, soils/sediments, and hazardous waste.

REBECCA BOWEN

Analyst, Chemical Hygiene Officer, Mobile Division

Dr. Bowen received a B.S. degree in biology in 1979 and a Ph.D. degree in basic medical sciences in 1989 from the University of South Alabama.

As the Chemical Hygiene Officer, Dr. Bowen is responsible for training and educating employees about safety rules and regulations. She enforces the company safety policies and ensures that the laboratory chemical hygiene plan complies with OSHA guidelines. Additionally, Dr. Bowen is the primary analyst for determining pesticide residues, herbicides, and PCBs in extracted samples using GC-ECD techniques.

Prior to employment with Savannah Laboratories, Dr. Bowen performed post-doctoral research at MacMaster University in Hamilton, Ontario. Her research involved investigating the pharmacological influences of prostaglandin and cyclic nucleotide metabolism on blood platelets in human tumor cells. She has several publications relating to her research in medical and other scientific journals.

Dr. Bowen has one year of environmental laboratory experience. She is familiar with SW-846, 40 CFR Part 136, and SDWA protocols for the parameters for which she is responsible.

PANDA CARTER

Analyst, Mobile Division

Ms. Carter has a B.S. degree in biology with a minor in chemistry from the University of South Alabama.

Ms. Carter joined Savannah Laboratories in 1991. Her primary responsibilities include sample analyses by ICP, flame, GFAA, and cold vapor/hydride generation atomic absorption techniques.

Ms. Carter has 12 years experience in atomic absorption spectroscopy and various wet chemistry techniques from past employment with Union Carbide Corporation and Protein Technologies International. She is thoroughly familiar with EPA-600 and SW-846 sample preparation and analytical methods for drinking waters, wastewaters, soils/sediments, hazardous waste samples, and TCLP extracts as well as the associated QC requirement.

CHRISTOPHER A. COOK

Field Manager, Mobile Division

Mr. Cook received a B.A. degree in biology from Clemson University in May, 1990. His primary responsibilities with Savannah Laboratories is scheduling field activities, coordinating field logistics for environmental programs and the field team leader for sampling events.

Mr. Cook joined Savannah Laboratories in 1990, and has developed operating procedures which have satisfied the scrutiny of federal and state regulatory agencies performing on-site audits. Mr. Cook is skilled in providing field support for water quality programs, groundwater monitoring, solid/hazardous waste characterization, air monitoring for personnel exposure and other environmental programs.

Mr. Cook has completed the forty hours "Hazardous Assessment and Response Management" training course to meet the requirements of 20 CFR 1910.120.

CEDRIC CRAWLEY

Technician/Extraction Lab Group Leader, Mobile Division

Mr. Crawley has completed course work toward a degree in computer science. As extractions lab group leader, Mr. Crawley is responsible for scheduling the organic extractions of BNAs, herbicides, pesticides, PCBs, phenols, phthalates, and PAHs from drinking waters, wastewaters, solids/sediments, and TCLP extracts for analysis by GC and GC/MS. He performs analysis of oil and grease and petroleum hydrocarbons by gravimetric and infrared techniques, and total phenolics and MBAS using organic extraction/spectrophotometric techniques.

Mr. Crawley's previous laboratory experience includes field sampling and analysis. He was responsible for sampling of NPDES projects and analysis of such parameters as D.O., conductivity, residual chlorine, turbidity, and pH.

Mr. Crawley has three years of environmental laboratory experience, one of which has been in a group leader role. He is familiar with SW-846 and 40 CFR Part 136 methods, protocols, and associated QC requirements for semivolatile organic extractions.

SHERYL S. FULLER

Chemist, Mobile Division

Ms. Fuller has a B.S. degree in chemistry from Stillman College. She has three years of analytical laboratory experience in the analysis of nutrients in waters, wastewaters, soils and sediment samples. She is also experienced in teh analysis of cyanides in a variety of sample matrices.

Since joining Savannah Laboratories in 1989, Ms. Fuller has gained extensive experience using wet chemical and spectrophotometric methods and ion specific electrodes. She is currently specializing in the determination of demand analyses and phosphorous in waters, wastewaters, soils and sediments. Ms. Fuller is thoroughly familiar with EPA methodologies for wet chemistry testing and the associated QC requirements.

STEPHANIE H. JONES

Field Scientist, Mobile Division

Ms. Jones has a B.S. degree in geology from the University of South Alabama. She joined Savannah Laboratories' field sampling department in 1991 as a trainee, bringing with her an extensive background in field sampling and analytical techniques.

Ms. Jones has been involved in several major sampling projects for drinking water, groundwater, stormwater, soil/sediment and hazardous waste samples. She has worked with clients in establishing sampling programs and writing SOPs.

Ms. Jones is thoroughly familiar with SW-846 sampling protocols, and is able to apply her extensive practical experience to any special sampling techniques as required.

SHAU-WEI LI

Chemist, Mobile Division

Dr. Li received her Ph.D. in 1989 and M.S. in 1986 in organic chemistry from Shanghai Institute of Organic Chemistry, Shanghai, China. She received her B.S. degree in chemistry from the Zhe-Tsian University in 1983.

Dr. Li joined Savannah Laboratories in 1991 as a pesticide residue chemist in the semivolatile gas chromatography (GC) laboratory. She is responsible for the analysis of pesticides/PCBs, PAHs, phenols and microextractable compounds in environmental samples. she is familiar with the operation of GCs equipped with electron capture, flame ionization, nitrogen-phosphorous detectors using capillary and packed columns. she is familiar with the Nelson and Hewlett Packard computerized data management system to collect and process analytical data.

Dr. Li has attended seminars and courses on gas chromatography involving column maintenance and operation according to new methods and techniques. She regularly attends the Gulf Coast Chromatographers Discussion Group meetings.

Prior to joining Savannah Laboratories, Dr. Li was a post-doctoral research associate for one year with the University of South Alabama Chemistry Department. she conducted research in the chemical synthesis of naturally occurring antibiotics.

Dr. Li is thoroughly familiar with the GC methods regarding sample preparation and analytical methods for drinking water, wastewater, soils/sediments, hazardous waste samples and TCLP extract analyses. she has extensive knowledge of EPA SW-846, 40 CFR Part 136 protocols and associated QC requirements.

KATHERINE WYNN MORGAN

Sample Coordinator, Mobile Division

Ms. Morgan has completed several courses toward a B.S. degree in chemistry. She is currently enrolled at the Faulkner State University and working toward completion of that degree.

Ms. Morgan's duties at Savannah Laboratories include filling client requests for sample bottles, resolving discrepancies in requests for analysis at sample receipt, and disposing of samples when analysis and reporting are complete. She coordinates all project orders from sample login to computer login and interfaces with the clients and project managers to facilitate the sample flow through the laboratory. In addition, she is responsible for ordering and receiving supplies and materials for the laboratory.

Prior to her employment with Savannah Laboratories in 1988, she worked in the petrochemical industry. As a laboratory technician, she performed chemical analysis of petrochemical products. She also developed skills such as data recording on a computer data system, interacting with clients, packaging and mailing restricted articles, and purchasing/receiving for the laboratory.

Ms. Morgan has eight years of laboratory bench experience. She has extensive knowledge of field sampling procedures and packaging and transporting requirements of a variety of chemicals. Ms. Morgan is familiar with the laboratory information management system of Savannah Laboratories. She is available to assist clients with scheduling bottle order shipments and receipt of samples in the laboratory.

EDWARD OETKEN

Metals Digestion Coordinator, Mobile Division

Mr. Oetken has a B.S. degree in biomedical sciences with a chemistry minor from the University of South Alabama.

At Savannah Laboratories, Mr. Oetken supervises all digestion procedures and sample receipts in the metals section. In this role, he has acquired knowledge of laboratory techniques and become familiar with SW-846 and EPA 600 protocols.

TRACY S. OWENS

Metals Supervisor, Mobile Division

Ms. Owens has a B.S. degree in environmental sciences from Troy State University. She joined Savannah Laboratories in 1990, and has specialized in the determination of trace metals analysis using inductively coupled plasma (ICP), flame, cold vapor, hydride generation and graphite furnace atomic absorption spectroscopy techniques.

Ms. Owens was promoted to metals lab supervisor in 1992. she is responsible for scheduling digestion and analysis for drinking water, waste water, soil/sediment, hazardous waste and TCLP projects. she ensures that proper preparation and analysis techniques are followed and method QC requirements are met. Ms. Owens oversees instrument maintenance and troubleshooting for the metals department.

Ms. Owens has three years experience in the laboratory. She is familiar with EPA SW-846 and Title 40 Part 136 test method and associated QC requirements.

SONYA REYNOLDS

Inorganics Group Leader, Mobile Division

Ms. Reynolds has a B.S. degree in biology and environmental science from Livingston University. She was a founding member of the L.U. Conservacy group and is active in promoting environmental awareness.

Since joining Savannah Laboratories in 1991, she has gained extensive knowledge of EPA methodologies for demand, nutrient, and general wet chemical analyses. She is familiar with SW-846, Standard Methods, and EPA 600 series methods of analysis for waters, wastewater, soil/sediment, and hazardous waste samples as well as the associated QC requirements.

Ms. Reynolds is responsible for analysis of TOC and COD, coliforms by both membrane filtration and multiple tube techniques, sulfides, and chlorides. She also oversees the analytical work of several other analysts and troubleshoots problems with data and QC.

LETITIA SAUNDERS

Analyst, Mobile Division

Ms. Saunders has a B.A. degree in biology from Berea College. She has completed two years of study toward a degree in dentistry at the University of Kentucky. She joined Savannah Laboratories in 1991 as a nutrients analyst. In this position, she was responsible for the determination of TKN, NH_3, NO_3, and NO_2 in waters, wastewaters, soils, and sediments. She is familiar with EPA-600 wet chemistry methodologies and associated QC requirements.

Ms. Saunders has moved to the volatiles laboratory and is responsible for the analysis of environmental samples for volatile organic compounds by gas chromatography using Hall and Photo Ionization (PID) detectors according to EPA mehtods 501.1, 502.2, 601/602, and SW-846 8010/8020. She interprets chromatograms, calculates and reports results, and checks QC for these instruments.

Prior to joining Savannah Laboratories, Ms. Saunders was a research technologist at the University of South Alabama. She is experienced in the use of a variety of spectrophotometric equipment and is familiar with HPLC and column chromatography techniques.

NAN SCARBROUGH

Analyst, Mobile Division

Ms. Scarbrough received a B.S. degree in wildlife biology from Livingston University. She also holds a Master of Education degree from Livingston University. Her primary responsibility at Savannah Laboratories is analyses of cyanide in waters, wastewaters, soils/sediments, and hazardous waste samples.

Prior to joining Savannah Laboratories in 1991, Ms. Scarbrough worked as a lab technician for the Alabama Co-op Fish and Wildlife Research Unit performing habitat mapping and collection and identification of fish. She also has experience in bioassay analysis from her employment as an aquaculture specialist with TAI Environmental Sciences, Inc.

Ms. Scarbrough has two years of laboratory experience. She is familiar with SW-846 and EPA-600 methods for cyanide analyses on a variety of sample matrices.

JOHN SIMS

Analyst, Mobile Division

Mr. Sims has a B.S. degree in physics with a minor in computer science from Alabama State University. He joined Savannah Laboratories in 1991 as an analyst with the responsibility of extracting both volatile and non-volatile TCLP samples.

Mr. Sims is currently responsible for the analysis of semivolatile extractable organics, primarily phenols, PAHs, and phthalate esters, by GC-FID methods. He is trained in both 40 CFR and SW-846 methods and QC requirements.

Prior to joining Savannah Laboratories, Mr. Sims worked as a lab technician in the biomedical research department at Alabama State University. He also co-authored four publications regarding PIXIE analysis techniques for analyzing environmental samples. He has also worked as a computer programmer with Computer Graphic Management, writing programs on level 6 machines for report formats, payrolls, and invoices for a variety of businesses.

RHODA SMITH

Office Manger/Data Coordinator, Mobile Division

Ms. Smith attended Georgia State University in Atlanta, Georgia, where she majored in business administration. She has held various positions in the financial field. She joined Savannah Laboratories in 1988 as office manager. Her duties include supervision of office personnel and coordination of data and billing. She is thoroughly familiar with Savannah Laboratories' Information Management System (LIMS) and is responsible for editing reports for complex projects. She reports directly to the Laboratory Director and works with project mangers, analysts, and clients to coordinate prompt data flow through the laboratory.

VIRGINIA VASQUEZ

Analyst, Mobile Division

Ms. Vasquez has a B.S. degree in chemistry/biology from the University of Guadalajara, Mexico. She has four years of analytical laboratory experience. She is familiar with EPA SW-846 and CFR Title 40 Part 136 test methods, protocols, and associated QC requirements. She was previously employed as a laboratory supervisor in a wastewater control laboratory. She was responsible for assuring that proper methods, techniques and procedures were used. She also worked as an analyst in an instrumental, wet chemistry and biology laboratory.

Ms. Vasquez's primary responsibility at Savannah Laboratories is the analysis of environmental samples for volatile organic compounds by gas chromatography using Hall and flame ionization detectors (FID) according to EPA Methods 601/602 and SW-846 8010/8020. She interprets chromatograms, calculates and reports results, and checks QC for these methods.

CYNTHIA WILSON

Chemist, Mobile Division

Ms. Wilson has a B.S. degree in chemistry from East Carolina University in Greenville, North Carolina. She joined Savannah Laboratories in 1989. She is responsible for the semivolatile organic analysis of environmental samples by GC/MS. Her duties include standard preparations, instrument calibrations, data interpretation and reporting, and maintenance of quality control for the GC/MS instrument.

Prior laboratory experience includes analytical testing to monitor plant operation for a municipal wastewater laboratory. She performed wet chemical analysis including BOD, DO, pH, specific conductivity, residual chlorine, chlorides, solids, and microbiological analysis for fecal and total coliforms. She previously worked at the Savannah, Georgia division of Savannah Laboratories as a GC volatiles chemist where she gained experience reporting volatile data and associated QC requirements.

Ms. Wilson has three years of analytical environmental testing experience on a variety of sample matrices including wastewaters, soils/sediments, and TCLP extracts. She is experienced in the use of purge and trap systems, FID, PID, and HECD detectors, and PE-Nelson and ChemStation data systems. She is familiar with SW-846 and 40 CFR Part 136 test methods, protocols, and QC requirements for semivolatiles organic analysis.

PAUL CANEVARO

Laboratory Director/Project Manager, Deerfield Beach Division

Mr. Canevaro received his B.S. degree in chemistry from the University of Montevallo in 1982. He has a total of 12 years experience working in environmental laboratories. This experience includes the operation of GC, GC/MS, ICP, HPLC, and AA instruments using EPA protocols. Other related experience includes the coordination of inorganic and organic laboratories with a staff of 60 chemists and technicians, professional and technical guidance to laboratory supervisors, and development and maintenance of a quality control/quality assurance program.

Mr. Canevaro joined Savannah Laboratories in June, 1989 as the Deerfield Beach, Florida facility laboratory director. He is responsible for the day-to-day operation of the laboratory, project design and implementation, and client relations.

RHONDA MOLL

Project Manager, Deerfield Beach Division

Ms. Moll received her B.S. degree in biology with a double minor in chemistry and physics from Troy State University. She began her career with Savannah Laboratories in 1987 at the Tallahassee Division where she determined volatile organic compounds using GC and GC/MS. Her past experience also includes the quality control testing and approval of raw materials used in the manufacture of pharmaceuticals and hospital supplies at Baxter Corporation in Miami, Florida.

Ms. Moll joined the Deerfield Beach Division upon its opening in 1989, as the volatile organics manager. She was responsible for the initial set-up of the volatiles laboratory which included instrumentation, quality control, methodology and personnel training. She coordinated all laboratory functions and reviewed all data generated from this department.

Ms. Moll was promoted to quality control manager of this division where she oversees all laboratory quality control functions such as evaluations, inspections, data review, and implementing new procedures required by methodology or Savannah Laboratories' corporate quality assurance program.

KATHY C. IRMINGER

Quality Assurance Manager, Deerfield Beach Division

Ms. Irminger received a B.A. degree in chemistry from Wake Forest University and began working at the Colorado School of Mines Research Center in Golden, Colorado. There she performed atomic absorption spectrophotometry in metallurgical and environmental applications and also developed inorganic bench methods. She also has worked for Camp, Dresser, and McKee and the Colorado State Department of Health performing inorganic EPA methods. At AC Laboratories in Florida, she developed expertise in gas chromatography for EPA Methods 601, 602, 502.2, 604, 610, 8010, and 8020.

Ms. Irminger joined Savannah Laboratories' Deerfield Beach Division when it opened in 1989, as a volatiles chemist performing GC and GC/MS analyses. She is well versed in SW-846 and CFR 40 methodologies.

LINDA BACKUS

Chemist, Deerfield Beach Division

Ms. Backus received a B.S. degree in microbiology and a B.A. degree in chemistry from Florida Atlantic University. She taught microbiology at the collegiate level and performed extensive research on oral microbes. Upon graduation, she was employed with the University of Miami/Jackson Memorial Hospital initiating a tissue procurement facility for nationwide cancer research.

Ms. Backus joined Savannah Laboratories in 1990 as a trace metal analyst. Her present duties include determinations and data reporting of metals utilizing ICP techniques.

THERONA T. JAMES

Analyst, Deerfield Beach Division

Ms. James has a B.A. degree in chemistry with a minor in education from Columbia College in Columbia, South Carolina.

Prior to her employment with Savannah Laboratories in 1991, she was employed by the South Carolina Department of Environmental Health and Control as a chemist. There her duties encompassed wet chemistry, metals, and asbestos analyses. Her previous experience also includes metals analysis, digestion, and QA/QC data responsibilities at AC Laboratories in Fort Lauderdale, Florida.

Ms. James' current responsibilities at the Deerfield Beach facility include the analysis of volatile organic compounds by GC.

CATHERINE KATSIKIS

Analyst, Deerfield Beach Division

Ms. Katsikis received a B.S. degree in chemistry from the Chemical Engineering College in Athens, Greece. Her previous experience as a chemical laboratory supervisor included working with PVC stabilizers, polymerics, co-polymers, and organic compounds.

Ms. Katsikis joined Savannah Laboratories in 1990 as a trace metals analyst. Her duties include determinations and data reporting of metals utilizing ICP techniques.

ERIC SCHINSING

Technician, Deerfield Beach Division

Mr. Schinsing has been with Savannah Laboratories since 1990. He has an A.S. degree from the Community College of The Finger Lakes of New York and is currently pursuing a degree in oceanographic engineering. His responsibilities include assisting the analysts in the general chemistry laboratory.

MARIANNE WALKER

Sample/Data Manager, Deerfield Beach Division

Ms. Walker's experience with environmental analytical laboratories includes two years at Pioneer Laboratory, Inc. in Pensacola, Florida, where she served as reporting department manager as well as office manager.

Ms. Walker joined Savannah Laboratories in 1989, where she assisted in coordinating the initial set-up of the Deerfield Beach laboratory operation. Her initial responsibilities included supervision of sample custody, sample bottle preparation, sample login, and data entry, as well as providing in-house project coordination.

As Sample/Data Manager, Ms. Walker is currently responsible for coordinating analytical programs for many of Savannah Laboratories' clients, including major consulting firms, counties, and water management districts.

JANICE WILTSHIRE

Data Coordinator, Deerfield Beach Division

Ms. Wiltshire obtained her diploma in computer science from Computer and Business Institute in Jamaica and has one year experience as a data entry clerk at AC Laboratories. She joined Savannah Laboratories in 1990, and her duties include all phases of data handling and assisting project mangers with client report preparation.

PHILL TAYLOR, JR.

Field Coordinator, Deerfield Beach Division

Mr. Taylor joined Savannah Laboratories in 1990. His previous experience includes working as a water treatment plant operator for the cities of Deerfield Beach and Pompano Beach, Florida. Mr. Taylor's current responsibilities include all field sampling activities scheduled at the Deerfield Beach facility.

KIMBERLY L. AMBISCO-KOSTZER

Organics Manager, Deerfield Beach Division

Ms. Ambisco-Kostzer has a B.S. degree in biology/pre-med with a minor in chemistry from Barry University of Miami Shores, Florida. She worked at the University of Miami School of Medicine as a research biochemist after graduation.

Ms. Ambisco-Kostzer joined Savannah Laboratories in 1989. Her duties include the analysis of pesticides, herbicides, phthalates, EDB, PAH, phenols, hydrocarbons, and formaldehydes.

LAWRENCE TEICH

Chemist, Deerfield Beach Division

Mr. Teich has a B.A. in chemistry with an emphasis in zoology from Florida Atlantic University. Prior to joining Savannah Laboratories in 1989, he taught laboratory course work in animal physiology at Florida Atlantic University in Boca Raton.

Mr. Teich's responsibilities at Savannah Laboratories include mercury determinations by cold vapor atomic absorption. He also assists with trace metal analysis of As, Pb, Se, and Tl by graphite furnace atomic absorption and helps in the digestion of samples.

MARY VALEST

Chemist, Deerfield Beach Division

Ms. Valest obtained a B.S. degree in chemistry from the Catholic University of Puerto Rico. She completed her Chemistry Practicum at Destileria Serralles, Inc., a rum manufacturing company, where she performed analysis of finished products by UV, GC, and colorimeter. In raw materials, she conducted water monitoring, testing and distillation of fermented sugars.

Ms. Valest assisted on a temporary basis as quality control manager at Fruits Drinks, Inc. (Puerto Rico) where her responsibilities included the quality control process, documentation and daily production reports; coordination of chemical and microbiological testing of raw materials and finished products; supervision of laboratory technicians; and control of safety and sanitation systems.

She then joined SmithKline Beecham Pharmaceuticals (Puerto Rico) where she worked as quality assurance analyst with bulk, finished products, and long term stability samples conducting testing procedures by HPLC, GC, UV, turbidimeter, osmometer and extractions. In the area of raw materials, she worked with IR, TLC, gravimetric analysis, all process sterile water monitoring and process rinse water testings.

In 1990, she moved into the continental United States and worked on a temporary basis with Schering-Plough (Pembroke Pines, Florida) where she performed dissolution technology and HPLC and assisted in identification of chromatographic samples and calculation of resolution and tailing factors for a new quantitation method for fatty acids.

Ms. Valest joined Savannah Laboratories in 1991, and she is currently working in the semivolatile GC department performing EDB and pesticide residue analysis.

CAROL-ANN VASSELL

Chemist, Deerfield Beach Division

Ms. Vassell obtained a B.S. degree in chemistry from the City College of New York. Upon graduation, she worked as a research chemist at the Institute of Food and Agricultural Sciences.

Ms. Vassell joined AC Laboratories where she performed trace metal determinations by AA as well as EDB and trihalomethane determinations by GC. She also conducted sample extractions for organic compounds as well as chloride, cyanide, and phenols determinations.

Ms. Vassell joined Savannah Laboratories in 1990 as a chemist. Her responsibilities include the analysis of acids, base neutral and pesticide compounds by GC/MS techniques.

KATHY SHEFFIELD

Laboratory Director/Project Manager, Tampa Bay Division

Ms. Sheffield has B.S. degrees in chemistry and biology plus seven years of analytical chemistry experience. Throughout her career, she has specialized in the field of organic chemistry and has developed considerable expertise in pesticide and volatile organic analysis.

Ms. Sheffield was employed by the Florida Department of Agriculture in the Pesticide Use Monitoring Section of the Chemical Residue Laboratory. She was responsible for the analysis of water, soil, and food products for a variety of pesticides and herbicides using gas chromatography and high performance liquid chromatography (HPLC). She was instrumental in the development of new procedures using HPLC, and wrote several standard operating procedures. Ms. Sheffield was promoted to a supervisory level where she was responsible for all data generated by the analytical section.

Ms. Sheffield began her employment with Savannah Laboratories and Environmental Services, Inc. as senior chemist. She performed analyses on environmental samples using instrumental techniques including GC/MS, GC, and HPLC. She was promoted to organic section manager, with additional duties in the administration of the quality assurance program.

As laboratory director/project manager, Ms. Sheffield is responsible for coordinating analytical programs for many of Savannah Laboratories' clients, including major consulting firms, counties, governmental agencies, and industries.

ANDRE RACHMANINOFF

Project Manger, Tampa Bay Division

Mr. Rachmaninoff has a B.A. degree in biology from Kalamazoo College and eight years of experience in environmental analytical work. Six years of this experience was in a supervisory or laboratory management capacity.

Mr. Rachmaninoff is thoroughly familiar with analytical, microbiological, and radiochemistry techniques. He has extensive bench experience in both flame and furnace AA spectroscopy, ICP emission spectroscopy, IR and UV/VIS spectroscopy, Gamma spectrometry, alpha and beta particle emissions analysis, and numerous automated and manual wet chemistry analyses.

Mr. Rachmaninoff is an active member of the Florida Society of Environmental Analysts, and served as President from 1990-1991.

Mr. Rachmaninoff provides technical assistance and support to clients for field and analytical services as a project manager.

DOMINIC P. FRALLI

Project Manager, Tampa Bay Division

Mr. Fralli holds an M.S. degree in environmental science from the University of Texas in Dallas. He has more than seven years experience as a gas chromatography chemist and supervisor. Mr. Fralli was an environmental scientist with the Hillsborough County Environmental Protection Commission where he was responsible for the operation of the organic section of the laboratory prior to joining Savannah Laboratories. He implemented EPA methods for analysis of water and soil samples and was in charge of the QA/QC generated for these methods. He supervised two chemists and provided information concerning organic chemicals to the public and to agency personnel.

As QA Manager, he is responsible for ensuring that method QA requirements are met and also issues and evaluates in-house check samples.

TRACY H. BOTTO

Inorganics Manager, Tampa Bay Division

Ms. Botto holds a B.S. degree in microbiology from the University of Maine and has five years experience in a variety of laboratory techniques. Her specialty is trace metals determinations by ICP, though she is familiar with flame, furnace, and cold-vapor techniques.

Her responsibilities as inorganics manager include management of personnel, overseeing of all method development, and adherence to EPA methodology and QA/QC requirements of the Tampa Bay Division laboratory.

INAS M. SOBKY

Quality Assurance Manager, Tampa Bay Division

Ms. Sobky has a B.S. degree in chemistry/zoology from Ain Shames University, Cairo, Egypt and seven years of experience in organic environmental analytical work. Four years was spent in an organic laboratory management capacity.

Ms. Sobky is familiar with EPA 500, 600, and 8000 series gas chromatography (GC) methodologies. She has additional training from ACS in gas chromatography system maintenance and troubleshooting. She attended an analytical gas chromatography workshop with the Southeastern Chromatography Association and she is an active member of the Florida Society of Environmental Analysts.

Ms. Sobky's responsibilities include management and implementation of technical EPA GC methods, training and supervision of organic chemists and technicians, and maintenance of GC instrumentation as a GC manager for Savannah Laboratories, Tampa Bay Division.

LINDA DOWD

Analyst, Tampa Bay Division

Ms. Dowd has a B.S. degree in biology from York College and an A.S. degree in environmental health technology from Queensboro Community College. While working toward her degrees, she was employed as an environmental educator for the New York City Department of Parks. Her duties included flora and fauna identification and inventories, water sampling, and the creation and implementation of a variety of environmental education programs for the public.

Her responsibilities as an analyst include the preparation of standards, calibration and loading of the GC, and assisting the chemist in charge with identification and calculation of volatile organic compounds for the volatiles section at Savannah Laboratories.

CHRIS E. HARRIS

Field Sampler/Lab Technician, Tampa Bay Division

Mr. Harris has more than three years of experience as a field/laboratory technician in the environmental field. He has collected soil, groundwater, surface water, drinking water, and industrial waste samples using current EPA protocol. In the laboratory, he has performed a wide variety of titrimetric, gravimetric, and colorimetric analyses according to EPA protocol for both aqueous and nonaqueous sample matrices.

Mr. Harris is responsible for the scheduling and planning of all field sampling projects for the Tampa Bay facility. When not collecting field samples, he is responsible for all analyses associated with the general and biological laboratories.

CARL JOHN HOOVER, JR.

Chemist, Tampa Bay Division

Mr. Hoover holds a B.S. in zoology from the University of South Florida. He has more than six years experience in the environmental field. Mr. Hoover was a chemist with PBS&J Environmental Laboratories where he was responsible for trace metals analysis by GFAA, hexavalent chromium analysis, mercury analysis by cold vapor method and TCLP extractions prior to joining Savannah Laboratories. He was an environmental scientist and laboratory technician at Southwest Florida Water Management District where he assisted in environmental impact studies and performed wet chemistry analysis before his employment with PBS&J.

At Savannah Laboratories, Mr. Hoover is responsible for trace metals analysis by GFAA and by ICP.

ANTONIUS LEBRUN

Chemist, Tampa Bay Division

Mr. Lebrun has a B.S. degree in chemistry from University of Florida. He was a chemist with Cargill/Gardinier, Inc., in Riverview, Florida, where he worked in the environmental department prior to joining Savannah Laboratories.

At Savannah Laboratories, Mr. Lebrun is responsible for analysis of samples for metals by ICP and GFAA.

MARSHA MARTINOVICH

Analyst, Tampa Bay Division

Ms. Martinovich has a B.A. degree in sociology with a minor in chemistry from West Virginia University in Morgantown, West Virginia, and has more than three years experience in the environmental field. She was responsible for analysis of organic contaminants in water, wastewater, soil, and hazardous waste samples prior to joining Savannah Laboratories as a GC analyst.

At Savannah Laboratories, Ms. Martinovich is responsible for volatile analysis by GC using methods 601, 602, 8010, and 8020.

NATALIE L. PARK

Analyst, Tampa Bay Division

Ms. Park has a B.S. degree in biology from Florida State University. She has two years experience doing organic extractions at an environmental laboratory. She was responsible for extraction of soil and water samples for EPA Methods 604, 606, 608, 610, 614, 615, 625, and all SW-846 series methods. She is also familiar with Methods 418.1 and 413.2.

Ms. Park's duties at Savannah Laboratories include metal digestions, TCLP extractions, and mercury analysis using cold vapor techniques.

TALICIA C. SMITH

Chemist, Tampa Bay Division

Ms. Smith has a B.S. degree in chemistry from Florida A&M University, plus five years of analytical chemistry experience. Ms. Smith was employed by the Florida Department of Agriculture and Consumer Services, Chemical Residue Laboratory, prior to joining Savannah Laboratories. Her duties included method development, quality control and supervision of a technical staff. She also developed considerable expertise in gas chromatographic procedures.

Ms. Smith is in charge of volatile GC/MS analysis following EPA Methods 624 and 8240.

TAYSEER E. ZAYAN

Chemist, Tampa Bay Division

Ms. Zayan has a B.S. degree in chemistry from the University of Cairo in Cairo, Egypt, and more than six years experience as a chemist in the environmental field. She was a section manager with an environmental laboratory where she was responsible for analysis of water, wastewater, and soil samples prior to joining Savannah Laboratories.

At Savannah Laboratories, Ms. Zayan is responsible for semivolatile analyses by GC using Methods 608/8080, 610/8100, and 504.

Appendix A: Method Validations

Summary of Contents

Appendix A: Method Validations

Summary of Contents				
Method	Matrix	Analyte	Page #	Date Submitted
8080/608.1	water	chloroneb	23	05/06/92
8080/608.1	water	propachlor	23	05/06/92
8080/608.1	water	chloropropylate	23	05/06/92
8080/608.1	water	etridiazole	23	05/06/92
8080	soil	chloroneb	24	05/06/92
8080	soil	propachlor	24	05/06/92
8080	soil	chloropropylate	24	05/06/92
8080	soil	etridiazole	24	05/06/92
8150	water	picloram	25	05/06/92
8150	soil	picloram	25	05/06/92
8141	water	dioxathion	26	05/06/92
8141	water	dichlofenthion	26	05/06/92
8141	soil	dioxathion	27	05/06/92
8141	soil	dichlofenthion	27	05/06/92
8141/619	soil	terbutryn	27	05/06/92
8141/619	water	ametryn	28	05/06/92
8141/619	water	atrazine	28	05/06/92
8141/619	water	prometryn	28	05/06/92
8141/619	water	prometon	28	05/06/92
8141/619	water	propazine	28	05/06/92
8141/619	water	simazine	29	05/06/92
8141/619	water	terbuthylazine	29	05/06/92
8141/619	water	terbutryn	29	05/06/92
8141/619	soil	ametryn	30	05/06/92
8141/619	soil	atrazine	30	05/06/92
8141/619	soil	prometryn	30	05/06/92
8141/619	soil	prometon	30	05/06/92
8141/619	soil	propazine	30	05/06/92
8141/619	soil	simazine	31	05/06/92
8141/619	soil	terbuthylazine	31	05/06/92
8141/619	soil	terbutryn	31	05/06/92
632	water	bromacil	32	05/06/92
504	water	EDB	33	05/06/92
504	water	DBCP	33	05/06/92
504	water	chloropicrin	33	05/06/92
504	water	1,1-dichloropropane	33	05/06/92
504	water	methyl isothiocyanate	33	05/06/92
504	water	c/t-1,3-dichloropropene	34	05/06/92
8330	water	diphenylamine	35	12/17/92
8330	water	n-nitrosodiphenylamine	35	12/17/92
8330	soil	diphenylamine	36	06/23/92
8330	soil	n-nitrosodiphenylamine	36	06/23/92
8330	water	nitroglycerin	37	07/14/92
8330	soil	nitroglycerin	38	07/14/92
8270	water	ethyl carbamate	39	07/14/92
8270	soil	ethyl carbamate	40	07/14/92
7041/3005	water	antimony	41	07/14/92
7041/3050	soil	anitimony	42	07/14/92
831/3550	soil	benomyl	43	07/14/92

METHOD VALIDATION

Date: 05/31/91

Method: 630 Reference: EPA 1982, Pressly/Longbottom Matrix: water

Instrument: Milton/Roy Spec. 21 Analytical technique: colorimetric

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000 mL -or- Wt. ext.(dry): _____g Extraction Solvent: SnCl2/HCl1 Final Solvent: Cupric acid/ethanolamine2 Final Volume: 25 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Ziram				
Spike level(unit)	25 ug/L				
Replicate 1	23				
Replicate 2	25				
Replicate 3	26				
Replicate 4	29				
Replicate 5	26				
Replicate 6	27				
Replicate 7	26				
Average result	26				
(n-1)sd	1.826				
MDL*	5.7 ug/L				
PQL**	18 ug/L				
Is spike level<10x calculated MDL?	yes				
SL GQAP PQL	NA				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Robert Berry

QA Manager: E.L. Schneider

Remarks: 1Decomposition reagent. 2Color reagent. All dithiocarbamates are reported as Ziram. Absorbance was determined at 435nm and 380nm. Results presented are from the 435nm determination. Correct absorbance is based on the analyte concentration.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (_____)

METHOD VALIDATION

Date: 07/16/91

Method: 8141 Reference: SW846 Proposed Update I Matrix: soil

Instrument: Varian 3400 Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 10 g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Ethion	Trithion			
Spike level(unit)	100 ug/kg	100 ug/kg			
Replicate 1	84.1	100			
Replicate 2	78.6	80			
Replicate 3	76.9	133			
Replicate 4	77.7	113			
Replicate 5	89.2	120			
Replicate 6	74.7	103			
Replicate 7	79.8	93.3			
Average result	80.1	106			
(n-1)sd	4.938	17.59			
MDL*	15.5	55.2			
PQL**	49.4	176			
Is spike level<6x calculated MDL?	yes	yes			
SL GQAP PQL	300	200			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: D. Koren

QA Manager: E.L Schneider

Remarks: _____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (_____)

METHOD VALIDATION

Date: 7/13/92

Method: 631/3550 Reference: EPA/SW846 Matrix: Soil

Instrument: Waters 600E/Waters 484UV detector Analytical technique: HPLC/UV

Single lab validation by SL Division: TALLAHASSEE

Extractables	Purgeables
Volume ext: _____ ml -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: ACN Final Volume: 1 ml	Amount purged: _____ ml -or- _____ g soil in _____ ml H_2O

Analyte:	Benomyl				
Spike level(unit)	0.667(ug/kg)				
Replicate 1	0.228				
Replicate 2	0.251				
Replicate 3	0.244				
Replicate 4	0.201				
Replicate 5	0.275				
Replicate 6	0.204				
Replicate 7	0.221				
Average result	0.232				
(n-1)sd	0.0266				
MDL*	0.084				
PQL**	0.27				
Is spike level≤6x calculated MDL?	NO				
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: Benomyl can be extracted and analyzed concurrently with Method 632/3550.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg dw)
Benomyl	18 - 60	0 - 35		1.0

METHOD VALIDATION

Date: 08/01/91

Method: 632/3550 Reference: EPA/SW846 Matrix: soil

Instrument: Waters HPLC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

Analyte:	Fenuron	Monuron	Baygon	Fluometuron	Diron
Spike level(unit)	10 ug/kg	3.0 ug/kg	120 ug/kg	8.0 ug/kg	3.0 ug/kg
Replicate 1	9.29	2.54	106	7.28	2.97
Replicate 2	10.6	2.30	106	7.47	3.19
Replicate 3	10.2	1.87	108	7.32	3.10
Replicate 4	9.58	1.73	88.9	6.20	2.48
Replicate 5	9.69	2.02	89.8	5.82	2.66
Replicate 6	9.42	2.02	86.9	6.48	2.72
Replicate 7	8.17	1.73	84.2	6.14	2.79
Average result	9.57	2.03	95.7	6.67	2.84
(n-1)sd	0.77	0.30	10.4	0.67	0.23
MDL*	2.42	0.94	32.8	2.10	0.74
PQL**	7.7	3.0	104	6.7	2.3
Is spike level<6x calculated MDL?	yes	yes	yes	yes	yes
SL GQAP PQL	100	20	20	20	20

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: _____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Fenuron				10
Monuron				5.0
Baygon				100
Fluometuron				10
Diron				5.0

METHOD VALIDATION

Date: 07/15/91

Method: 632/3550 Reference: EPA/SW846 Matrix: soil

Instrument: Waters/LC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 30.7 g dw Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Carbofuran				
Spike level(unit)	29.3 ug/kg				
Replicate 1	28.3				
Replicate 2	31.3				
Replicate 3	26.7				
Replicate 4	28.3				
Replicate 5	28.3				
Replicate 6	26.7				
Replicate 7	23.4				
Average result	27.6				
(n-1)sd	2.395				
MDL*	7.51				
PQL**	24				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	200				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: R. Driver

QA Manager: E.L. Schneider

Remarks: _____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (_____)

METHOD VALIDATION

Date: 08/01/91

Method: 632/3550 Reference: EPA/SW846 Matrix: soil

Instrument: Waters HPLC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Propham	Methiocarb	Linuron	Chlorpropham	Barban
Spike level(unit)	60 ug/kg	40 ug/kg	4.0 ug/kg	40 ug/kg	50 ug/kg
Replicate 1	51.2	41.3	3.66	15.6	15.0
Replicate 2	47.8	42.4	3.64	13.0	15.0
Replicate 3	48.0	42.3	3.68	14.9	16.7
Replicate 4	41.1	33.1	3.13	12.3	11.7
Replicate 5	40.3	32.9	3.04	11.7	11.7
Replicate 6	41.0	36.4	3.28	11.7	13.3
Replicate 7	41.9	35.4	3.18	10.4	13.3
Average result	44.5	37.7	3.37	12.8	13.8
(n-1)sd	4.40	4.23	0.28	1.86	1.85
MDL*	13.8	13.3	0.87	5.84	5.81
PQL**	44	42	2.8	19	19
Is spike level<6x calculated MDL?	yes	yes	yes	no(x6.8)	no(x8.6)
SL GQAP PQL	20	100	20	20	20

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: Average %recovery for Chlorpropham is 32%. Average %recovery for Barban is 28%.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Propham				50
Methiocarb				50
Linuron				5.0
Chlorpropham				20
Barban				20

METHOD VALIDATION

Date: 08/01/91

Method: 632/3550 Reference: EPA/SW846 Matrix: soil

Instrument: Waters HPLC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

(reiteration of previous data)

Analyte:	Neburon			Carbofuran	
Spike level(unit)	3.0 ug/kg			29.3 ug/kg	
Replicate 1	2.97			28.3	
Replicate 2	2.97			31.3	
Replicate 3	2.97			26.7	
Replicate 4	2.43			28.3	
Replicate 5	2.30			28.3	
Replicate 6	2.57			26.7	
Replicate 7	2.70			23.4	
Average result	2.70			27.6	
(n-1)sd	0.28			2.395	
MDL*	0.88			7.51	
PQL**	2.8			24	
Is spike level<6x calculated MDL?	yes			yes	
SL GQAP PQL	20			200	

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Neburon				5.0
Carbofuran				50

METHOD VALIDATION

Date: 08/01/91

Method: 632/3550 Reference: EPA/SW846 Matrix: soil

Instrument: Waters HPLC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Oxamyl	Methomyl	Carbaryl		
Spike level(unit)	50 ug/kg	120 ug/kg	30 ug/kg		
Replicate 1	39.9	119.9	54.9		
Replicate 2	39.9	114.2	59.7		
Replicate 3	39.9	102.7	57.3		
Replicate 4	43.9	125.6	59.7		
Replicate 5	39.9	119.9	57.3		
Replicate 6	51.8	148.4	59.7		
Replicate 7	41.8	114.2	54.9		
Average result	42.4	120.7	57.6		
(n-1)sd	4.415	14.15	2.16		
MDL*	13.9	44.5	6.8		
PQL**	44	142	22		
Is spike level<6x calculated MDL?	yes	yes	yes		
SL GQAP PQL	200	20	100		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: Average %recovery for carbaryl was 192%. Baseline interfence is suspected; the study will be rerun as soon as possible for carbaryl.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Oxamyl				50
Methomyl				200
Carbaryl				50

METHOD VALIDATION

Date: 08/03/91

Method: 8081 Reference: SW846 Proposed Update II Matrix: soil

Instrument: Varian 3400 GC Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____mL -or- Wt. ext.(dry): 10 g Extraction Solvent: MeCl2/Acetone Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Dicofol				
Spike level(unit)	50 ug/kg				
Replicate 1	52.4				
Replicate 2	50.4				
Replicate 3	50.9				
Replicate 4	54.1				
Replicate 5	51.4				
Replicate 6	51.8				
Replicate 7	50.8				
Average result	51.7				
(n-1)sd	1.258				
MDL*	3.95				
PQL**	12.6				
Is spike level<6x calculated MDL?	no(x12.6)				
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Amy Hayes

QA Manager: E.L. Schneider

Remarks: DB-608 column reported. DB-5 results were similar. Spike level is greater than 10x calculated MDL. Study will be rerun at a lower level as soon as possible.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Dicofol				20

METHOD VALIDATION

Date: 08/03/91

Method: 8081 Reference: SW846 Proposed Update II Matrix: groundwater

Instrument: Varian 3400 GC Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000 mL -or- Wt. ext.(dry): _____ g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Dicofol				
Spike level(unit)	0.05 ug/L				
Replicate 1	0.0597				
Replicate 2	0.0649				
Replicate 3	0.0595				
Replicate 4	0.0555				
Replicate 5	0.0610				
Replicate 6	0.0592				
Replicate 7	0.0517				
Average result	0.0588				
(n-1)sd	0.00418				
MDL*	0.0131				
PQL**	0.042				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Amy Hayes

QA Manager: E.L. Schneider

Remarks: DB-608 column reported. DB-5 results were similar._____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Dicofol				0.10

METHOD VALIDATION

Date: 08/07/91

Method: 632 Reference: EPA SW-846 Matrix: soil

Instrument: Waters HPLC Analytical technique: HPLC

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 30 g Extraction Solvent: MeCl2 Final Solvent: Acetonitrile Final Volume: 1 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Mexacarbate	Siduron			
Spike level(unit)	25 ug/kg	16.7 ug/kg			
Replicate 1	11.3	12.7			
Replicate 2	14.6	12.7			
Replicate 3	14.6	11.4			
Replicate 4	14.6	11.4			
Replicate 5	12.9	13.9			
Replicate 6	12.1	13.9			
Replicate 7	11.3	10.8			
Average result	13.06	12.40			
(n-1)sd	1.54	1.24			
MDL*	4.8	3.9			
PQL**	15.4	12.4			
Is spike level<6x calculated MDL?	yes	yes			
SL GQAP PQL	20	20			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygeil

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (____)

METHOD VALIDATION

Date: 08/07/91

Method: 6010(3010) Reference: USEPA SW-846 Matrix: water

Instrument: Jarrell Ash ICAP61 Analytical technique: _____

Single lab validation by SL Division: Tallahassee

Inorganics (digestion)	Purgeables
Volume ext: 100 mL -or- Wt. ext.(dry): _____ g Extraction Solvent: n/a Final Solvent: n/a Final Volume: 100 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Tin				
Spike level(unit)	0.10 mg/L				
Replicate 1	0.1023				
Replicate 2	0.0978				
Replicate 3	0.0945				
Replicate 4	0.0912				
Replicate 5	0.0973				
Replicate 6	0.0939				
Replicate 7	0.0989				
Average result	0.0966				
(n-1)sd	0.00367				
MDL*	0.0115				
PQL**	0.0366				
Is spike level<6x calculated MDL?	no (x8.7)				
SL GQAP PQL	20				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Todd Baumgartner

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (____)

METHOD VALIDATION

Date: 08/07/91

Method: 6010(3010) Reference: USEPA SW-846 Matrix: soil

Instrument: Jarrell Ash ICAP61 Analytical technique: _____

Single lab validation by SL Division: Tallahassee

Inorganics (digestion)	Purgeables
Volume ext: _____ mL -or- Wt. ext.(dry): 1.40 g Extraction Solvent: n/a Final Solvent: n/a Final Volume: 100 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Tin				
Spike level(unit)	7.46 mg/kg				
Replicate 1	4.73				
Replicate 2	3.25				
Replicate 3	5.30				
Replicate 4	5.02				
Replicate 5	4.84				
Replicate 6	5.64				
Replicate 7	4.61				
Average result	4.77				
(n-1)sd	0.757				
MDL*	2.37				
PQL**	7.57				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	5.0				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Todd Baumgartner

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (____)

METHOD VALIDATION

Date: 08/07/91

Method: 8081 Reference: EPA SW-846 Matrix: groundwater

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 700 mL -or- Wt. ext.(dry): ____ g Extraction Solvent: MECl2 Final Solvent: Hexane Final Volume: 10 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Isodrin	#Chlorb	Mirex		
Spike level(unit)	0.023 ug/L	0.57 ug/L	0.23 ug/L		
Replicate 1	0.0235	0.650	0.201		
Replicate 2	0.0248	0.6640	0.206		
Replicate 3	0.0199	0.572	0.183		
Replicate 4	0.0222	0.634	0.204		
Replicate 5	0.0220	0.778	0.207		
Replicate 6	0.0170	0.630	0.163		
Replicate 7	0.0174	0.580	0.150		
Average result	0.0210	0.641	0.188		
(n-1)sd	0.00298	0.0677	0.023		
MDL*	0.00936	0.212	0.0722		
PQL**	0.0298	0.677	0.230		
Is spike level<6x calculated MDL?	yes	yes	yes		
SL GQAP PQL	0.020	0.50			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10
Chlorb=Chlorbenzilate

Analyst: D. Koren

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Isodrin				0.050
Chlorbenzilate				1.0
Mirex				0.50

METHOD VALIDATION

Date: 08/07/91

Method: 8081 Reference: EPA SW-846 Matrix: soil

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 10.8 g Extraction Solvent: MECl2 Final Solvent: Hexane Final Volume: 10 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Isodrin	#Chlorb	Mirex		
Spike level(unit)	1.5 ug/kg	37 ug/kg	15 ug/kg		
Replicate 1	0.841	14.6	6.59		
Replicate 2	0.939	15.7	6.44		
Replicate 3	0.805	14.6	6.45		
Replicate 4	1.01	19.0	6.51		
Replicate 5	0.813	12.4	4.08		
Replicate 6	0.686	12.5	5.24		
Replicate 7	0.813	15.6	6.05		
Average result	0.844	14.9	5.91		
(n-1)sd	0.104	2.24	0.923		
MDL*	0.327	7.03	2.93		
PQL**	1.04	22.4	9.32		
Is spike level<6x calculated MDL?	yes	yes	yes		
SL GQAP PQL	4.0	80			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10
#Chlorb=Chlorbenzilate

Analyst: D. Koren

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Isodrin				2.0
Chlorobenzilate				50
Mirex				20

METHOD VALIDATION

Date: 08/07/91

Method: 8081 Reference: EPA SW-846 Matrix: groundwater

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000 mL -or- Wt. ext.(dry): ____ g Extraction Solvent: MECl2 Final Solvent: Hexane Final Volume: 10 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Kepone				
Spike level(unit)	10 ug/L				
Replicate 1	9.56				
Replicate 2	10.9				
Replicate 3	10.7				
Replicate 4	8.60				
Replicate 5	7.95				
Replicate 6	10.2				
Replicate 7	9.26				
Average result	9.60				
(n-1)sd	1.10				
MDL*	3.45				
PQL**	11.0				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	0.050				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Amy Hayes

QA Manager: E.L. Schneider

Remarks: Spike level was too high. Reanalysis at a lower level will result in a lower MDL and PQL.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Kepone				10

METHOD VALIDATION

Date: 08/07/91

Method: 8081 Reference: EPA SW-846 Matrix: soil

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 10 g Extraction Solvent: MECl2 Final Solvent: Hexane Final Volume: 10 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Kepone				
Spike level(unit)	2000 ug/kg				
Replicate 1	1850				
Replicate 2	1940				
Replicate 3	1920				
Replicate 4	1890				
Replicate 5	1920				
Replicate 6	1920				
Replicate 7	1810				
Average result	1890				
(n-1)sd	47.7				
MDL*	150				
PQL**	477				
Is spike level<6x calculated MDL?	no				
SL GQAP PQL	100				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Amy Hayes

QA Manager: E.L. Schneider

Remarks: Spike level was too high. Reanalysis at a lower level will result in a lower MDL and PQL.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Kepone				500

Date: 08/09/91

Method: 8141 Reference: SW846 Proposed Update I Matrix: groundwater

Instrument: Varian 3300 GC Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000 mL -or- Wt. ext.(dry): ____ g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Thionazin	Sulfotepp	Phorate	Dimethoate	Disulfoton
Spike level(unit)	0.50 ug/L	0.50 ug/L	0.50 ug/L	5.0 ug/L	0.50 ug/L
Replicate 1	0.445	0.438	0.406	3.81	0.484
Replicate 2	0.420	0.423	0.400	3.50	0.467
Replicate 3	0.470	0.433	0.432	5.58	0.506
Replicate 4	0.458	0.435	0.422	5.96	0.505
Replicate 5	0.421	0.395	0.380	4.52	0.454
Replicate 6	0.442	0.401	0.385	4.72	0.432
Replicate 7	0.405	0.365	0.351	5.02	0.420
Average result	0.437	0.413	0.397	4.73	0.453
(n-1)sd	0.0230	0.0270	0.0273	0.887	0.0356
MDL*	0.072	0.085	0.086	2.79	0.112
PQL**	0.23	0.27	0.27	8.87	0.36
Is spike level<6x calculated MDL?	no (x6.9)	yes	yes	yes	yes
SL GQAP PQL	1.0	1.5	1.5	10	2.0

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Talicia Smith

QA Manager: E.L. Schneider

Remarks: DB-17 column reported; DB-5 results similar._____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Thionazin				0.50
Sulfotepp				0.50
Phorate				0.50
Dimethoate				10
Disulfoton				0.50

METHOD VALIDATION

Date: 08/09/91

Method: 8141 Reference: SW846 Proposed Update I Matrix: groundwater

Instrument: Varian 3300 GC Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000 mL -or- Wt. ext.(dry): ____ g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Methyl parathion	Ethyl parathion	Famphur		
Spike level(unit)	0.50 ug/L	0.50 ug/L	2.0 ug/L		
Replicate 1	0.418	0.438	1.79		
Replicate 2	0.396	0.410	1.96		
Replicate 3	0.422	0.443	2.10		
Replicate 4	0.417	0.435	2.12		
Replicate 5	0.386	0.389	1.90		
Replicate 6	0.389	0.416	1.97		
Replicate 7	0.381	0.382	1.82		
Average result	0.401	0.416	1.95		
(n-1)sd	0.0172	0.0241	0.127		
MDL*	0.054	0.076	0.399		
PQL**	0.17	0.24	1.27		
Is spike level<6x calculated MDL?	no(x9.3)	no(x6.6)	yes		
SL GQAP PQL	0.30	1.0	10		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Talicia Smith

QA Manager: E.L. Schneider

Remarks: DB-17 column reported; DB-5 results similar._____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Methyl parath.				0.30
Ethly parath.				0.50
Famphur				2.0

METHOD VALIDATION

Date: 08/07/91

Method: 8141 Reference: EPA SW846 Matrix: soil

Instrument: Varian 3300 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 10 g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Thionazin	Sulfotepp	Phorate	Dimethoate	Disulfoton
Spike level(unit)	50 ug/kg	50 ug/kg	50 ug/kg	500 ug/kg	50 ug/kg
Replicate 1	56.5	54.9	48.1	754	39.5
Replicate 2	35.9	49.6	44.4	569	46.8
Replicate 3	53.2	51.0	48.8	269	52.8
Replicate 4	48.9	51.7	43.1	595	36.8
Replicate 5	53.8	51.2	41.3	472	29.6
Replicate 6	46.2	49.3	34.9	601	14.6
Replicate 7	50.5	48.7	41.5	***	32.0
Average result	49.3	50.9	43.2	543	36.0
(n-1)sd	6.81	2.07	4.69	162	12.4
MDL*	21.4	6.51	14.7	509	39.0
PQL**	68.1	20.7	46.9	1621	124
Is spike level<6x calculated MDL?	yes	no	yes	yes	yes
SL GQAP PQL	200	300	300	2000	400

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Talicia Smith

QA Manager: E.L. Schneider

Remarks: DB-17 column reported; DB-5 results similar.
***-Replicate 7 for dimethoate had a result of 178 and was not used. Calculations based on (n-1)sd of 6 points. (factor=3.36)

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Thionazin				100
Sulfotepp				20
Phorate				50
Dimethoate				2000
Disulfoton				200

METHOD VALIDATION

Date: 08/07/91

Method: 8141 Reference: EPA SW-846 Matrix: soil

Instrument: Varian 3300 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 10 g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10.0 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Methyl parathion	Ethyl parathion	Famphur		
Spike level(unit)	50 ug/kg	50 ug/kg	200 ug/kg		
Replicate 1	51.5	52.8	279		
Replicate 2	40.4	41.4	263		
Replicate 3	49.5	52.0	276		
Replicate 4	45.8	47.8	281		
Replicate 5	50.2	52.3	290		
Replicate 6	44.6	45.7	226		
Replicate 7	45.2	46.1	229		
Average result	46.7	48.3	263		
(n-1)sd	3.87	4.27	25.8		
MDL*	12.2	13.4	81		
PQL**	38.7	42.7	258		
Is spike level<6x calculated MDL?	yes	yes	yes		
SL GQAP PQL	60	200	2000		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Talicia Smith

QA Manager: E.L. Schneider

Remarks: DB-17 column reported; DB-5 results similar._____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Methyl parath.				50
Ethly parath.				50
Famphur				500

METHOD VALIDATION

Date: 08/07/91

Method: 8270 Reference: USEPA SW-846 Matrix: groundwater

Instrument: HP SVMS 2 Analytical technique: GC/MS

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 700 mL -or- Wt. ext.(dry): ____ g Extraction Solvent: MeCl2 Final Solvent: MeCl2 Final Volume: 1 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	1,4-Dioxane				
Spike level(unit)	20 ug/L				
Replicate 1	7.64				
Replicate 2	10.0				
Replicate 3	9.56				
Replicate 4	9.11				
Replicate 5	8.84				
Replicate 6	7.53				
Replicate 7	8.71				
Average result	8.76				
(n-1)sd	0.920				
MDL*	2.89				
PQL**	9.2				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	10				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: David Karnes

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
1,4-Dioxane				10

METHOD VALIDATION

Date: 08/07/91

Method: 8270 Reference: USEPA SW-846 Matrix: soil

Instrument: HP SVMS 2 Analytical technique: GC/MS

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 30 Extraction Solvent: MeCl2 Final Solvent: MeCl2 Final Volume: 1 mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	1,4-Dioxane				
Spike level(unit)	467 ug/kg				
Replicate 1	287				
Replicate 2	213				
Replicate 3	289				
Replicate 4	254				
Replicate 5	288				
Replicate 6	245				
Replicate 7	257				
Average result	261				
(n-1)sd	28.3				
MDL*	88.9				
PQL**	283				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	330				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: David Karnes

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
1,4-Dioxane				330

Date: 05/06/92

Method: 8080/608.1 Reference: SW846 3rd Ed. Matrix: water

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000mL cont liq-liq	Amount purged: _____mL
-or-	-or-
Wt. ext.(dry): _____ g	_____g soil in _____mL H2O
Extraction Solvent: MeCl2	
Final Solvent: Hexane	
Final Volume: 10mL	

Analyte:	Chloroneb	Propachlor	#Chloroprop	#Etridiaz*	
Spike level(unit)	0.20 ug/L	0.21 ug/L	0.25 ug/L	0.010 ug/L	
Replicate 1	0.23/0.24	0.21/0.21	0.25/0.26	---/0.011	
Replicate 2	0.25/0.25	0.21/---	0.27/0.24	---/0.010	
Replicate 3	0.24/0.25	0.20/0.21	0.27/0.26	---/0.011	
Replicate 4	0.25/0.26	0.22/0.22	0.28/0.28	---/0.011	
Replicate 5	0.23/0.24	0.20/0.20	0.26/0.26	---/0.011	
Replicate 6	0.24/0.24	0.21/0.21	0.26/0.26	---/0.011	
Replicate 7	0.24/0.24	0.21/0.21	0.25/0.21	---/0.011	
Average result	0.240/0.246	0.209/0.210	0.263/0.253	---/0.01086	
(n-1)sd	0.008/0.008	0.007/0.006	0.011/0.022	---/0.00038	
MDL*	0.026/0.025	0.022/0.021	0.035/0.070	---/0.00119	
PQL**	0.082/0.079	0.069/0.062	0.111/0.221	---/0.00378	
Is spike level<6x calculated MDL?	no(7.8/8.1)	no(9.2/9.6)	no-7.16/yes	no(---/8.4)	
SL GQAP PQL	0.4	10	2.0	0.4	

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Dana B. Till

QA Manager: E.L. Schneider

Remarks: Results are presented from both GC columns: DB5/DB608.
*Etridiazole exhibited matrix interference in water on the DB-5 column.
#Chloroprop = Chloropropylate #Etridiaz = Etridiazole

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Chloroneb				0.40
Propachlor				0.50
Chloropropylate				0.50
Etridiazole				0.010

Date: 05/06/92

Method: 8080 Reference: SW846 3rd Ed. Matrix: soil

Instrument: Varian 3400 Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____ mL -or- Wt. ext.(dry): 30g sonic. Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

Analyte:	Chloroneb	Propachlor	#Chloroprop	#Etridiaz*	
Spike level(unit)	6.60 ug/kg	6.60 ug/kg	8.25 ug/kg	1.65 ug/kg	
Replicate 1	7.0/6.7	7.1/6.5	9.9/12.0	1.0/1.3	
Replicate 2	7.3/7.7	7.8/7.2	11.0/13.0	1.3/1.5	
Replicate 3	7.4/7.3	8.0/7.1	11.0/13.0	1.4/1.6	
Replicate 4	6.9/7.4	8.1/6.9	10.0/12.0	1.4/1.6	
Replicate 5	7.1/7.6	7.3/6.7	9.9/10.0	1.3/1.7	
Replicate 6	6.7/7.4	7.4/6.7	10.0/10.0	1.4/1.6	
Replicate 7	6.7/7.4	7.3/6.7	9.7/10.0	1.4/1.6	
Average result	7.01/7.34	7.57/6.83	10.21/11.43	1.31/1.56	
(n-1)sd	0.27/0.32	0.39/0.25	0.55/1.40	0.15/0.13	
MDL*	0.86/1.01	1.23/0.78	1.71/4.39	0.46/0.40	
PQL**	2.73/3.21	3.90/2.50	5.46/13.97	1.46/1.27	
Is spike level<6x calculated MDL?	no(7.7/6.6)	yes/no-8.42	yes	yes	
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Dana B. Till

QA Manager: E.L. Schneider

Remarks: Results are presented from both GC columns: DB5/DB608.
#Chloroprop = Chloropropylate #Etridiaz = Etridiazole

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Chloroneb				13
Propachlor				16
Chloropropylate				16
Etridiazole				0.33

Date: 05/06/92

Method: 8150 Reference: SW846 3rd ed. Matrix: water/soil

Instrument: Varian 3400 dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 500mL water -or- Wt. ext.(dry): 30g soil Extraction Solvent: ethyl ether Final Solvent: hexane Final Volume: 5.0mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

	water		soil	
	DB-5	DB-1301	DB-5	DB-1301
Analyte:	Picloram	Picloram	Picloram	Picloram
Spike level(unit)	0.10ug/L	0.10ug/L	1.67ug/kg	1.67ug/kg
Replicate 1	0.108	0.110	2.7	3.0
Replicate 2	0.096	0.102	2.7	3.0
Replicate 3	0.090	0.091	2.8	3.1
Replicate 4	0.101	0.104	2.7	3.1
Replicate 5	0.094	0.098	3.2	3.6
Replicate 6	0.097	0.098	3.1	3.1
Replicate 7	0.097	0.098	2.8	3.0
Average result	0.0976	0.1001	2.857	3.129
(n-1)sd	0.0057	0.0060	0.207	0.214
MDL*	0.0178	0.0187	0.650	0.671
PQL**	0.0568	0.0596	2.070	2.138
Is spike level<6x calculated MDL?	yes	yes	yes	yes
SL GQAP PQL				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: _____

_____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Picloram				3.3

Date: 05/06/92

Method: 8141 Reference: SW846 3rd ed. Final update Matrix: water

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000mL cont liq-liq -or- Wt. ext.(dry): ___g Extraction Solvent: MeCl2 Final Solvent: hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

	DB-5	DB-1701		DB-5	DB-1701
Analyte:	Dioxathion	Dioxathion		#Dichlofen	#Dichlofen
Spike level(unit)	6.0ug/L	6.0ug/L		1.0ug/L	1.0ug/L
Replicate 1	5.26	4.08		1.14	0.969
Replicate 2	5.15	4.08		1.13	0.899
Replicate 3	6.21	3.88		1.10	0.893
Replicate 4	5.90	3.49		1.09	0.867
Replicate 5	6.17	3.92		1.09	0.878
Replicate 6	5.08	3.58		1.08	0.856
Replicate 7	6.63	5.52		1.14	0.892
Average result	5.771	4.079		1.110	0.893
(n-1)sd	0.610	0.675		0.026	0.036
MDL*	1.915	2.121		0.081	0.114
PQL**	6.097	6.754		0.258	0.364
Is spike level<6x calculated MDL?	yes	yes		no(12.3)	no(8.8)
SL GQAP PQL	2.0	2.0		1.0	1.0

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: #Dichlofen = Dichlofenthion

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Dioxathion				10
Dichlofenthion				1.0

Date: 05/06/92

Method: 8141 Reference: SW846 3rd Ed. Final update Matrix: soil

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____mL -or- Wt. ext.(dry): 30g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Dioxathion	#Dichlofen	Terbutryn		
Spike level(unit)	200 ug/kg	33.3 ug/kg	66.7 ug/kg		
Replicate 1	245/140	37.7/28.6	66.0/57.0		
Replicate 2	250/160	39.3/33.2	73.0/64.3		
Replicate 3	248/149	38.2/30.9	70.3/61.7		
Replicate 4	236/116	39.7/31.3	54.0/53.6		
Replicate 5	247/94.3	38.3/25.4	21.8/28.2		
Replicate 6	192/74.0	39.8/27.6	54.9/55.3		
Replicate 7	247/94.3	38.3/25.4	78.4/28.2		
Average result	238/118.2	38.77/28.91	59.77/49.76		
(n-1)sd	20.7/32.3	0.82/3.01	19.02/15.17		
MDL*	65.05/101.5	2.57/9.47	59.72/47.65		
PQL**	207/323	8.18/30.15	190/152		
Is spike level<6x calculated MDL?	yes	no-13.0/yes	yes		
SL GQAP PQL	66	33	66		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: Results are presented from both GC columns: DB5/DB1701.
#Dichlofen = Dichlofenthion

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Dioxathion				330
Dichlofenthion				33
Terbutryn				330

Date: 05/06/92

Method: 8141/619 Reference: SW846 3rd Ed. Final Update I/EPA Matrix: wa

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000mL -or- Wt. ext.(dry): ___g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

Analyte:	Ametryn	Atrazine	Prometryn	Prometon*	Propazine
Spike level(unit)	1.5 ug/L	1.5 ug/L	1.5 ug/L	1.5 ug/L	1.5 ug/L
Replicate 1	2.05/1.44	1.61/1.15	2.14/1.45	---/1.13	2.52/1.73
Replicate 2	1.56/1.67	1.17/0.989	1.66/1.56	---/0.919	1.85/1.57
Replicate 3	1.69/1.42	1.16/1.02	1.67/1.38	---/1.14	1.87/1.59
Replicate 4	1.50/1.60	1.10/0.962	1.56/1.50	---/0.488	1.76/1.51
Replicate 5	2.20/1.56	1.70/1.18	2.20/1.52	---/1.25	2.28/1.75
Replicate 6	1.34/1.52	1.00/0.865	1.51/1.49	---/0.442	1.66/1.4
Replicate 7	1.56/1.69	1.07/0.931	1.58/1.54	---/0.938	1.72/1.47
Average result	1.70/1.56	1.26/1.01	1.76/1.49	---/0.901	1.95/1.58
(n-1)sd	0.312/0.106	0.279/0.115	0.285/0.060	---10.320	0.322/0.120
MDL*	0.979/0.332	0.876/0.362	0.895/0.189	---/1.00	1.01/0.375
PQL**	3.12/1.06	2.79/1.15	2.85/0.603	---/3.20	3.22/1.195
Is spike level<6x calculated MDL?	yes	yes	yes/no-7.9	---/yes	yes
SL GQAP PQL	2.0	2.0	2.0	2.0	2.0

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: Results are presented from both GC columns: DB5/DB1701.
*Prometon and Simazine co-elute on the DB-5 column.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Ametryn				2.0
Atrazine				2.0
Prometryn				2.0
Prometon				2.0
Propazine				2.0

Date: 05/06/92

Method: 8141/619 Reference: SW846 3rd Ed. Final Update I/EPA Matrix: water

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000mL -or- Wt. ext.(dry): ___g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

Analyte:	Simazine*	#Terbuthyl	Terbutryn		
Spike level(unit)	1.5 ug/L	1.5 ug/L	1.5 ug/L		
Replicate 1	---/1.64	2.40/1.78	2.50/2.89		
Replicate 2	---/1.41	2.50/1.54	2.96/3.42		
Replicate 3	---/1.44	1.89/1.53	3.08/3.57		
Replicate 4	---/1.38	1.76/1.48	2.79/3.17		
Replicate 5	---/1.77	2.44/1.80	2.74/3.14		
Replicate 6	---/1.17	2.34/1.35	2.65/3.05		
Replicate 7	---/1.33	1.73/1.45	2.94/3.37		
Average result	---/1.45	2.15/1.56	2.81/3.23		
(n-1)sd	---/0.201	0.343/0.168	0.202/0.235		
MDL*	---/0.630	1.08/0.529	0.635/0.739		
PQL**	---/2.01	3.43/1.68	2.02/2.35		
Is spike level<6x calculated MDL?	---/yes	yes	no-6.30/yes		
SL GQAP PQL	2.0	2.0	2.0		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: Results are presented from both GC columns: DB5/DB1701.
*Prometon and Simazine co-elute on the DB-5 column.
#Terbuthyl = Terbuthylazine

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Simazine				2.0
Terbuthylazine				2.0
Terbutryn				2.0

METHOD VALIDATION

Date: 05/06/92

Method: 8141/619 Reference: SW846 3rd Ed. Final Update I/EPA Matrix: so

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____mL -or- Wt. ext.(dry): 30g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H2O

Analyte:	Ametryn	Atrazine	Prometryn	Prometon	Propazine
Spike level(unit)	50 ug/kg	50 ug/kg	50 ug/kg	50 ug/kg	50 ug/kg
Replicate 1	54.8	36.9	48.9	54.9	53.4
Replicate 2	49.3	34.0	45.0	47.2	48.8
Replicate 3	49.8	34.6	45.1	50.0	49.5
Replicate 4	56.5	29.5	50.6	39.1	45.4
Replicate 5	52.9	28.2	47.5	33.6	43.8
Replicate 6	56.5	29.0	50.6	38.3	45.1
Replicate 7	55.6	29.0	49.6	37.7	45.2
Average result	53.6	31.6	48.2	43.0	47.3
(n-1)sd	3.02	3.49	2.38	7.77	3.43
MDL*	9.49	10.95	7.48	24.4	10.76
PQL**	30.2	34.9	23.8	77.7	34.3
Is spike level<6x calculated MDL?	yes	yes	no(6.7)	yes	yes
SL GQAP PQL	66	33	66	66	66

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: DB-17 Megabore column

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Ametryn				66
Atrazine				66
Prometryn				66
Prometon				66
Propazine				66

METHOD VALIDATION

Date: 05/06/92

Method: 8141/619 Reference: SW846 3rd Ed. Final Update I/EPA Matrix: soil

Instrument: Varian 3400 Dual NPD Analytical technique: GC/NPD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: ____mL -or- Wt. ext.(dry): 30g Extraction Solvent: MeCl2 Final Solvent: Hexane Final Volume: 10mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Simazine	#Terbuthyl	Terbutryn		
Spike level(unit)	50 ug/kg	50 ug/kg	133 ug/kg		
Replicate 1	56.8	55.1	104.8		
Replicate 2	52.4	50.9	92.1		
Replicate 3	53.7	51.8	90.6		
Replicate 4	42.5	44.5	111.4		
Replicate 5	39.8	43.0	99.8		
Replicate 6	41.2	43.9	106.0		
Replicate 7	41.7	44.6	109.9		
Average result	46.9	47.7	102.1		
(n-1)sd	7.13	4.83	8.26		
MDL*	22.4	15.2	25.9		
PQL**	71.3	48.3	82.6		
Is spike level<6x calculated MDL?	yes	yes	yes		
SL GQAP PQL	33	66	66		

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Susan Harrison

QA Manager: E.L. Schneider

Remarks: #Terbuthyl = Terbuthylazine
DB-17 Megabore column.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Simazine				66
Terbuthylazine				66
Terbutryn				330

Date: 04/28/92

Method: 632 Reference: EPA Matrix: water

Instrument: Waters 600E/WISP Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 1000mL -or- Wt. ext.(dry): _____ g Extraction Solvent: MeCl2 Final Solvent: ACN Final Volume: 1mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	Bromacil				
Spike level(unit)	1.0 ug/L				
Replicate 1	1.01				
Replicate 2	1.01				
Replicate 3	0.96				
Replicate 4	1.10				
Replicate 5	0.92				
Replicate 6	1.01				
Replicate 7	1.06				
Average result	1.01				
(n-1)sd	0.059				
MDL*	0.19				
PQL**	0.6				
Is spike level<6x calculated MDL?	yes				
SL GQAP PQL	2.0				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: E.L. Schneider

Remarks: C18 column.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
Bromacil				2.0

Date: 05/04/92

Method: 504 Rev. 2.0 Reference: EPA/600/4-88/039 Matrix: water

Instrument: Shimadzu GC 9AM Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 38mL	Amount purged: _____mL
-or-	-or-
Wt. ext.(dry): ____ g	_____g soil in _____mL H20
Extraction Solvent: Hexane	
Final Solvent: Hexane	
Final Volume: 3.0mL	

Analyte:	EDB	DBCP	#Chloropic	1,1-DCPa	#Thiocyan
Spike level(unit)	0.020 ug/L	0.020 ug/L	0.0080ug/L	2.7 ug/L	20.0 ug/L
Replicate 1	0.0177	0.0170	0.00817	2.95	26.1
Replicate 2	0.0191	0.0230	0.00754	3.00	26.7
Replicate 3	0.0174	0.0160	0.00817	3.00	27.4
Replicate 4	0.184	0.0190	0.00880	3.06	26.4
Replicate 5	0.0204	0.0180	0.00817	2.89	26.1
Replicate 6	0.0194	0.0220	0.00880	2.89	27.7
Replicate 7	0.0211	0.0230	0.00896	2.68	27.2
Average result	0.0191	0.0197	0.00837	2.92	26.8
(n-1)sd	0.001361	0.0029277	0.00050444	0.124	0.643
MDL*	0.00427	0.00919	0.00158	0.390	2.02
PQL**	0.0136	0.0293	0.00504	1.24	6.43
Is spike level<6x calculated MDL?	yes	yes	yes	no(6.9)	no(9.9)
SL GQAP PQL	0.020 ug/L	0.020 ug/L	0.010 ug/L	0.50ug/L	75.0ug/L

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Martin Thomas

QA Manager: E.L. Schneider

Remarks: Results are from DB-5 column. DB-1701 results are very similar.
DBCP on DB-1701 MDL=0.0078, PQL=0.0247
#Chloropic = Chloropicrim. #1,1-DCPa = 1,1-Dichloropropane.
#Thiocyan = methyl isothiocyanate.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
#1,1-DCPa				2.0
#Thiocyan				20

Date: 05/04/92

Method: 504 Rev. 2.0 Reference: EPA/600/4-88/039 Matrix: water

Instrument: Shimadzu GC-9AM Dual ECD Analytical technique: GC/ECD

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 38mL -or- Wt. ext.(dry): ____ g Extraction Solvent: Hexane Final Solvent: Hexane Final Volume: 3.0mL	Amount purged: _____mL -or- _____g soil in _____mL H20

Analyte:	#cis-DCPe	#trans-DCPe			
Spike level(unit)	0.119 ug/L	0.0792 ug/L			
Replicate 1	0.116	0.0866			
Replicate 2	0.110	0.0866			
Replicate 3	0.113	0.0802			
Replicate 4	0.114	0.0802			
Replicate 5	0.107	0.0823			
Replicate 6	0.108	0.0760			
Replicate 7	0.113	0.0887			
Average result	0.112	0.0829			
(n-1)sd	0.0033	0.00454			
MDL*	0.0104	0.0142			
PQL**	0.0331	0.0454			
Is spike level<6x calculated MDL?	no(11.4)	yes			
SL GQAP PQL	1.0(total)	1.0(total)			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Martin Thomas

QA Manager: E.L. Schneider

Remarks: #cis-DCPe = cis-1,3-Dichloropropene
#trans-DCPe = trans-1,3-Dichloropropene

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
1,3-Dichloro-propene(total)				1.0

METHOD VALIDATION

Date: 07/09/92

Method: 8330 Modified Reference: SW846 Proposed Update II/SL Matrix: water

Instrument: Waters 600E/484 UV Detector Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____ml -or- Wt. ext.(dry): _____g Extraction Solvent: _____ Final Solvent: _____ Final Volume: _____ml	Amount purged: _____ml -or- _____g soil in _____ml H_2O

Analyte:	Nitroglycerin				
Spike level(unit)	8.0 ug/l				
Replicate 1	7.96				
Replicate 2	6.96				
Replicate 3	6.96				
Replicate 4	7.96				
Replicate 5	7.96				
Replicate 6	8.96				
Replicate 7	7.96				
Average result	7.82				
(n-1)sd	0.690				
MDL*	2.2				
PQL**	6.9				
Is spike level≤6x calculated MDL?	yes				
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rvgiel

QA Manager: Elizabeth L. Schneider

Remarks: Sample preparation consists of filtration. The filtered sample is injected directly into the HPLC system.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/l)
Nitroglycerin	71-121%	0-22%		10

METHOD VALIDATION

Date: 07/09/92

Method: 8330 Modified Reference: SW846 Proposed Update II/SL Matrix: soil

Instrument: Waters 600E/484 UV Detector Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____ ml -or- Wt. ext.(dry): 2.0 g Extraction Solvent: ACN Final Solvent: 1:1 ACN:5g/l CaCl2 Final Volume: 10 ml	Amount purged: _____ ml -or- _____ g soil in _____ ml H_2O

Analyte:	Nitroglycerin				
Spike level(unit)	250 ug/kg				
Replicate 1	294				
Replicate 2	294				
Replicate 3	331				
Replicate 4	220				
Replicate 5	404				
Replicate 6	257				
Replicate 7	257				
Average result	294				
(n-1)sd	60.12				
MDL*	189				
PQL**	601				
Is spike level≤6x calculated MDL?	yes				
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: Elizabeth L. Schneider

Remarks: Mobile phase = 45:55 ACN:water; wavelength = 209nm.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
Nitroglycerin	46-190%	0-72%		1000

METHOD VALIDATION

Date: July 15, 1991

Method: 8330 Reference: SW 846 Proposed Update II Matrix: Water

Instrument: Waters/LC Analytical technique: HPLC/UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____ml -or- Wt. ext.(dry): _____g Extraction Solvent: _____ Final Solvent: _____ Final Volume: _____ml	Amount purged: _____ml -or- _____g soil in _____ml H_2O

n-NDPA = n-Nitrosodiphenylamine
DPA = diphenylamine

Analyte:	n-NDPA	DPA			
Spike level(unit)	10 ug/L	10 ug/L			
Replicate 1	13.3	11.2			
Replicate 2	12.0	12.8			
Replicate 3	12.0	10.6			
Replicate 4	13.3	10.1			
Replicate 5	12.0	10.6			
Replicate 6	13.3	10.6			
Replicate 7	12.0	11.2			
Average result	12.5	11.0			
(n-1)sd	0.69	0.88			
MDL*	2.17	2.75			
PQL**	6.9	8.8			
Is spike level<6x calculated MDL?	YES	YES			
SL GQAP PQL	N/A	N/A			

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: R. Driver

QA Manager: L. Schneider

Remarks: Accuracy & precision targets were derived from 6 mid-level spikes. The range for DPA is extremely small and will be updated when more data points are acquired.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/L)
n-NDPA	55-121	0-20	96-100	10
DPA	65-95	0-20	96-100	10

METHOD VALIDATION

Appendix A
Page Number 36

Date: 06/23/92

Method: 8330 Reference: SW846 Proposed Update I Matrix: Soil

Instrument: Waters HPLC/Kratos fluorescence detector/Waters UV detector Analytical technique: HPLC/fluor./UV

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____ ml -or- Wt. ext.(dry): 2.0 g Extraction Solvent: acetonitrile Final Solvent: acetonitrile Final Volume: 10 ml	Amount purged: _____ ml -or- _____ g soil in _____ ml H_2O

Analyte:	DPA*	nnDPA**			
Spike level(unit)	50.0 ug/kg	50.0 ug/kg			
Replicate 1	42.0	60.0			
Replicate 2	57.0	60.0			
Replicate 3	46.0	55.0			
Replicate 4	46.0	40.0			
Replicate 5	42.0	35.0			
Replicate 6	49.0	40.0			
Replicate 7	46.0	47.0			
Average result	46.9	47.0			
(n-1)sd	5.113	10.286			
MDL*	16.1	32.3			
PQL**	51	103			
Is spike level≤6x calculated MDL?	yes	yes			
SL GQAP PQL					

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Paul Rygiel

QA Manager: Elizabeth L. Schneider

Remarks: *DPA= diphenylamine; **nnDPA= n-nitrosodiphenylamine

Analysis performed using an isocratic mobile phase of 70% methanol/30% water: C_{18} column.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (ug/kg)
DPA	50-125	0-35		100
nnDPA	34-158	0-35		100

METHOD VALIDATION

Date: 07/06/92

Method: 7041/3005 Reference: SW846 3rd. Ed. Matrix: water

Instrument: Varian SpectrAA-400 Analytical technique: GFAA-Zeeman

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: 100 ml -or- Wt. ext.(dry): _____ g Extraction Solvent: _____ Final Solvent: _____ Final Volume: 100 ml	Amount purged: _____ ml -or- _____ g soil in _____ ml H_2O

Analyte:	Antimony				
Spike level(unit)	0.050 mg/l				
Replicate 1	0.0437				
Replicate 2	0.0412				
Replicate 3	0.0454				
Replicate 4	0.0470				
Replicate 5	0.0449				
Replicate 6	0.0430				
Replicate 7	0.0445				
Average result	0.0442				
(n-1)sd	0.00185				
MDL*	0.00581				
PQL**	0.0185				
Is spike level≤6x calculated MDL?	no (8.6)				
SL GQAP PQL	0.020				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Todd Baumgartner

QA Manager: Elizabeth L. Schneider

Remarks: _____

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (mg/l)
Antimony	80-120%	0-20%		0.020

METHOD VALIDATION

Date: 07/06/92

Method: 7041/3050 Reference: SW846 3rd. Ed. Matrix: soil

Instrument: Varian SpectrAA-400 Analytical technique: GFAA-Zeeman

Single lab validation by SL Division: Tallahassee

Extractables	Purgeables
Volume ext: _____ ml -or- Wt. ext.(dry): 0.50 g dw Extraction Solvent: _____ Final Solvent: _____ Final Volume: 100 ml	Amount purged: _____ ml -or- _____ g soil in _____ ml H_2O

Analyte:	Antimony				
Spike level(unit)	10.0 mg/kg dw				
Replicate 1	8.56				
Replicate 2	8.78				
Replicate 3	9.12				
Replicate 4	7.80				
Replicate 5	8.20				
Replicate 6	9.40				
Replicate 7	7.72				
Average result	8.51				
(n-1)sd	0.641				
MDL*	2.01				
PQL**	6.41				
Is spike level≤6x calculated MDL?	yes				
SL GQAP PQL	5.0				

*MDL = sd(n-1) x 3.14
**PQL = sd(n-1) x 10

Analyst: Todd Baumgartner

QA Manager: Elizabeth L. Schneider

Remarks: Digestion method 3005 is not applicable to soil. The normal 3050 digestion method was employed. NBS 1633A soil matrix was used.

QA Objectives and PQL's to be added to Table 5:

Analyte:	Accuracy(%Rec)	Precision(%RPD)	Completeness(%)	PQL (mg/kg dw)
Antimony	70-130%	0-30%		5.0

Method: 8270 Date:07/08/92
Reference: SW846 Proposed update 1
Matrix: SOIL
Technique: GC/MS

EXTRACTABLES		PURGEABLES:		METALS:	
Volume/Mass EXT:	30 g	Amount (H2O):	mls	H2O Amt Digested:	mls
Extraction Method:	sonication	or		Soil Amt Digested:	g
Solvent:	MeCl2/Acetone	Soil amount:	g		
Final Volume:	1 ml	in (mls water):	mls	Final Volume:	mls
Final Solvent:	MeCl2				
Instrument:	SMS2				
Analyst:	Teresa Rygiel				

Results
For Seven replicates

Compound Name	Spike Level	Unit	R1	R2	R3	R4	R5	R6	R7	AVE	s(n-1)	MDL	PQL	* Y/N	Factor SLPQL
ETHYL CARBAMATE	333	ug/kg	187	195	215	186	200	193	183	194.1	10.966	34.226	187.628	No	9.7

QA Objectives and PQLs to be added to Table 5:

Analyte	Accuracy	Precision	PQL (ug/kg dw)
Ethyl carbamate	48-100%	0-20%	200

* = is spike level </= 6x calculated MDL?

Savannah Labs Method Validation SL Tallahassee

Method: 8270 Date: 06/30/92
Reference: SW846 Proposed update 1 Instrument: SMS2
Matrix: Groundwater Analyst: Teresa Rygiel
Technique: GC/MS

EXTRACTABLES		PURGEABLES:		METALS:	
Volume/Mass EXT:	1000 mls	Amount (H2O):	mls	H2O Amt Digested:	mls
Extraction Method:	cont ll	or		Soil Amt Digested:	g
Solvent:	MeCl2	Soil amount:	g		
Final Volume:	1	in (mls water):	mls	Final Volume:	mls
Final Solvent:	MeCl2				

Results
For Seven replicates

Compound Name	Spike Level	Unit	R1	R2	R3	R4	R5	R6	R7	AVE	s(n-1)	MDL	PQL	* Y/N	Factor SL PQL
ETHYL CARBAMATE	10	ug/l	6.56	6.31	6.84	7.22	6.96	7.35	7.52	6.9	0.569	1.758	5.597	Yes	5.7

QA Objectives and PQLs to be added to Table 5:

Analyte	Accuracy	Precision	PQL(ug/l)
Ethyl carbamate	52-100%	0-24%	10

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* = is spike level </= 5x calculated MDL?