Appendix C

Quality Assurance Project Plan

for the

RCRA Facility Investigation

at the

CIBA-GEIGY FACILITY
Cranston, Rhode Island

Prepared by:

Savannah Laboratories and Environmental Services, Inc.
5102 LaRoche Avenue
Savannah, GA 31404

for

CIBA-GEIGY
410 Swing Road
Greensboro, NC 27409

December 14, 1992

Linda A. Wolfe — 12/14/92
Savannah Laboratories Project Manager — Date

[illegible] C. [illegible] — 12-14-92
Savannah Laboratories Project QA Manager — Date

Frank Sakra — 16 Dec 92
Ciba-Geigy Quality Assurance Manager — Date

Diana Foldi — 12/17/92
National Services Contract Administrator, Ciba-Geigy — Date

SEMS DocID 657724

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3.0 PROJECT DESCRIPTION

An administrative order on Consent (No. I-88-1088) to CIBA-GEIGY Corporation, Ardsley, New York, was issued by Region I United States Environmental Protection Agency. This order requires that a RCRA Facility Investigation be conducted at the CIBA-GEIGY facility in Cranston, Rhode Island, in order to evaluate thoroughly the nature and extent of any release of hazardous waste or hazardous constituents at or from the facility and to gather data necessary to support and develop the corrective measures study.

Savannah Laboratories has been contracted by CIBA-GEIGY to perform analysis of field samples for this CIBA-GEIGY RCRA facility investigation.

All data collected during this RCRA Facility Investigation and the decisions based upon these data must be technically sound, statistically valid, and properly documented. This laboratory Quality Assurance Project Plan (QAPjP) describes the procedures that will be used to document sample analyses during the RCRA Facility Investigation (RFI) at the CIBA-GEIGY facility. This plan includes the organization of investigative methodologies for Appendix IX (excluding dioxins) and water quality parameters, and the associated QA/QC procedures that will be utilized to ensure that all data collected during, and reported by, this study are representative of existing site conditions.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Savannah Laboratories and Environmental Services, Inc. will provide the chemical analyses for the RCRA Facility Investigation.

Savannah Laboratories has full-service facilities in Savannah, Georgia; Tallahassee, Florida; Deerfield Beach, Florida; Tampa, Florida; and Mobile, Alabama.

Savannah Laboratories's laboratory facility in Savannah, Georgia, will serve as the primary contract lab for this project. The Tallahassee facility will serve as a secondary laboratory only in the event of instrument failure or overflow of samples with prior approval from the CIBA-GEIGY NSCA. The organizational structure of these laboratory facilities are outlined in Figures 4-1 and 4-2. Savannah Laboratories' key personnel for Cranston project contacts are included in Figure 4-3. Resumes are included in Section 17.0 of this QAPjP.

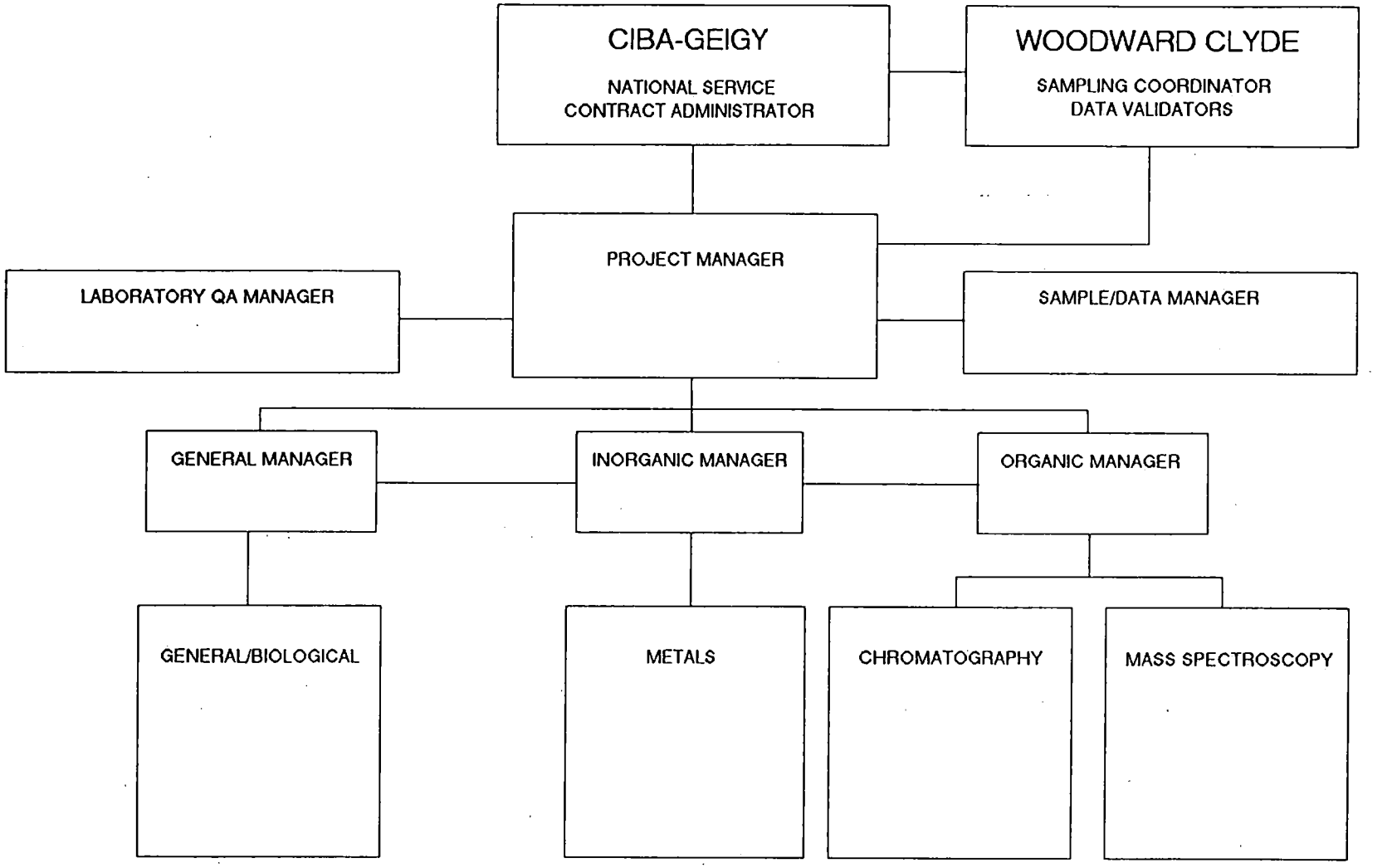
Duties of the key personnel are as follows:

A) Project Manager:

1) Initial contact with CIBA-GEIGY NSCA on individual job tasks:
2) Preparing all work plans, schedules and manpower allocations;
3) Initiation of all procurement of internal resources for the projects;
4) Day-to-day supervision of the project team including analytical department managers, and data management personnel;
5) Coordinating financial and contractual aspects of the projects;
6) Formatting and technical review of all reports;
7) Providing day-to-day communication with CIBA-GEIGY;
8) Exercise final review and approval on all reports and invoices for the project; and
9) Respond to post project inquiries.

B) Project QA Manager

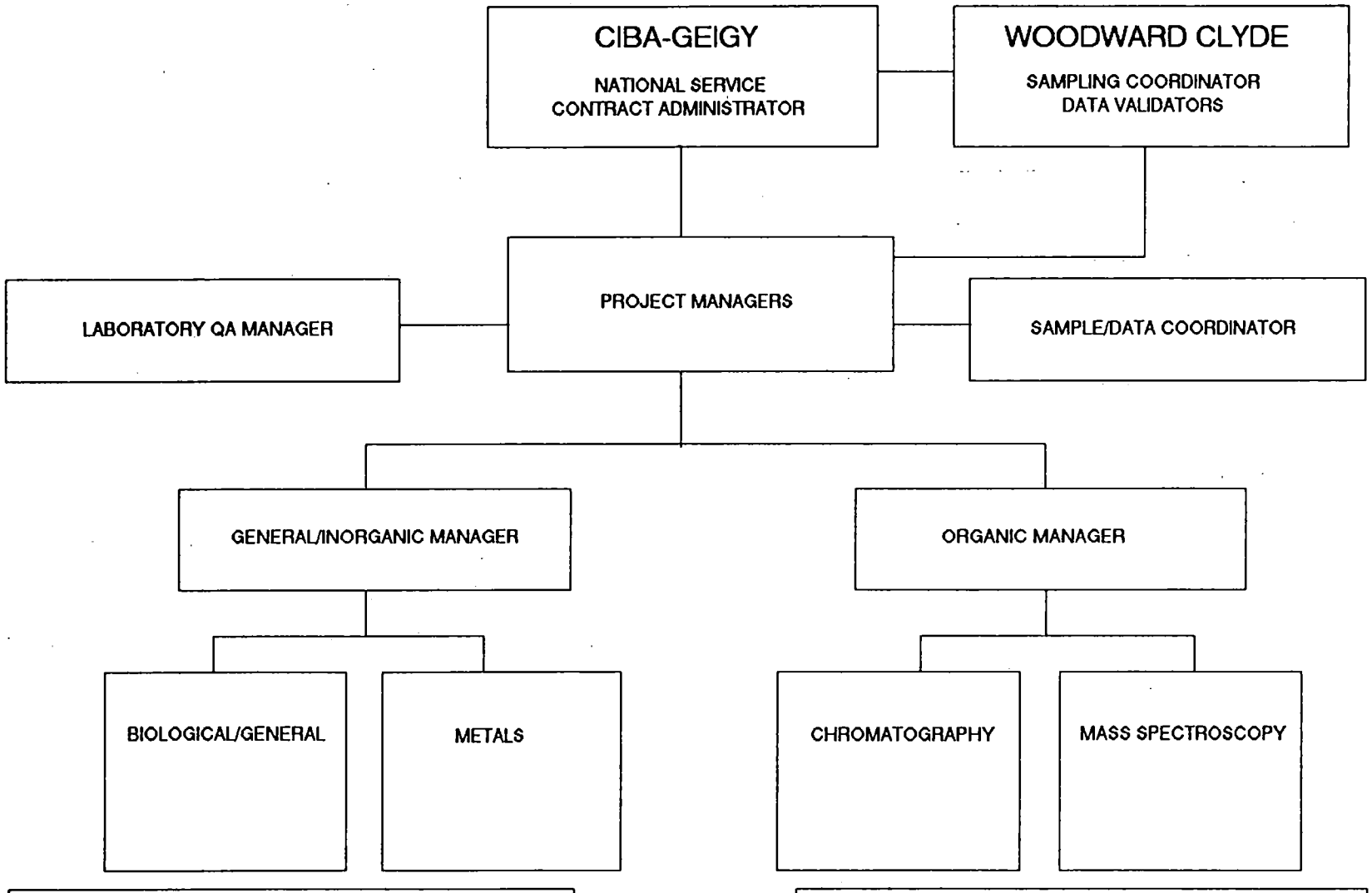
1) Coordinate with the Project Manager, Laboratory QA Manager, and all other project personnel in order to ensure that project QA is maintained;
2) Review all QA activities;
3) Review case narratives on each report;
4) Perform periodic system audits; and
5) Review nonconformance reports and approve corrective actions.



ORGANIZATIONAL STRUCTURE OF THE
SAVANNAH DIVISION LABORATORY

Figure 4-1

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE
TALLAHASSEE DIVISION LABORATORY

Figure 4-2

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

FIGURE 4-3

PROJECT CONTACTS	
Savannah Division 5102 LaRoche Avenue Savannah, Georgia 31404 Phone (912) 354-7858 Fax (912) 352-0165	
Name	Title
Linda Wolfe	Project Manager
Alan Bailey	QA Manager
Janette D. Long	Vice President/Lab Director
James W. Andrews	President/Administrative Director
Larry Phillips	Corporate Computer Manager
Savannah Laboratories Tallahassee Division 2846 Industrial Plaza Drive Tallahassee, Florida 32301 Phone (904) 878-3994 Fax (904) 878-9504	
Name	Title
Thomas Stevens	Vice President/Lab Director
Janet Pruitt	Lab Director/Project Manager
Elizabeth Schneider	QA Manager

5.0 QA OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

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 the 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 are entered into the Laboratory Information Management System (LIMS) (Figure 5-1). The LIMS provides a computerized mechanism for storing field data and sample 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, data management and reporting personnel have direct access via a CRT terminal to all project and QA data.

Tables 5-1 and 5-2 list the parameters anticipated for the RFI, the methodology, the QA objectives for precision, accuracy and completeness, and the normal practical quantification limits (PQL) for relatively clean environmental samples.

PRECISION

The objective for precision is to equal or exceed the precision data generated by the applicable method validation on similar matrices. Relative percent difference (RPD) is used to evaluate precision between two replicate values. In routine analyses, the values for most parameters are usually below PQL; therefore, precision data will be derived from duplicate matrix spike results. Criteria for precision are summarized in Tables 5-1 and 5-2.

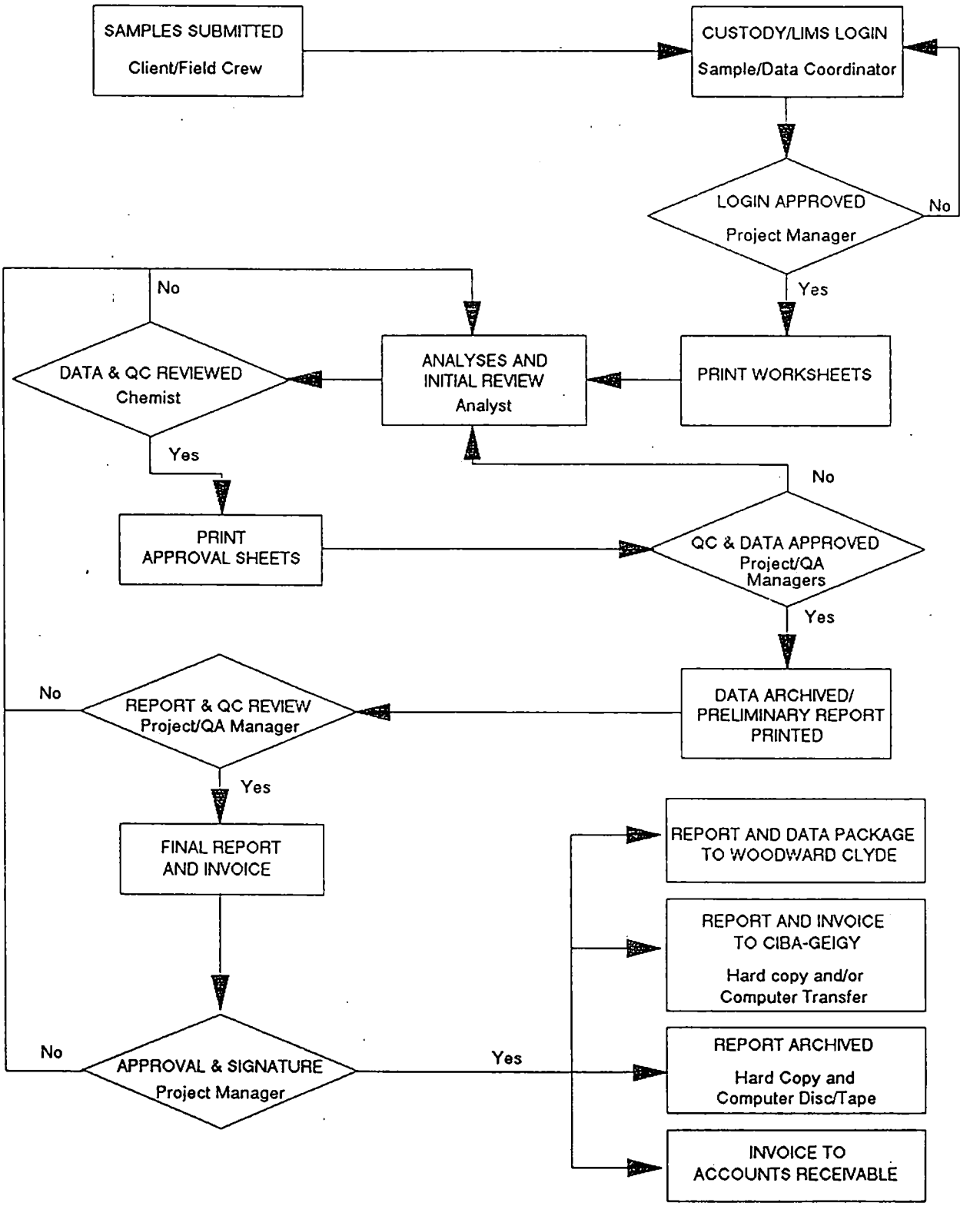
The relative percent difference (RPD) is calculated as:

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

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

FIGURE 5-1

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



ACCURACY

The objective for accuracy is to equal or exceed the accuracy data generated by the applicable method validation on similar matrices. Percent recovery (%R) data are used to access accuracy from the analysis of matrix spikes and surrogate spikes (Tables 5-1 and 5-2).

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

COMPLETENESS

The objective for completeness (%C) is to achieve the highest possible ratio of samples reported in control as compared to the total number of samples received in the laboratory. The percent complete (%C) is calculated as follows:

$$\%C = \frac{RR}{SR} \times 100$$

RR = Actual number of valid results reported

SR = Number of valid samples received

Completeness Data Quality Objective for all parameters is 96-100%.

COMPARABILITY

The 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 analytical methods, QA/QC procedures and consistency of reporting formats promotes the comparability of one set of reference data to another of comparable data.

REPRESENTATIVENESS

The 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.

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)
Antimony (MS)	6010 (3010)	1	75-125	0-20	50
Arsenic (MS)	7060 (3020)	1	75-125	0-20	10
Barium (MS)	6010 (3010)	1	75-125	0-20	10
Beryllium (MS)	6010 (3010)	1	75-125	0-20	5.0
Cadmium (MS)	6010 (3010)	1	75-125	0-20	5.0
Chromium (MS)	6010 (3010)	1	75-125	0-20	10
Cobalt (MS)	6010 (3010)	1	75-125	0-20	10
Copper (MS)	6010 (3010)	1	75-125	0-20	25
Iron (MS)	6010 (3010)	1	75-125	0-20	50
Lead (MS)	7421 (3020)	1	75-125	0-20	5.0
Manganese (MS)	6010 (3010)	1	75-125	0-20	10
Mercury (MS)	7470	1	75-125	0-20	0.20
Nickel (MS)	6010 (3010)	1	75-125	0-20	40
Selenium (MS)	7740 (3020)	1	75-125	0-20	10
Silica	6010 (3010)	1			500
Silver (MS)	6010 (3010)	1	75-125	0-20	10
Thallium (MS)	7841 (3020)	1	75-125	0-20	10
Tin (MS)	6010 (3010)	1	75-125	0-20	50
Vanadium (MS)	6010 (3010)	1	75-125	0-20	10
Zinc (MS)	6010 (3010)	1	75-125	0-20	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)
Alkalinity	310.1	3	75-125	0-30	1.0
Ammonia (as N)	350.3	3	75-125	0-30	0.030
Bicarbonate	403	4	NA	NA	1.0
BOD 5	405.1	3	60-140	0-30	2.0
Carbon, total organic	415.1	3	60-140	0-40	1.0
Chloride	325.3	3	75-125	0-30	1.0
COD	410.2	3	60-140	0-30	20
Halogens, total organic	450.1	3	60-140	0-40	0.010
Hardness, total	6010	4	NA	NA	0.34
Langlier Index	203	4	NA	NA	NA
Nitrate-Nitrite (as N)	353.2	3	75-125	0-30	0.050
Nitrogen, total Kjeldahl (TKN)	351.2	3	75-125	0-30	0.10
Oil & Grease	413.2	3	60-140	0-30	5.0
Petroleum hydrocarbons	418.1	3	60-140	0-30	1.0
Orthophosphate	365.1	3	75-125	0-30	0.050
Residue, dissolved	160.1	3	75-125	0-30	5.0
Residue, suspended	160.2	3	75-125	0-30	5.0
Sulfate	375.2	3	75-125	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)
Cyanide, total (MS)	9012	1	75-125	0-30	10
Sulfide (MS)	9030/SL	1/2	50-150	0-50	100

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)	8080 (3520)	1	40-120	0-22	0.050
alpha-BHC	8080 (3520)	1			0.050
beta-BHC	8080 (3520)	1			0.050
delta-BHC	8080 (3520)	1			0.050
gamma-BHC (MS)	8080 (3520)	1	56-123	0-15	0.050
alpha-Chlordane	8080 (3520)	1			0.050
gamma-Chlordane	8080 (3520)	1			0.050
Chlorobenzilate	8080 (3520)	1			0.50
4,4'-DDD	8080 (3520)	1			0.10
4,4'-DDE	8080*** (3520)	1			0.10
4,4'-DDT (MS)	8080 (3520)	1	38-127	0-27	0.10
Dieldrin (MS)	8080 (3520)	1	52-126	0-18	0.10
Endosulfan I	8080 (3520)	1			0.050
Endosulfan II	8080 (3520)	1			0.10
Endosulfan sulfate	8080 (3520)	1			0.10
Endrin (MS)	8080 (3520)	1	56-121	0-21	0.10
Endrin aldehyde	8080 (3520)	1			0.10
Heptachlor (MS)	8080 (3520)	1	40-131	0-20	0.050
Heptachlor epoxide	8080 (3520)	1			0.050
Isodrin	8080*** (3520)	1			0.050
Kepone	8080*** (3520)	1			0.10
Methoxychlor	8080 (3520)	1			0.50
Toxaphene	8080 (3520)	1			5.0
PCB 1016	8080 (3520)	1			1.0
PCB 1221	8080 (3520)	1			2.0
PCB 1232	8080 (3520)	1			1.0
PCB 1242	8080 (3520)	1			1.0
PCB 1248	8080 (3520)	1			1.0
PCB 1254	8080 (3520)	1			1.0
PCB 1260	8080 (3520)	1			1.0
Surrogate - Tetrachloro-m-xylene (TCMX)	8080 (3520)	1	60-150		NA
Surrogate - Dibutylchlorendate (DBC)	8080 (3520)	1	24-154		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)
Dimethoate	8141 (3520)	1			10
Disulfoton	8141 (3520)	1			2.0
Famphur	8141*** (3520)	1			2.0
Parathion, ethyl (MS)	8141 (3520)	1	18-171	0-28	1.0
Parathion, methyl (MS)	8141 (3520)	1	40-140	0-40	0.50
Phorate	8141 (3520)	1			1.0
Sulfotepp	8141 (3520)	1			0.50
Thionazin (MS)	8141*** (3520)	1	25-160	0-60	1.0
Surrogate - Triphenylphosphate	8141*** (3520)	1	40-125		

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)	8151/SL	1	25-129	0-60	0.50
2,4,5-T (MS)	8151/SL	1	25-145	0-62	0.50
2,4,5-TP (Silvex) (MS)	8151/SL	1	10-150	0-81	0.50
Surrogate - 2,4-Dichlorophenyl acetic acid (DCAA)	8151/SL	1	10-135		
Surrogate - 2,4-Dichlorophenoxy butanoic acid (2,4-DB)	8151/SL	1	40-140		

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)	1			25
Acetonitrile	8240*** (5030)	1			1000
Acrolein	8240 (5030)	1			100
Acrylonitrile	8240 (5030)	1			100
Benzene (MS)	8240 (5030)	1	76-127	0-11	5.0
Bromodichloromethane	8240 (5030)	1			5.0
Bromoform	8240 (5030)	1			5.0
Bromomethane	8240 (5030)	1			10
2-Butanone (MEK)	8240 (5030)	1			25
Carbon disulfide	8240 (5030)	1			5.0
Carbon tetrachloride	8240 (5030)	1			5.0
Chlorobenzene (MS)	8240 (5030)	1	75-130	0-13	5.0
Chloroethane	8240 (5030)	1			10
Chloroform	8240 (5030)	1			5.0
Chloromethane	8240 (5030)	1			10
2-Chloro-1,3-butadiene (Chloroprene)	8240 (5030)	1			5.0
3-Chloropropene (Allyl chloride)	8240*** (5030)	1			5.0
Dibromochloromethane	8240 (5030)	1			5.0
1,2-Dibromo-3-chloropropane	8240*** (5030)	1			10
1,2-Dibromoethane	8240*** (5030)	1			5.0
Dibromomethane	8240*** (5030)	1			5.0
trans-1,4-Dichloro-2-butene	8240*** (5030)	1			10
Dichlorodifluoromethane	8240*** (5030)	1			5.0
1,1-Dichloroethane	8240 (5030)	1			5.0
1,2-Dichloroethane	8240 (5030)	1			5.0
1,1-Dichloroethene (MS)	8240 (5030)	1	61-145	0-14	5.0
trans-1,2-Dichloroethene	8240 (5030)	1			5.0
1,2-Dichloropropane	8240 (5030)	1			5.0
cis-1,3-Dichloropropene	8240 (5030)	1			5.0
trans-1,3-Dichloropropene	8240 (5030)	1			5.0
Ethylbenzene	8240 (5030)	1			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)
Ethyl methacrylate	8240 (5030)	1			5.0
2-Hexanone	8240 (5030)	1			25
Iodomethane	8240 (5030)***	1			5.0
Isobutanol (Isobutyl alcohol)	8240*** (5030)	1			1000
Methacrylonitrile	8240*** (5030)	1			100
Methylene chloride	8240 (5030)	1			5.0
Methyl methacrylate	8240*** (5030)	1			5.0
4-Methyl-2-pentanone (MIBK)	8240 (5030)	1			25
n-Octane	8240*****(5030)/SL	1			10
Oxy-bis(ethanol)	MOD 8015*****DAI/SL	1			10000
Pentachloroethane	8240*** (5030)	1			25
Propanenitrile (Propionitrile)	8240*** (5030)	1			100
Styrene	8240 (5030)	1			5.0
1,1,1,2-Tetrachloroethane	8240*** (5030)	1			5.0
1,1,2,2-Tetrachloroethane	8240 (5030)	1			5.0
Tetrachloroethene	8240 (5030)	1			5.0
Toluene (MS)	8240 (5030)	1	76-125	0-13	5.0
1,1,1-Trichloroethane	8240 (5030)	1			5.0
1,1,2-Trichloroethane	8240 (5030)	1			5.0
Trichloroethene (MS)	8240 (5030)	1	71-120	0-14	5.0
Trichlorofluoromethane	8240 (5030)	1			5.0
1,2,3-Trichloropropane	8240*** (5030)	1			5.0
Vinyl acetate	8240 (5030)	1			10
Vinyl chloride	8240 (5030)	1			10
O-Xylene	8240 (5030)	1			5.0
M&P-xylene	8240 (5030)	1			5.0
Surrogate - Toluene-d8	8240 (5030)	1	88-110		
Surrogate - p-Bromofluorobenzene	8240 (5030)	1	86-115		
Surrogate - 1,2-Dichloroethane-d4	8240 (5030)	1	76-114		

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)	8270 (3520)	1	46-118	0-31	10
Acenaphthylene	8270 (3520)	1			10
Acetophenone	8270 (3520)	1			10
2-Acetylaminofluorene	8270*** (3520)	1			10
4-Aminobiphenyl	8270 (3520)	1			10
Aniline	8270 (3520)	1			50
Anthracene	8270 (3520)	1			10
Aramite	8270 (3520)	1			10
Benzo(a)anthracene	8270 (3520)	1			10
Benzo(b)fluoranthene	8270 (3520)	1			10
Benzo(k)fluoranthene	8270 (3520)	1			10
Benzo(g,h,i)perylene	8270 (3520)	1			10
Benzo(a)pyrene	8270 (3520)	1			10
Benzyl alcohol	8270 (3520)	1			10
1,1-Biphenyl	8270***** (3520)	1			10
Bis(2-chloroethoxy) methane	8270 (3520)	1			10
Bis(2-chloroethyl) ether	8270 (3520)	1			10
Bis(2-ethylhexyl) phthalate	8270 (3520)	1			10
4-Bromophenyl phenyl ether	8270 (3520)	1			10
Butazolidin (MS)	8270**** (3520)	1	D-415	0-200	50
Butylbenzylphthalate	8270 (3520)	1			10
4-Chloroaniline	8270 (3520)	1			20
4-Chloro-3-methylphenol (MS)	8270 (3520)	1	23-97	0-42	10
2-Chloronaphthalene	8270 (3520)	1			10
2-Chlorophenol (MS)	8270 (3520)	1	27-123	0-40	10
4-Chlorophenylphenyl ether	8270 (3520)	1			10
Chrysene	8270 (3520)	1			10
3-Methylphenol + 4 Methylphenol (m-Cresol + p Cresol)	8270*** (3520)	1			10
2 Methylphenol (o-Cresol)	8270 (3520)	1			10
2 Cyclohexene-1-ol	8270***** (3520)	1			10
2 Cyclohexene-1-one	8270***** (3520)	1			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)
2,5-Cyclohexadiene-1,4-dione	8270***** (3520)	1			10
Diallate	8270*** (3520)	1			10
Dibenz(a,h)anthracene	8270 (3520)	1			10
Dibenzofuran	8270 (3520)	1			10
Di-n-butylphthalate	8270 (3520)	1			10
1,2-Dichlorobenzene	8270 (3520)	1			10
1,3-Dichlorobenzene	8270 (3520)	1			10
1,4-Dichlorobenzene (MS)	8270 (3520)	1	36-97	0-28	10
3,3'-Dichlorobenzidine	8270 (3520)	1			20
Dichlorodibenzofuran	8270 (3520)/SL	5			ND
Dichlorodibenzo-p-dioxin	8270 (3520)/SL	5			ND
2,4-Dichlorophenol	8270 (3520)	1			10
2,6-Dichlorophenol	8270 (3520)	1			10
Diethylphthalate	8270 (3520)	1			10
3,4-Dimethoxyacetophenone	8270***** (3520)	1			10
p-(Dimethylamino)azobenzene	8270 (3520)	1			10
7,12-Dimethylbenz(a)anthracene	8270 (3520)	1			10
3,3'-Dimethylbenzidine	8270*** (3520)	1			200
a,a-Dimethylphenethylamine	8270 (3520)	1			2000
2,4-Dimethylphenol	8270 (3520)	1			10
Dimethylphthalate	8270 (3520)	1			10
1,3-Dinitrobenzene	8270*** (3520)	1			10
4,6-Dinitro-2-methylphenol	8270 (3520)	1			50
2,4-Dinitrophenol	8270 (3520)	1			50
2,4-Dinitrotoluene (MS)	8270 (3520)	1	24-96	0-38	10
2,6-Dinitrotoluene	8270 (3520)	1			10
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270*** (3520)	1			10
Di-n-octylphthalate	8270 (3520)	1			10
1,4-Dioxane	8270*** (3520)	1			10
Diphenylamine/ N-nitrosodiphenylamine	8270 (3520)	1			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)
Ethyl methanesulfonate	8270 (3520)	1			10
Fluoranthene	8270 (3520)	1			10
Fluorene	8270 (3520)	1			10
Hexachlorobenzene	8270 (3520)	1			10
Hexachlorobutadiene	8270 (3520)	1			10
Hexachlorocyclopentadiene	8270 (3520)	1			10
Hexachloroethane	8270 (3520)	1			10
Hexachloropropene	8270*** (3520)	1			10
Indeno(1,2,3-cd)pyrene	8270 (3520)	1			10
Irgasan DP-300 (MS)	8270**** (3520)	1	D-164	0-132	10
Isophorone	8270 (3520)	1			10
Isosafrole	8270*** (3520)	1			10
Methapyrilene	8270*** (3520)	1			2000
2&4-Methyl benzenesulfonamide	8270***** (3520)	1			10
3-Methylcholanthrene	8270 (3520)	1			10
Methyl methanesulfonate	8270 (3520)	1			10
2-Methylnaphthalene	8270 (3520)	1			10
Naphthalene	8270 (3520)	1			10
1,4-Napthoquinone	8270*** (3520)	1			10
1-Napthylamine	8270 (3520)	1			10
2-Napthylamine	8270 (3520)	1			10
2-Nitroaniline	8270 (3520)	1			50
3-Nitroaniline	8270 (3520)	1			50
4-Nitroaniline	8270 (3520)	1			50
Nitrobenzene	8270 (3520)	1			10
2-Nitrophenol	8270 (3520)	1			10
4-Nitrophenol (MS)	8270 (3520)	1	10-80	0-50	50
4-Nitroquinoline-N-oxide	8270*** (3520)	1			100
N-Nitrosodi-n-butylamine	8270 (3520)	1			10
N-Nitrosodiethylamine	8270*** (3520)	1			10
N-Nitrosodimethylamine	8270 (3520)	1			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)
N-Nitrosodi-n-propylamine (MS)	8270 (3520)	1	41-116	0-38	10
N-Nitrosomethylethylamine	8270*** (3520)	1			10
N-Nitrosomorpholine	8270*** (3520)	1			10
N-Nitrosopiperidine	8270 (3520)	1			10
N-Nitrosopyrrolidine	8270*** (3520)	1			10
5-Nitro-o-toluidine	8270*** (3520)	1			10
2,2'-Oxybis(1-Chloropropane) (Bis(2-chloroisopropyl) ether)	8270 (3520)	1			10
Pentachlorobenzene	8270 (3520)	1			10
Pentachloronitrobenzene	8270 (3520)	1			10
Pentachlorophenol (MS)	8270 (3520)	1	9-103	0-50	50
Phenacetin	8270 (3520)	1			10
Phenanthrene	8270 (3520)	1			10
Phenol (MS)	8270 (3520)	1	12-110	0-42	10
p-Phenylenediamine	8270*** (3520)	1			2000
2-Picoline	8270 (3520)	1			200
Pronamide	8270 (3520)	1			10
Propazine (MS)	8270**** (3520)	1	D-233	0-110	20
Pyrene (MS)	8270 (3520)	1	26-127	0-31	10
Pyridine	8270*** (3520)	1			200
Safrole	8270*** (3520)	1			10
1,2,4,5-Tetrachlorobenzene	8270 (3520)	1			10
2,3,4,6-Tetrachlorophenol	8270 (3520)	1			50
Tinuvin - 328 (MS)	8270**** (3520)	1	D-148	0-141	10
Tofranil (MS)	8270**** (3520)	1	D-118	0-111	100
o-Toluidine	8270*** (3520)	1			10
1,2,4-Trichlorobenzene (MS)	8270 (3520)	1	39-98	0-28	10
Trichlorodibenzofuran	8270 (3520)/SL	5			ND
Trichlorodibenzo-p-dioxin	8270 (3520)/SL	5			ND
2,4,5-Trichlorophenol	8270 (3520)	1			10
2,4,6-Trichlorophenol	8270 (3520)	1			10
o,o,o-Triethylphosphorothioate	8270*** (3520)	1			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)
1,3,5-Trinitrobenzene	8270*** (3520)	1			200
Surrogate - Nitrobenzene-d5	8270 (3520)	1	35-114		
Surrogate - 2-Fluorobiphenyl	8270 (3520)	1	43-116		
Surrogate - p-Terphenyl-d14	8270 (3520)	1	33-141		
Surrogate - Phenol-d5	8270 (3520)	1	10-110		
Surrogate - 2-Fluorophenol	8270 (3520)	1	21-110		
Surrogate - 2,4,6-Tribromophenol	8270 (3520)	1	10-123		

Liquid control limits for the CIBA-GEIGY fingerprint compounds Butazolidin, Irgason DP-300, Propazine, Tinuvin-328, and Tofranil are based on a limited number of data points and will be updated as more data are generated.

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)
Antimony (MS)	6010 (3050)	1	75-125	0-20	5.0
Arsenic (MS)	7060 (3050)	1	75-125	0-20	1.0
Barium (MS)	6010 (3050)	1	75-125	0-20	1.0
Beryllium (MS)	6010 (3050)	1	75-125	0-20	0.50
Cadmium (MS)	6010 (3050)	1	75-125	0-20	0.50
Chromium (MS)	6010 (3050)	1	75-125	0-20	1.0
Cobalt (MS)	6010 (3050)	1	75-125	0-20	1.0
Copper (MS)	6010 (3050)	1	75-125	0-20	2.5
Lead (MS)	7421 (3050)	1	75-125	0-20	0.50
Mercury (MS)	7471 (3050)	1	75-125	0-20	0.030
Nickel (MS)	6010 (3050)	1	75-125	0-20	4.0
Selenium (MS)	7740 (3050)	1	75-125	0-20	1.0
Silver (MS)	6010 (3050)	1	75-125	0-20	1.0
Thallium (MS)	7841 (3050)	1	75-125	0-20	1.0
Tin (MS)	6010 (3050)	1	75-125	0-20	5.0
Vanadium (MS)	6010 (3050)	1	75-125	0-20	1.0
Zinc (MS)	6010 (3050)	1	75-125	0-20	2.0

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** (mg/kg)
Cyanide, total (MS)	9012	1	75-125	0-30	1.0
Sulfide (MS)	9030/SL	1/2	50-150	0-50	2.5

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)	1	34-132	0-43	1.7
alpha-BHC	8080 (3550)	1			1.7
beta-BHC	8080 (3550)	1			1.7
gamma-BHC (MS)	8080 (3550)	1	46-127	0-50	1.7
delta-BHC	8080 (3550)	1			1.7
alpha Chlordane	8080 (3550)	1			1.7
gamma Chlordane	8080 (3550)	1			1.7
Chlorobenzilate	8080*** (3550)	1			17
4,4'-DDD	8080 (3550)	1			3.3
4,4'-DDE	8080 (3550)	1			3.3
4,4'-DDT (MS)	8080 (3550)	1	23-134	0-50	3.3
Dieldrin (MS)	8080 (3550)	1	31-134	0-38	3.3
Endosulfan I	8080 (3550)	1			1.7
Endosulfan II	8080 (3550)	1			3.3
Endosulfan sulfate	8080 (3550)	1			3.3
Endrin (MS)	8080 (3550)	1	42-139	0-45	3.3
Endrin aldehyde	8080 (3550)	1			3.3
Heptachlor (MS)	8080 (3550)	1	35-130	0-31	1.7
Heptachlor epoxide	8080 (3550)	1			1.7
Isodrin	8080*** (3550)	1			3.3
Kepone	8080*** (3550)	1			17
Methoxychlor	8080 (3550)	1			17
Toxaphene	8080 (3550)	1			170
PCB-1016	8080 (3550)	1			33
PCB-1221	8080 (3550)	1			67
PCB-1232	8080 (3550)	1			33
PCB-1242	8080 (3550)	1			33
PCB-1248	8080 (3550)	1			33
PCB-1254	8080 (3550)	1			33
PCB-1260	8080 (3550)	1			33
Surrogate - Dibutylchlorendate (DBC)	8080 (3550)	1	24-150		
Surrogate - Tetrachloro-m-xylene (TCMX)	8080 (3550)	1	60-150		

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)
Dimethoate	8141*** (3550)	1			330
Disulfoton	8141 (3550)	1			130
Famphur	8141 (3550)	1			330
Parathion, ethyl (MS)	8141 (3550)	1	15-141	0-79	33
Parathion, methyl (MS)	8141 (3550)	1	40-140	0-40	17
Phorate	8141 (3550)	1			33
Sulfotepp	8141 (3550)	1			17
Thionazin (MS)	8141*** (3550)	1	25-160	0-60	33
Surrogate - Triphenylphosphate	8141*** (3550)	1	40-125		

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)	8151	1	10-130	0-47	17
2,4,5-T (MS)	8151	1	24-115	0-40	17
2,4,5-TP (Silvex) (MS)	8151	1	10-150	0-54	17
Surrogate - 2,4-Dichlorophenoxy butanoic acid (2,4-DB)	8151	1	20-160		
Surrogate - 2,4-Dichlorophenyl acetic acid (DCAA)	8151	1	20-160		

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)	1			25
Acetonitrile	8240*** (5030)	1			200
Acrolein	8240*** (5030)	1			200
Acrylonitrile	8240*** (5030)	1			100
Benzene (MS)	8240 (5030)	1	66-142	0-21	5.0
Bromodichloromethane	8240 (5030)	1			5.0
Bromoform	8240 (5030)	1			5.0
Bromomethane	8240 (5030)	1			10
2-Butanone (MEK)	8240 (5030)	1			25
Carbon disulfide	8240 (5030)	1			5.0
Carbon tetrachloride	8240 (5030)	1			5.0
Chlorobenzene (MS)	8240 (5030)	1	60-133	0-21	5.0
Chloroethane	8240 (5030)	1			10
Chloroform	8240 (5030)	1			5.0
Chloromethane	8240 (5030)	1			10
2-Chloro-1,3-butadiene (Chloroprene)	8240 (5030)	1			10
3-Chloropropene (Allyl chloride)	8240*** (5030)	1			5.0
Dibromochloromethane	8240 (5030)	1			5.0
1,2-Dibromo-3-chloropropane (DBCP)	8240 (5030)	1			10
1,2-Dibromoethane	8240*** (5030)	1			5.0
Dibromomethane	8240*** (5030)	1			5.0
trans-1,4-Dichloro-2-butene	8240*** (5030)	1			5.0
Dichlorodifluoromethane	8240*** (5030)	1			5.0
1,1-Dichloroethane	8240 (5030)	1			5.0
1,2-Dichloroethane	8240 (5030)	1			5.0
1,1-Dichloroethene (MS)	8240 (5030)	1	59-172	0-22	5.0
trans-1,2-Dichloroethene	8240 (5030)	1			5.0
1,2-Dichloropropane	8240 (5030)	1			5.0
cis-1,3-Dichloropropene	8240 (5030)	1			5.0
trans-1,3-Dichloropropene	8240 (5030)	1			5.0
Ethylbenzene	8240 (5030)	1			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)
Ethyl methacrylate	8240*** (5030)	1			5.0
2-Hexanone	8240 (5030)	1			25
Iodomethane	8240*** (5030)	1			5.0
Isobutanol (Isobutyl alcohol)	8240*** (5030)	1			1000
Methacrylonitrile	8240*** (5030)	1			100
Methylene chloride	8240 (5030)	1			5.0
Methyl methacrylate	8240*** (5030)	1			5.0
4-Methyl-2-pentanone (MIBK)	8240 (5030)	1			25
n-Octane	8240*****(5030)/SL	1			10
Oxy-bis(ethanol)	Mod 8015***** DAI/SL	1			10000
Pentachloroethane	8240*** (5030)	1			25
Propanenitrile (Propionitrile)	8240*** (5030)	1			200
Styrene	8240 (5030)	1			5.0
1,1,1,2-Tetrachloroethane	8240 (5030)	1			5.0
1,1,2,2-Tetrachloroethane	8240 (5030)	1			5.0
Tetrachloroethene	8240 (5030)	1			5.0
Toluene (MS)	8240 (5030)	1	59-139	0-21	5.0
1,1,1-Trichloroethane	8240 (5030)	1			5.0
1,1,2-Trichloroethane	8240 (5030)	1			5.0
Trichloroethene (MS)	8240 (5030)	1	62-137	0-24	5.0
Trichlorofluoromethane	8240 (5030)	1			5.0
1,2,3-Trichloropropane	8240*** (5030)	1			5.0
Vinyl acetate	8240 (5030)	1			10
Vinyl chloride	8240 (5030)	1			10
O-xylenes	8240 (5030)	1			5.0
M&P xylene	8240 (5030)	1			5.0
Surrogate - 4-Bromofluorobenzene	8240 (5030)	1	59-113		
Surrogate - 1,2-Dichloroethane-d4	8240 (5030)	1	70-121		
Surrogate - Toluene-d8	8240 (5030)	1	84-138		

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)	1	31-137	0-19	330
Acenaphthylene	8270 (3550)	1			330
Acetophenone	8270 (3550)	1			330
2-Acetylaminofluorene	8270 (3550)	1			330
4-Aminobiphenyl	8270 (3550)	1			330
Aniline	8270 (3550)	1			330
Anthracene	8270 (3550)	1			330
Benzo(a)anthracene	8270 (3550)	1			330
Benzo(b)fluoranthene	8270 (3550)	1			330
Benzo(k)fluoranthene	8270 (3550)	1			330
Benzo(g,h,i)perylene	8270 (3550)	1			330
Benzo(a)pyrene	8270 (3550)	1			330
Benzyl alcohol	8270 (3550)	1			330
1,1-Biphenyl	8270*****(3550) /SL	1			330
Bis(2-chloroethoxy) methane	8270 (3550)	1			330
Bis(2-chloroethyl) ether	8270 (3550)	1			330
Bis(2-ethylhexyl) phthalate	8270 (3550)	1			330
4-Bromophenyl phenyl ether	8270 (3550)	1			330
Butazolidin (MS)	8270**** (3520)	1			1700
Butylbenzylphthalate	8270 (3550)	1			330
4-Chloroaniline	8270 (3550)	1			660
4-Chloro-3-methylphenol (MS)	8270 (3550)	1	26-103	0-33	330
2-Chloronaphthalene	8270 (3550)	1			330
2-Chlorophenol (MS)	8270 (3550)	1	25-102	0-50	330
4-Chlorophenylphenyl ether	8270 (3550)	1			330
Chrysene	8270 (3550)	1			330
3-Methylphenol + 4 Methylphenol (m-Cresol + p-Cresol)	8270 (3550)	1			330
2-Methylphenol (o-Cresol)	8270 (3550)	1			330
2-Cyclohexene-1-01	8270*****(3550)	1			330
2-Cyclohexene-1-one	8270*****(3550)	1			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)
2,5-Cyclohexadiene-1,4-dione	8270*****(3550)	1			330
Diallate	8270 (3550)	1			330
Dibenz(a,h)anthracene	8270 (3550)	1			330
Dibenzofuran	8270 (3550)				330
Di-n-butylphthalate	8270 (3550)	1			330
1,2-Dichlorobenzene	8270 (3550)	1			330
1,3-Dichlorobenzene	8270 (3550)	1			330
1,4-Dichlorobenzene (MS)	8270 (3550)	1	28-104	0-27	330
3,3'-Dichlorobenzidine	8270 (3550)	1			660
Dichlorodibenzofuran	8270 (3550)/SL	5			ND
Dichlorodibenzo-p-dioxin	8270 (3550)/SL	5			ND
2,4-Dichlorophenol	8270 (3550)	1			330
2,6-Dichlorophenol	8270 (3550)	1			330
Diethylphthalate	8270 (3550)	1			330
3,4-Dimethoxyacetophenone	8270*****(3550)	1			330
p-(Dimethylamino)azobenzene	8270 (3550)	1			330
7,12-Dimethylbenz(a)anthracene	8270 (3550)	1			330
3,3'-Dimethylbenzidine	8270 (3550)	1			1700
a,a-Dimethylphenethylamine	8270 (3550)	1			1700
2,4-Dimethylphenol	8270 (3550)	1			330
Dimethylphthalate	8270 (3550)	1			330
1,3-Dinitrobenzene	8270 (3550)	1			330
4,6-Dinitro-2-methylphenol	8270 (3550)	1			1700
2,4-Dinitrophenol	8270 (3550)	1			1700
2,4-Dinitrotoluene (MS)	8270 (3550)	1	28-89	0-47	330
2,6-Dinitrotoluene	8270 (3550)	1			330
Di-n-octylphthalate	8270 (3550)	1			330
Dinoseb (2-sec-Butyl-4,6-dinitrophenol)	8270 (3550)	1			330
1,4-Dioxane	8270 (3550)	1			330
Diphenylamine/ N-nitrosodiphenylamine	8270 (3550)	1			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)
Ethyl methanesulfonate	8270 (3550)	1			330
Fluoranthene	8270 (3550)	1			330
Fluorene	8270 (3550)	1			330
Hexachlorobenzene	8270 (3550)	1			330
Hexachlorobutadiene	8270 (3550)	1			330
Hexachlorocyclopentadiene	8270 (3550)	1			330
Hexachloroethane	8270 (3550)	1			330
Hexachloropropene	8270 (3550)	1			330
Indeno(1,2,3-cd)pyrene	8270 (3550)	1			330
Irgasan DP-300 (MS)	8270**** (3550)	1			330
Isophorone	8270 (3550)	1			330
Isosafrole	8270*** (3550)	1			330
Methapyrilene	8270 (3550)	1			3300
2&4-Methyl benzenesulfonamide	8270*****(3550)	1			330
3-Methylcholanthrene	8270 (3550)	1			330
Methyl methanesulfonate	8270 (3550)	1			330
2-Methylnaphthalene	8270 (3550)	1			330
Naphthalene	8270 (3550)	1			330
1,4-Napthoquinone	8270 (3550)	1			330
1-Napthylamine	8270 (3550)	1			330
2-Napthylamine	8270 (3550)	1			330
2-Nitroaniline	8270 (3550)	1			1700
3-Nitroaniline	8270 (3550)	1			1700
4-Nitroaniline	8270 (3550)	1			1700
Nitrobenzene	8270 (3550)	1			330
2-Nitrophenol	8270 (3550)	1			330
4-Nitrophenol (MS)	8270 (3550)	1	11-114	0-50	1700
4-Nitroquinoline-N-oxide	8270 (3550)	1			3300
N-Nitroso-di-n-butylamine	8270 (3550)	1			330
N-Nitrosodiethylamine	8270 (3550)	1			330
N-Nitrosodimethylamine	8270 (3550)	1			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)
N-Nitroso-di-n-propylamine (MS)	8270 (3550)	1	41-126	0-38	330
N-Nitrosomethylethylamine	8270 (3550)	1			330
N-Nitrosomorpholine	8270 (3550)	1			330
N-Nitrosopiperidine	8270 (3550)	1			330
N-Nitrosopyrrolidine	8270 (3550)	1			330
5-Nitro-o-toluidine	8270 (3550)	1			330
2,2-Oxybis (1-Chloropropane) (Bis(2-chloroisopropyl) ether)	8270 (3550)	1			330
Pentachlorobenzene	8270 (3550)	1			330
Pentachloronitrobenzene	8270 (3550)	1			330
Pentachlorophenol (MS)	8270 (3550)	1	17-109	0-47	1700
Phenacetin	8270 (3550)	1			330
Phenanthrene	8270 (3550)	1			330
Phenol (MS)	8270 (3550)	1	26-90	0-35	330
p-Phenylenediamine	8270 (3550)	1			1700
2-Picoline	8270 (3550)	1			330
Pronamide	8270 (3550)	1			330
Propazine (MS)	8270**** (3550)	1			660
Pyrene (MS)	8270 (3550)	1	35-142	0-36	330
Pyridine	8270 (3550)	1			330
Safrole	8270 (3550)	1			330
1,2,4,5-Tetrachlorobenzene	8270 (3550)	1			330
2,3,4,6-Tetrachlorophenol	8270 (3550)	1			1700
Tinuvin-328 (MS)	8270**** (3550)	1			330
Tofranil (MS)	8270**** (3550)	1			3300
o-Toluidine	8270*** (3550)	1			330
1,2,4-Trichlorobenzene (MS)	8270 (3550)	1	38-107	0-23	330
Trichlorodibenzofuran	8270 (3550)/SL	5			ND
Trichlorodibenzo-p-dioxin	8270 (3550)/SL	5			ND
2,4,5-Trichlorophenol	8270 (3550)	1			1700
2,4,6-Trichlorophenol	8270 (3550)	1			330
o,o,o-Triethylphosphorothioate	8270 (3550)	1			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)
1,3,5-Trinitrobenzene	8270 (3550)	1			330
Surrogate - 2-Fluorobiphenyl	8270 (3550)	1	30-115		
Surrogate - 2-Fluorophenol	8270 (3550)	1	25-121		
Surrogate - Nitrobenzene-d5	8270 (3550)	1	23-120		
Surrogate - Phenol-d5	8270 (3550)	1	24-113		
Surrogate - p-Terphenyl-d14	8270 (3550)	1	18-137		
Surrogate - 2,4,6-Tribromophenol	8270 (3550)	1	19-122		

Soil control limits for the CIBA-GEIGY fingerprint compounds Butazolidin, Irgasan DP-300, Propazine, Tinuvin 328, and Tofranil will be established as data points are generated.

REFERENCES AND NOTES FOR TABLES 5-1 AND 5-2

1. *Test Methods for Evaluating Solid Waste SW-846, Third Edition*; SW-846; U.S. EPA Office of Solid Waste and Emergency Response: Washington, DC, November, 1986.

2. Savannah Laboratories' Standard Operating Procedure (SOP).

3. *Methods of Chemical Analysis of Water and Wastes*; U.S. EPA Office of Research and Development: Cincinnati, OH, March 1983; EPA-600/4-79-020.

4. *Standard Methods for the Examination of Water and Wastewater; Sixteenth and Seventeenth Editions*; American Public Health Association: Washington, DC, 1985 and 1989.

5. Savannah Laboratories QAPjP, Section 9, page 2 of 7.

* Accuracy data are presented as recoveries for matrix and surrogate spikes. Percent recoveries are evaluated only on the CLP or lab selected matrix spike parameters. The matrix spiking compounds are designated by an (MS) following the parameter name. Precision data are presented as relative percent difference (%RPD). Since reportable levels (above PQL) for most parameters may not be detected in all environmental samples, precision is usually evaluated on duplicate matrix spike data.

** PQL - Practical Quantification Limits - These are the normal reporting limits for routine environmental samples. These PQLs are taken from SW-846 (Third Edition), the CLP reporting limits, 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 Appendix IX compound is not included in EPA's list of compounds for this method; however, it has been validated by SL to be ammenable to analysis by this method at the stated PQL.

**** This CIBA-GEIGY site specific compound is not included in EPA's list of compounds for this method; however, it has been validated by SL to be ammenable to analysis by this method at the stated PQL.

***** This compound is not included in EPA's list of compounds for this method; however, SL will follow SW-846 methodology for sample preparation and analyses with exceptions as noted in Section 9 of this QAPjP.

NA Not applicable for stated method.

6.0 SAMPLING PROCEDURES

Sampling procedures for this project are specified in the Woodward-Clyde Consultants (WCC) Quality Assurance Document.

Savannah Laboratories' sampling responsibilities will be limited to providing containers as specified in Tables 6-1 and 6-2 of this document which list the containers used for sampling, preservatives, holding times and conditions for water and soil/sediment samples.

TABLE 6-1

CONTAINER PRESERVATION TECHNIQUES, CORRESPONDING PRESERVATIVE COLOR CODE KEY AND MAXIMUM ANALYSIS HOLDING TIMES FOR WATER SAMPLES

PARAMETER	CONTAINER REQUIRED[1]	PRESERVATION[2]	PRESERVATIVE COLOR CODE	MAXIMUM ANALYSIS HOLDING TIME FROM COLLECTION DATE
Inorganics:				
Cyanide (9012)	1-100 mL polyethylene	Cool 4°C NaOH to pH >12, 0.6 g ascorbic acid	Blue	14 days
Metals (6010/7060/ 7740/7421/7841)	1-500 mL polyethylene	HNO_3 to pH <2	Red	6 months
Mercury (7470)	1-500 mL polyethylene	HNO_3 to pH <2	Red	28 days
Sulfide (9030)	1-500 mL polyethylene	Cool to 4°C, add zinc acetate + NaOH to pH >9	Tan	7 days
Organics:				
Purgeables (8240)	4-40 mL glass vials with TFE-lined septa	Cool 4°C, 4 drops conc. HCl per vial	Light blue	14 days
Base-Neutral/Acid Extractables (8270)	2-1 L amber glass with TFE-lined cap	Cool 4°C	Purple	Extraction-7 days Analysis-40 days
Chlorinated Pesticides (8080)	2-1 L amber glass with TFE-lined cap	Cool 4°C	Purple	Extraction-7 days Analysis-40 days
Organophosphorus Pesticides (8141)	1-1 L amber glass with TFE-lined cap	Cool 4°C	Purple	Extraction-7 days Analysis-40 days
Chlorinated Herbicides (8150)	1-1 L amber glass with TFE-lined cap	Cool 4°C	Purple	Extraction-7days Analysis-40 days
Water Treatability:				
Biological Oxygen Demand (BOD)	1-1 L polyethylene	Cool 4°C	Purple	48 hours
Chemical Oxygen Demand (COD)	1-100 L polyethylene	Cool 4°C, H_2SO_4 to pH <2	Green	28 days
Total Suspended Solids (TSS)	1-100 L polyethylene	Cool 4°C	Purple	7 days
Total Dissolved Solids (TDS)	1-1 L polyethylene	Cool 4°C	Purple	7 days
Total Petroleum Hydrocarbons (TPHC)	1-1 Liter amber glass	Cool 4°C, HCL to pH <2	Light blue	28 days
Oil and Grease	1-500 mL glass	Cool 4°C, H_2SO_4 to pH <2	Green	28 days
Total Organic Carbon (TOC)	1-125 mL amber glass	Cool 4°C, H_2SO_4 to pH <2	Green	28 days
Total Organic Halides (TOX)	1-500 mL glass	Cool 4°C, H_2SO_4 to pH <2	Green	28 days

TABLE 6-1

CONTAINER PRESERVATION TECHNIQUES, CORRESPONDING PRESERVATIVE COLOR CODE KEY AND MAXIMUM ANALYSIS HOLDING TIMES FOR WATER SAMPLES

PARAMETER	CONTAINER REQUIRED[1]	PRESERVATION[2]	PRESERVATIVE COLOR CODE	MAXIMUM ANALYSIS HOLDING TIME FROM COLLECTION DATE
Total Kjedahl Nitrogen (TKN)	1-100 mL polyethylene	Cool 4°C, H_2SO_4	Green	28 days
Chloride (Cl)	1-100 mL polyethylene	Cool 4°C	Purple	28 days
Sulfate (SO_4)	1-50 mL polyethylene	Cool 4°C	Purple	28 days
Bicarbonate (HCO_3)	1-250 mL polyethylene	Cool 4°C	Purple	14 days
Ammonia (NH_4)	1-100 mL polyethylene	Cool 4°C, H_2SO_4 to pH <2	Green	28 days
Nitrate/Nitrite (NO_3/NO_2)	1-100 mL polyethylene	Cool 4°C, H_2SO_4 to pH <2	Green	28 days
Phosphate (PO_4)	1-50 mL polyethylene	Cool 4°C	Purple	48 hours
Langlier Index				
Ca	1-250 mL polyethlene	HNO_3 to pH <2	Red	6 months
Mg	1-250 mL polyethlene	HNO_3 to pH <2	Red	6 months
TDS	1 1-L polyethylene	Cool 4°C	Purple	7 days
Alk-T	1-250 mL polyethylene	Cool 4°C	Purple	14 days
pH	1-50 mL polyethylene	None required	Purple	Analyze immediately
Specific Cond. Temperature	1-50 mL polyethylene	Cool 4°C (Field parameter)	Purple	28 days
Hardness	1-250 mL polyethylene	HNO_3 to pH <2	Red	6 months
Alkalinity	1-250 mL polyethylene	Cool 4°C	Purple	14 days

1. The sample quantities outlined are required for single sample analysis. Replicate samples will require double the sample volumes listed and matrix spike/matrix spike duplicate samples will require triplicate collection of sample volumes.

2. Field trip blank container requirements and preservatives will be the same as for aqueous samples. 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.

TABLE 6-2

CONTAINER PRESERVATION TECHNIQUES, CORRESPONDING PRESERVATIVE COLOR CODE KEY AND MAXIMUM ANALYSIS HOLDING TIMES FOR SEDIMENT SAMPLES

PARAMETER	CONTAINER REQUIRED	PRESERVATION	PRESERVATIVE COLOR CODE	MAXIMUM ANALYSIS HOLDING TIME FROM COLLECTION DATE[1]
Organics:				
Purgeables (8240)	1-120 mL amber glass with TFE-lined cap	Cool 4°C	Purple	14 days
Organics Extractables:				
Base-Neutral/Acid (8270)	1-500 mL w/m glass with TFE-lined cap	Cool 4°C	Purple	Extraction-14 days Analysis-40 days
Organophosphorus Pesticides (8141)	1-500 mL w/m glass with TFE-lined cap	Cool 4°C	Purple	Extraction-14 days Analysis-40 days
Chlorinated Pesticides/PCBs (8080)	1-500 mL w/m glass with TFE-lined cap	Cool 4°C	Purple	Extraction-14 days Analysis-40 total days
Chlorinated Herbicides (8150)	1-500 mL w/m glass with TFE-lined cap	Cool 4°C	Purple	Extraction-14 days Analysis-40 total days
Inorganics:				
Metals (6010/7060/7421/7841/7740)	1-500 mL w/m polypropylene	Not required	Purple	6 months
Mercury (7471)	1-500 mL w/m polypropylene	Not required	Purple	28 days
Cyanide (9012)	1-500 mL w/m polypropylene	Cool 4°C	Purple	14 days
Sulfide (9030)	1-500 mL w/m polypropylene	Cool 4°C	Purple	7 days

1. In instances where aqueous field and trip blanks are utilized to assess sediment data, sediment holding times and other related QA/QC criteria will apply for data validation of field and trip blanks.

7.0 SAMPLE CUSTODY

An overriding consideration for environmental measurement data is the ability to demonstrate that samples have been collected from the specified locations stated, delivered to the laboratory without alteration, were checked and stored securely at the laboratory, were processed within holding times and were properly identified in the laboratory. Evidence of collection, shipment, laboratory receipt, and laboratory custody must be documented to accomplish this task. Documentation is accomplished through a chain-of-custody record (see Figure 7.1) that records each sample and the individuals responsible for sample collection, shipment, and receipt. A sample is considered in custody if it is:

* In a person's actual possession;
* In view after being in physical possession;
* Sealed so that sample integrity will be maintained after having been in physical custody; and/or
* In a secured area, restricted to authorized personnel.

7.1 Field Custody

Field custody procedures are described in the WCC Quality Assurance Document. Sampling containers will be supplied by Savannah Laboratories upon written request of CIBA-GEIGY NSCA or conference calls with CIBA-GEIGY NSCA and WCC. A laboratory bottle request will accompany each cooler submitted to site.

7.2 Laboratory Custody

Upon arrival at the laboratory, the samples are immediately taken to the sample receiving area where they are logged into a bound sample registry by the sample custodian (See Figure 7.2). The date received, date sampled, etc., are recorded in the sample registry. Immediately, the shipping container is opened, and the temperature of the shipping container is obtained by measuring the temperature of the "temperature blank" containers. The arrival temperature is documented on the sample registry.

Shipping containers arriving at the laboratory with custody seals are inspected for integrity. A space labeled "custody intact" is provided on the custody form to record whether the custody seal is intact ("Y" for yes or "N" for no).

The custody form is checked against the bottle labels and then signed by the sample custodian. The sample custodian inspects all samples for leakage from any of the containers. A multi-phase sample which has leaked is not acceptable for analysis as its sample integrity has been altered. Samples which arrive at the laboratory in plastic containers, which appear to be bulging or evolving gas, are treated with caution since they may contain toxic fumes or be of an explosive nature.

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
		CRANSTON

CLIENT NAME	TELEPHONE/FAX NO.
CIBA-GEIGY CORPORATION	
CLIENT ADDRESS	CITY, STATE, ZIP CODE
SAMPLER(S) NAME	CLIENT PROJECT MANAGER

PAGE ____ OF ____

☐ STANDARD TAT

☐ EXPEDITED TAT *

REPORT DUE DATE _____

* SUBJECT TO RUSH FEES

SAMPLING DATE	SAMPLING TIME	SAMPLE IDENTIFICATON	MATRIX TYPE: Aqueous	Nonaqueous	Oil	A9 BNA+PP (P)	A9 PEST/PCB (P)	A9 OP PEST (P)	A9 HERB (P)	A9 VOC (LB)	A9 CN (B)	A9 SULFIDE (T)	LANGLIER INDEX/ ALKALINITY (P)	TOX (G)	A9 TOTAL/DIS MET SILICA/HARD (R)	REMARKS

NUMBER OF CONTAINERS SUBMITTED

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 ☐ YES ☐ NO	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:

FIGURE 7.1

FIGURE 7.2

SL SAMPLE REGISTRY

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

SAMPREG:08.13.92:1

Discrepancies between information on sample labels and information provided on the chain-of-custody form and broken or altered samples should be resolved with the client and Laboratory Project Manager before the sample is assigned for analysis.

If a custody problem occurs, the sample custodian initials the "NOTIFIED CLIENT" blank on the sample registry and immediately notifies the Project Manager or Project QA Manager. The Project QA Manager and Sample/Data Coordinator should immediately resolve custody problems and notify the client. After notification, an initialed note is made on the custody form which states who was notified, reason for notification, and resolution, if applicable.

After the chain of custody is verified, a six-digit project number is assigned to the samples, recorded on the Custody Form and Sample Registry and logged into the computerized LIMS (see Figure 5-1). Any accompanying paper work is placed in a project manager file until the order is completed. The six-digit laboratory project identification number is recorded on all containers submitted in the project shipment.

After addition of the project identification number, the samples are dispersed to the appropriate sample storage area. Color-code dots and sample bottle types are designed for specific analyses and are stored at designated sample storage areas throughout the laboratory. Sample storage temperature logs are maintained for all storage refrigerators to assure proper temperature (4 ± 2° C) of the sample is maintained throughout the analyses.

For samples requiring pH adjustments, the departmental custodian logs the samples into the departmental sample registry, checks and documents pH on an in-lab form and makes appropriate pH adjustments.

When analyses are initiated, the analyst retrieves the samples from the storage area and, after use, returns them to the storage area until final disposition. All unused samples, digests and extracts are disposed of by an approved Ciba-Geigy Hazardous and Chemical Waste Disposal facility.

7.3 Inter-Laboratory Custody

In the event of an emergency, instrumentation failure, or exceedence of laboratory capacity, samples may be transferred to the Tallahassee Division laboratory to ensure that holding times and turnaround deadlines are met after receiving approval from the Ciba-Geigy NSCA. If the samples are transferred to the Tallahassee Division laboratory, a chain-of-custody form will be initiated at shipping time by the sample custodian. This inter-laboratory chain of custody form will be sent along with the samples and upon arrival at the Tallahassee Division laboratory, all custody procedures are followed.

7.4 Data Archiving and Storage

At the end of a project, all custody forms are returned to the laboratory project manager. Copies of custody information are retained in the reporting laboratories' client files. Hard copies of reports, chain-of-custody forms and sample registries will be kept by Savannah Laboratories for a period of three years and bench data are kept for a period of three years.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

8.1 Laboratory Equipment

Savannah Laboratories is equipped with approved 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 Table 5.1 and 5.2 is found in Table 8.1.

8.2 Standard Receipt and Traceability

Standards are purchased from commercial sources in mixes designed for the specific methods or as neat compounds. Dates are placed on all standards upon arrival and records showing when the standards are opened and used are also documented in the laboratory standard tracking notebooks.

8.3 Standard Sources and Preparation

Savannah Laboratories maintains an inventory of materials to produce stock standards or purchases stock standards from commercial vendors. Preparation of all lab-prepared stocks, intermediate, and working standards is documented in standard preparation logbooks by the responsible analysts.

8.4 Instrument Calibration

All instruments are calibrated according to the method calibration requirements of the SW-846 methods listed in Tables 5-1, 5-2, and with the procedures listed in Section 9 of the QAPjP. Table 8-2 provides a summary of the calibration procedures, frequency, and standard used for each laboratory instrument.

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.

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 8-3.

Other miscellaneous support equipment such as autoclaves and block digestors are checked at a minimum, annually.

All thermometers are calibrated annually against an NBS-certified thermometer.

TABLE 8-1

MAJOR LABORATORY INSTRUMENTS AT EACH SAVANNAH LABORATORIES LOCATION

#	Instrument	Deerfield Beach	Tallahassee	Savannah	Mobile	Tampa Bay
7	ICP Units	1-Jarrell Ash 61	1-Jarrell Ash 61	1-Jarrell Ash 61 1-Jarrell Ash Enviro 36	1-Jarrell Ash 61E 1-Perkin Elmer 5500	1-Jarrell Ash 61E
5	Mercury Cold Vapor Units	1-Perkin Elmer 508	1-Varian VGA-76/AA20	1-Varian VGA-76/AA20	1-Perkin Elmer 603	1-Perkin Elmer 508
18	Atomic Absorption Furnace/Flame	1-Varian 400Z 1-Perkin Elmer 2380 2-Varian AA 20	2-Varian 400Z 1-Varian AA 20	2-Jarrell Ash 4000 1-Varian 400Z 1-Varian AA 20 1-Jarrell Ash 22 1-Perkin Elmer 2380	1-Varian 400Z 1-Perkin Elmer 5000 1-Perkin Elmer 603	1-Varian 400Z 1-Varian AA 20
11	GC/MS Semivolatiles	1-HP 5970	2-HP 5970	1-HP-5971 5-HP 5970	1-HP 5970	1-HP 5971
10	GC/MS Volatiles	1-HP 5970	2-HP 5970	3-HP 5970 2-HP 5971	1-HP 5970	1-HP 5971
24	Gas Chromatography Semivolatiles	2-Varian 3400	1-Varian 3300 4-Varian 3400 1-Shimadzu 9AM 1-HP 5880	3-Varian 3700 2-Varian 3400 1 HP 5890 1-Varian 3300	4-Varian 3400 Perkin Elmer 3920B	3-Varian 3400
18	Gas Chromatography Volatiles	2-Varian 3300	2-Varian 3300 2-Varian 3400 1-Varian 3700	3-Varian 3300 2-Varian 3700 1-HP 5890	2-Varian 3300	2-Varian 3300 1-Tracor 560
3	TOC Analyzers	1-OI 524		1-Dohrmann DC80	1-OI 524	
6	IR Spectrometers	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 Spectrometers	1-B&L 21	1-B&L 21	1-Perkin Elmer 35 1-B&L 88 1-Milton Roy 301	1-B&L 21	1-B&L 21
3	Nutrient Autoanalyzers			3-Technicon Traacs 800		
2	TOX Analyzers			2-Dohrmann MC-3		
2	Conductivity Meters	1-YSI 35		1-YSI 35		

TABLE 8-2

SUMMARY OF CALIBRATION PROCEDURES

LABORATORY INSTRUMENT	CALIBRATION PROCEDURE	CALIBRATION FREQUENCY/ NUMBER OF STANDARDS	CALIBRATION ACCEPTANCE CRITERIA	STD. SOURCE
pH Meters	150.1	Initial: Daily, 3 standards. Continuing: per use, 1 std.	pH 10 buffer ± 0.10 unit	Fisher, VWR
Conductivity Meters	120.1	Initial: Monthly, 5 stds. Continuing: Per use, 1 std.	Use 5 values in linear regression analysis to establish cell constant	KCl solutions, Baker, Mallinckrodt
Thermometers	170.1	Annually: 3 temperatures.		NBS certified thermometer
Laboratory Balances (analytical/toploading)	SL SOP AN10	Analytical: Initial: Internal cal. monthly. Cal. Check: 6 weights monthly, 1 wt. daily. Toploading: Initial: 1 wt. monthly. Cal. Check: 6 wts. monthly, 1 wt daily.	Per SOP Per SOP	Class S weights
Perkin Elmer Infrared (IR) Scanning Spectrophotometers Model 720 and 727	418.1, 413.2	Initial: Weekly 5 pt. curve. Continuing: 1 pt. daily.	Manual curve -- no data pat. > 10% from line ± 2 absorbance units	EPA, B&J, Perkin Elmer
Technicon TRAACS 800 Autoanalyzer	9000	Daily: 5 stds.	Corr. Coeff. > 0.990	EPA, ERA
Perkin Elmer and Varian Atomic Spectrophoto-meters, Jarrell Ash 22 Dual Channel AA with Hydride System	7000	Initial: 3 pt. curve and a blank. Continuing Cal. Check: Every 10 samples.	Corr. Coeff. > 0.995 ± 10% of true value	Baker/Spex
Varian and P.E. Cold Vapor Analyzers	7470/7471	Initial: 5 pt. curve daily. Cal. Check: Every 10 samples.	Corr. coeff. > 0.995 ± 20% of true value	Fisher certified
Jarrell Ash Model 61 and Jarrell Ash Enviro 36	6010	Initial: 1 std. and blank daily minimum. Continuing: Cal. blank every 10 samples. Check std. every 10 samples. Interference check sample begin, end.	± 2 sd of mean value ± 10% of expected value ± 20% of mean value	Baker/Spex

TABLE 8-2

SUMMARY OF CALIBRATION PROCEDURES

LABORATORY INSTRUMENT	CALIBRATION PROCEDURE	CALIBRATION FREQUENCY/ NUMBER OF STANDARDS	CALIBRATION ACCEPTANCE CRITERIA	STD. SOURCE
GCs: Varian 3600, 3400, 3700; HP 5890; with Autosamplers	SW-846, 8000 series methods Semivolatiles	Initial: 5 pt. curve as needed. Continuing cal check: every 10 client samples.	RSD of RFs ≤ 20% Plot curve of response vs. conc. %D ≤ 15% from ave. RF or curve (primary) %D ≤ 20% from Ave. RF or curve (Confirmation)	Restek/Supelco/ Ultra/Aldrich/ Accustandard
HP 5971 with 5890 GC, HP 5970 with 5890 GC, ChemStation or RTE/A data station; NBS spectral library: 7673A autosamplers or Tekmar LSC-2000 p + t concentrator/Tekmar ALS 2016 automatic liquid samplers	SW-846 (8240, 8270) CLP	Initial: 5 pt. curve as needed. Cal. Check: Every 12 hours. Tune: every 12 hours.	RSD of RFs ≤ 30% for CCCs min. RF criteria SPCCs %D ≤ 30% for CCCs min. RF criteria for SPCCs (8270) %D ≤ 25% for CCCs min. RF criteria for SPCCs (CLP, 8240)	Restek/Supelco/ Ultra/Aldrich/ Accustandard

TABLE 8.3

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

9.0 ANALYTICAL PROCEDURES

Laboratory analysis of all samples is conducted by EPA-approved methodology, unless such methodology does not exist. Tables 5-1 and 5-2 list all laboratory parameters with their respective method numbers. A list of all methods used with complete reference data is found at the end of Section 5.

Unless indicated below, all parameters listed in Tables 5-1 and 5-2 are analyzed by the methods indicated, without modifications.

In cases where a GC or GC/MS method is used for analysis of compounds not included in the actual method analyte list, these compounds are noted in the tables.

A detailed SOP has been prepared for each analytical method. All variations from EPA methodology are documented in the SOPs. Copies of SOPs are kept at the respective analytical benches, or by each department/ section supervisor, the QA manager and the laboratory director.

9.1 APPENDIX IX PARAMETERS

GC/MS Semivolatile Organics

DFTPP Tune

A solution of 50 ng/uL of decafluorotriphenylphosphine (DFTPP) is evaluated for each 12-hour shift as per EPA Method 8270. The DFTPP solution must meet the following criteria for a 50 ng injection of DFTPP.

DFTPP KEY IONS AND ION ABUNDANCE CRITERIA	
Mass	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

A 50 ng DFTPP standard will be analyzed and must meet the tuning criteria. The initial calibration consists of separate five-point calibrations for the 8270 TCLs and the Appendix IX compounds that cover the range from 20 ng to 160 ng. The response factors for CCCs in the 8270 TCL calibration must be ≤ 30% RSD and the RF for the SPCCs must be > 0.050. The average RF for the 8270 TCL will be used for quantitation. The five point average RF for the Appendix IX compounds will not be used for quantitation. A single point RF from the Appendix IX mid-level standard will be used for quantitation.

Every 12 hours, a 50 ng DFTPP standard, 8270 TCL calibration check, and Appendix IX continuing calibration will be analyzed. The % difference of the RFs from the calibration check must be ≤ 30% of the average RF for the CCCs and meet the SPCC criteria already stated for the initial calibration. The five point 8270 TCL calibration will be analyzed if the calibration check does not meet criteria. The RFs of the Appendix IX compounds will be updated from the mid-level continuing calibration Appendix IX standard. Analyst discretion will be used to determine whether or not to reanalyze the Appendix IX five point calibration.

The additional semivolatile MS compound requests by CIBA-GEIGY will be processed within the same standard mix and analytical scope as the additional Appendix IX standard. The exception to this procedure involves the quantitation of butazolidin. It has been determined through ongoing analyses of butazolidin that degradation of this compound occurs over time when in solution with the other APPIX additional compounds and CIBA-GEIGY fingerprint compounds. Since it is important to prepare a fresh standard each time a continuing calibration standard is analyzed, the average response factor generated from a five-point initial calibration using only freshly prepared standard will be used in the quantitation of butazolidin.

The internal standard acceptance criteria and corrective action from the 2/88 and 3/90 CLP SOWs will be used to evaluate the data.

Aramite

Aramite is a tradename for the compound sulfurous acid, 2-chloroethyl, 2-[4-(1,1-dimethylethyl) phenoxy]-1-methylethyl ester which displays four isomers. The aramite concentration reported will be the combined concentration of the four isomers.

Di- and Tri-chlorinated dioxins/furans

The following isomers will be used for quantitation of the di- and tri-chlorinated dioxins/furans which are detected by a library search:

2,7-Dichlorodibenzo-p-dioxin
1,2,4-Trichlorodibenzo-p-dioxin
2,8-Dichlorodibenzofuran
2,3,8-Trichlorodibenzofuran

Each isomer will be analyzed once at a concentration of 50 ug/mL and response factors will be generated for each isomer based on the Total Ion Area relative to the nearest internal standard.

A library search will be completed as requested. If any di- or tri-dioxins or furans are detected as TICs, quantitation will be based on the RF generated from the initial run of the 50 ug/mL standard. All data will be reported as estimated. If di- and tri-chlorinated dioxins/furans are not detected by the library search, ND will be reported with no definite Practical Quantitation Limit.

As with any library search, reported TICs must be at least 10% of nearest internal standard and only 20 TICs will be detected and/or reported.

GC/MS Volatiles

BFB Tune

A 50 ng injection or purge of 4-bromofluorobenzene (p-BFB) is evaluated every 12-hour shift as per EPA Method 8240. This BFB solution must meet the criteria established in the attached Table 3 from SW-846.

BFB KEY ION ABUNDANCE CRITERIA	
Mass	**Ion Abundance Criteria**
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

A 50 ng BFB standard will be analyzed and must meet the tuning criteria. A single point mid-level calibration standard (XAPP9) will be analyzed for pentachloroethane, n-octane, 1,1,1,2-tetrachloroethane, and chloroprene. (Pentachloroethane rapidly degrades to tetrachloroethene when prepared for analysis; the elution of 1,1,1,2-Tetrachloroethane in close proximity to the internal standard, chlorobenzene-d5, causes quantitation problems in samples not containing 1,1,1,2-tetrachloroethane). Chloroprene is only available commercially in a 50% mix with xylene, therefore, it must be analyzed separately from xylenes in the first mix. The response factor generated from the single point calibration for pentachloroethane,

1,1,1,2-tetrachloroethane, n-octane, and chloroprene will be used for quantitation (if detected). A five-point initial calibration will be analyzed for all other compounds. The RFs for the CCCs, must be ≤ 30% RSD and all SPCCs must have an average RF > 0.300, except bromoform, where RF > 0.250. The response factor generated from the five point calibration will be used for quantitation.

The concentration of the standards for the five-point calibration will range from 20 ng/mL - 200 ng/mL for all compounds except the following:

* Acrolein, Acrylonitrile, Propionitrile, and 2-methyl-2-propionitrile	---	80 ng/mL- 800 ng/mL
* Acetonitrile	---	500 ng/mL- 5000 ng/mL
* Isobutanol	---	4000 ng/mL- 40000 ng/mL
* Methyl methacrylate, Ethyl methacrylate, m, and p-Xylene, 1,2,3-Trichloropropane, 1,4-Dichloro-2-butene, and 1,2-Dibro-3-chloropropane	---	40 ng/mL- 400 ng/mL

A 50 ng p-BFB, Appendix IX calibration check, and XAPP9 continuing calibration will be analyzed every 12 hours. The RFs from the Appendix IX calibration check must be ± 25% of the average RFs for the CCCs and meet the SPCC criteria already stated for the initial calibration. A five point calibration will be analyzed if the calibration check does not meet criteria. A continuing calibration (XAPP9) for pentachloroethane, 1,1,1,2-tetrachloroethane, n-octane and chloroprene will be used to update the RFs for these compounds.

The internal standard acceptance criteria and corrective action from the 2/88 and 3/90 CLP SOWs will be used to evaluate the data.

Direct injection technique of the aqueous sample or solid matrix sample extracted into an equal part of water will be utilized to analyze for oxy-bis (ethanol) when specifically requested. A Nukol fused silica capillary column, 15 m X 0.53 mm ID, 0.5 μL m film or 0.8% THEEED packed column on carbopack C, 80/100 mesh, 3 ft. X 2 mm ID with a flame ionization detector will also be employed in the analysis. A five point calibration at the following levels; 5, 10, 20, 50, 100 μg/mL will be initially analyzed and must meet ≤ 20% RSD. If the % RSD > 20%, a least square curve can be generated and used for quantification. A calibration check at 20 μg/mL will be analyzed every 10 client samples and the RF must be ≤ 15% difference from the initial calibration average response factor. If a least square curve is used, the calculated concentration of the calibration check standard must not exceed ± 15% of the true value.

Soil samples will be prepared by adding an equal volume of water to soil (ideally, 3 mL to 3 g), shaking vigorously for two minutes, and then the subsequent analysis will involve injecting the aqueous extract.

Gas Chromatography

Chlorinated Pesticides (8080)

The following standard mixes will be employed:

I - AR 1221, II - AR 1232, III - AR 1242, IV - AR 1248, V - A 1660 (AR 1016 + AR 1260), VII - Toxaphene, VIII - ISMA (INDA - CLP 2/88 protocol), IX - Appendix IX Mix (Isodrin, Kepone, Chlorobenzilate).

A five (5) point external standard calibration will be analyzed for each of the above listed compound mixes with the exception of EVALB mix. The average response factor will be generated for each standard from the calibration curve, and it will be used in quantitation of sample data. The % RSD of the response factors must be ≤ 20%. A typical daily analysis sequence will be analyzed in the following fashion:

A. 1. EVAL B - Check Endrin / DDT breakdown ≤ 20%.
   2. Appendix IX mix - Establish retention time for compounds in mix.
   3. AR 1660 - Check RF vs. Avg RF.
      a. If RF ≤ 15% Difference of Avg RF, proceed
      b. If RF > 15% Avg RF, recalibrate **ALL** multicomponent aroclors and toxaphene.
   4,5. ISMA + ISMB - Check RF vs. Avg RF.
      a. If RF ≤ 15% Diff Avg RF, proceed.
      b. If RF > Diff Avg RF, recalibrate all ISMA/ISMB/Appendix IX compound mixes.

B. Analyze 10 client samples.
C. Repeat steps 3, 4, and 5.
D. Analyze 10 client samples.
E. Repeat steps 2,3,4,and 5 and analyze 10 client samples - Day 2 (see Day 1 sequence).

Retention time windows may be calculated from ± 0.75% of the absolute retention time (RTA) in the calibration check standard.

$$RT\ window = RT_A \pm (RT_A \times 0.0075)$$

GC Organophosphorus Pesticides (8141)/GC Herbicides (8150/SL)

A five (5) point external standard calibration will be analyzed. The average RF may be used for quantitation if the % RSD from the calibration is ≤ 20% or alternatively, a least square curve with a forced fit through the origin will be generated for response vs. concentration. The curve will be used for quantitation. A mid-level calibration check standard will be analyzed after every 10 client samples. Alternatively, a least square curve is used. If the average RF is used for quantitation, the calibration check standard RF must not exceed ± 15% difference of the average RF on the primary column nor ± 20% difference on the confirmation column. If the calculated concentration for each compound in the mid-level standard must not exceed ± 15% of the true concentration, for the

primary column nor ± 20% for the confirmation column. When any one compound does not meet this criteria, the five (5) point calibration will be reanalyzed.

Retention time windows may be calculated from ± 0.75% of the absolute retention time (RTA) in the calibration check standard.

$$RT\ window = RT_A \pm (RT_A \times 0.0075)$$

Inorganics

SW-846 methodology will be employed for daily working protocol. Where the SW-846 methods fall short or are vague as to procedures for non-conforming QC sample data, SL utilizes CLP procedures for guidance in establishing daily standard operating procedures. Examples are as follows:

A. Serial dilutions and interference check solutions are evaluated as per CLP protocol.

B. Analytical spikes are employed in graphite furnace analysis following CLP guidelines using Savannah Laboratories' limits of 75-125% for evaluation of the analytical spike recovery data.

Initial Calibration: An Initial Calibration will be evaluated on a daily basis. The percent recovery of each analyte must agree within 10% of the true value. The initial calibration for mercury must agree with 20% of the true value.

Continuing Calibration: A Continuing Calibration is performed at a frequency of 10%. The percent recovery must agree within 10% of the true value. The continuing calibration for mercury must agree within 20% of the true value.

Interference Check Solution (ICP only)

These Check Solutions are analyzed at the beginning and end of an analysis run or every 8 hours. Values obtained must agree within ± 20% of the true (established) value.

Serial Dilution (ICP only)

This dilution is analyzed at a frequency of one per matrix batch of 20 samples. If the analyte concentration is sufficiently high (minimally a factor of 50 above the IDL in the original sample), an analysis of a 5-fold dilution must agree within 10% of the original determination.

9.2 GLASSWARE CLEANING PROCEDURES

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

Nonvolatile Organics

Prerinse apparatus 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 rinseate 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. Store glassware inverted or cap opening with foil to exclude dust and other contaminants. Caps, septa, and plastic items are rinsed with water only.

Volatile Organics

Wash with hot water and Alconox or Liquinox, then rinse thoroughly with tap water and deionized water. Rinse glassware with methanol. Highly contaminated glassware is allowed to soak in dichromate solution overnight, then washed as above.

Microbiology, Nutrients, Demands

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

Metals

Wash glass, plastic, and Teflon items in hot 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 tap water and deionized water and allowed to air dry.

9.3 REAGENT STORAGE

Reagents are stored with consideration for safety and maximum shelf life.

All acids, except those poured up in small marked containers which are for immediate use, are in separate areas designated for specific acid storage and are stored in the original container.

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

Solvents are specified as either flammable or non-flammable. All solvents, except those poured up for immediate use are stored in designated cabinets or areas.

Dry reagents are stored in designated cabinets in cool, dry areas.

9.4 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 9-1.

TABLE 9-1

WASTE DISPOSAL PROCEDURES

Waste Type	Associated Analytical and Sample Prep Methods	Storage Procedures	Disposal Procedures
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 & non-halogenated)	VOC standards, Herbicides, Pesticides	Store in glass bottles, then in drums	Disposal by HW contractor
Mixed Halogenated Solvents	VOC standards, Phenols	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 or glass/plastic bottles	Disposal by HW contractor
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	Return to Client, or disposal by HW contractor

* Hazardous Waste Characteristics (D001-D017) (40 CFR Part 261), HCN > 250 mg/kg, HS > 500 mg/kg, FP < 140° F, pH ≤ 2 or ≥ 12.5, TCLP Toxicity Characteristics (*Federal Register*, 55FR 11798), March 29, 1990, or contains greater than 50 ppm PCBs

10.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction and validation procedures follow those given in each SW-846 method. Table 10-1 summarizes the equations used for calculation of results and reporting units.

Data review is routinely handled by the computerized LIMS which is outlined in Figure 5-1. It provides a computerized mechanism for storing field and login information, keeping track of sample holding times, scheduling and preparing laboratory work sheets, storing results and QC data, checking data entry and bench calculations, flagging and reviewing out-of-control QC, preparing quality control charts, reviewing results and relating them to their corresponding QC data, and printing reports (results and QC data) and invoices.

All reports will be prepared by a Project Manager and reviewed by the Project QA Manager. Since each of the SL project managers have several years experience in evaluating analytical data, they have developed both objective and subjective techniques for data validation.

Figure 10-1 contains the Table of Contents of each fraction and reflects the paper deliverables which will be submitted to Woodard-Clyde Consultants.

The CIBA-GEIGY diskette deliverable format is defined in the Quality Assurance Document - Supplement 1. The electronic deliverables will be generated after completion of data review and printing of the final report. The diskette will be forwarded on a 3½" floppy disk in ASCII (Text) file format.

Tables 5-1 and 5-2 provide a list of parameters anticipated for the RFI. These tables also contain PQLs for water and soil/sediments samples. If in a given analysis, a matrix interference or some other problem prevents routine PQLs from being obtained, a higher PQL (usually based on a dilution factor or smaller sample aliquot) is reported per EPA SW-846 guidelines.

Table 10-2 provides a list of data qualifiers and their definitions.

TABLE 10-1

SUMMARY OF EQUATIONS USED IN CALCULATIONS

PARAMETER	EQUATIONS	REPORTING UNITS WATER	REPORTING UNITS SEDIMENT
BN/A Extractables By GC/MS	Internal Standard Method 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/mL) Cis = concentration of the internal standard (ug/mL) Water Concentration (ug/L) $= \frac{As}{Ais} \times \frac{Cis}{RF} \times \frac{\text{final volume (mL)}}{\text{initial volume (L)}} \times$ dilution factor As = area of the characteristic ion (sample) Ais = area of the characteristic ion (internal standard) Cis = concentration of the internal standard (ug/mL) RF = response factor Sediment Concentration (ug/kg) $= \frac{As}{Ais} \times \frac{Cis}{RF} \times \frac{\text{final volume (mL)}}{\text{initial wt. (kg)}} \times \frac{\text{dilution factor}}{\text{\% solid} \times 0.01}$ As = area of the characteristic ion (sample) Ais = area of the characteristic ion (internal standard) RF = response factor Cis = concentration of the internal standard (ug/mL)	ug/L (or mg/L)	ug/kg (or mg/kg)
VOCs By GC	Internal Standard Method Response factor (RF) $= \frac{\text{peak height analyte}}{\text{peak height ISTD}} \times \frac{\text{conc. (ng/mL) ISTD}}{\text{conc. (ng/mL) analyte}}$ Water Concentration (ug/L) $= \frac{\text{peak height analyte}}{\text{peak height ISTD}} \times \frac{\text{conc (ng) ISTD}}{\text{Sample Amt. (mL)}} \times \frac{\text{dilution factor}}{\text{RF analyte}}$ Sediment Concentration (ug/kg) $= \frac{\text{peak height analyte}}{\text{peak height ISTD}} \times \frac{\text{conc ISTD (ng)}}{\text{Sample Amt. (g)}} \times \frac{\text{dilution factor}}{\text{RF analyte}}$	ug/L (or mg/L)	ug/kg (or mg/kg) $\times \frac{1}{\text{\% solid} \times 0.01}$
VOC by GC/MS Nutrients and other colorimetric procedures	Internal Standard Method - See section on VOCs by GC except substitute area of characteristic ion for peak height. Water Concentration (mg/L) = mg/L * X dilution factor Sediment Concentration (mg/kg) $= \text{mg/L}^{*} \times \frac{\text{liters of leachate (or digest)}}{\text{(kg of sample)(\% solids} \times .01)}$ * Concentration of sample from standard curve.	mg/L	mg/kg
Pesticides/PCBs and other GC procedures	External Standard Method Response factor (RF) (Standards) $= \frac{\text{ug of analyte}}{\text{peak area}}$ Water Concentration (ug/L) = RF X peak area X $\frac{\text{final volume (uL)}}{\text{initial volume (L) injection volume (uL)}}$ X dilution factor Sediment Concentration (ug/kg) = RF X peak area X $\frac{\text{final volume (uL)}}{\text{initial wt. (kg) (\% solids} \times .01) \text{ injection volume (uL)}}$ X dilution factor	ug/L (or mg/L)	ug/kg (or mg/kg)

Figure 10-1

Cranston Paper Deliverables

VOLATILE GC/MS (8240)

Total Pages _____ to _____

I. Method Blank Summary (Form IV) _____ to _____
   a. Blank Association Form
   b. pH Verification

II. Tune Summaries (Form V) (Initial Calibration) _____ to _____
   a. Tune Data
   b. Initial Calibration Form VI
      1. Calibration Summary
      2. Medium Quant Reports

III. Tune Summaries (Form V) (Continuing Calibration) _____ to _____
   a. Tune Data
   b. Internal Standard Area and RT Summary (Form VIII)
   c. Continuing Calibration Form
      1. Calibration Data
      2. Medium Quant Reports

IV. Surrogate Recovery Summary (Form II) _____ to _____
   a. Organic Analysis Data Sheet (Form I)
   b. Organic Analysis TIC Sheet (Form I-TIC)
   c. Sample Raw Data

V. Matrix Spike/Matrix Spike Duplicate Recoveries (Form III) _____ to _____
   a. Organic Analysis Data Sheet for MS/MSD (Form I)
   b. MS/MSD Raw Data

VI. Lab Control Data _____ to _____
   a. Method Blank (Form I)
   b. Suporting Raw Data
   c. Lab Control Spikes (Form III)
   d. Supporting Raw Data

SEMIVOLATILE GC/MS (8270)

Total Pages _____ to _____

I. Method Blank Summary (Form IV) _____ to _____
   a. Extraction Sheet

II. Tune Summaries (Form V) (Initial Calibration) _____ to _____
   a. Tune Data
   b. Initial Calibration Form
      1. Calibration Data
      2. Medium Quant Report

III. Tune Summaries (Form V) (Continuing Calibration) _____ to _____
   a. Tune Data
   b. Internal Standard Area and RT Summary Form (VIII)
   c. Continuing Calibration Form
      1. Calibration Data
      2. Medium Quant Report

IV. Surrogate Recovery Summary (Form II) _____ to _____
   a. Organic Analysis Data Sheet (Form I)
   b. Organic Analysis TIC Sheet (Form I-TIC)
   c. Sample Raw Data

V. Matrix Spike/Matrix Spike Duplicate Recoveries (Form III) _____ to _____
   a. Organic Analysis Data Sheet for MS/MSD (Form I)
   b. MS/MSD Raw Data

VI. Lab Control Data _____ to _____
   a. Method Blank (Form I)
   b. Suporting Raw Data
   c. Lab Control Spikes (Form III)
   d. Supporting Raw Data

PESTICIDES/PCBS (8080)

Total Pages _____ to _____

I. Method Blank Summary (Form IV) _____ to _____
   a. Extraction Sheets

II. Initial Calibrations (Form VI) _____ to _____
   a. Retention Times (6D)
   b. Response Factors (6E)
   c. Sequence of Run
   d. Method Curves
   e. Supporting Data (Raw)

III. Continuing Calibrations _____ to _____
   a. Sequence of Sample Runs
   b. Form VII with Supporting Data (Raw)
   c. Endrin and DDT Breakdown (8d) With Supporting Data (Raw)
   d. Absolute DBC Retention Time for Samples (8e) (Primary and Secondary Columns)

IV. Surrogate Recovery Summary (Form II) _____ to _____
   a. Results Data Sheet (Form I)
   b. Pesticide Identification (Form X)
   c. Supporting Sample Data (raw)

V. Matrix Spike/Matrix Spike Duplicate Recoveries (Form III) _____ to _____
   a. Supporting Sample Data (raw)

VI. Lab Control Data _____ to _____
   a. Method Blank (Form I)
   b. Suporting Raw Data
   c. Lab Control Spikes (Form III)
   d. Supporting Raw Data

HERBICIDES (8151)

Total Pages _____ to _____

I. Method Blank Summary (Form IV) _____ to _____
   a. Extraction Sheets

II. Initial Calibrations (Form VI) _____ to _____
   a. Retention Times (6D)
   b. Response Factors (6E)
   c. Sequence of Run
   d. Method Curves
   e. Supporting Data (Raw)

III. Continuing Calibrations _____ to _____
   a. Sequence of Sample Runs
   b. Form VII with Supporting Data

IV. Surrogate Recovery Summary (Form II) _____ to _____
   a. Results Data Sheet (Form I)
   b. Herbicide Identification (Form X)
   c. Supporting Sample Data (raw)

V. Matrix Spike/Matrix Spike Duplicate Recoveries (Form III) _____ to _____
   a. Supporting Sample Data (raw)

VI. Lab Control Data _____ to _____
   a. Method Blank (Form I)
   b. Suporting Raw Data
   c. Lab Control Spikes (Form III)
   d. Supporting Raw Data

ORGANOPHOSPHORUS PESTICIDES (8141)

Total Pages _____ to _____

I. Method Blank Summary (Form IV) _____ to _____
   a. Extraction Log

II. Initial Calibrations (Form VI) _____ to _____
   a. Retention Times (6D)
   b. Response Factors (6E)
   c. Sequence of Run
   d. Method Curves
   e. Supporting Data (Raw)

III. Continuing Calibrations _____ to _____
   a. Sequence of Sample Runs
   b. Form VII with Supporting Data (raw)

IV. Surrogate Recovery Summary (Form II) _____ to _____
   a. Results Data Sheet (Form I)
   b. Pesticide Identification (Form X)
   c. Supporting Sample Data (raw)

V. Matrix Spike/Matrix Spike Duplicate Recoveries (Form III) _____ to _____
   a. Supporting Sample Data (raw)

VI. Lab Control Data _____ to _____
   a. Method Blank (Form I)
   b. Suporting Raw Data
   c. Lab Control Spikes (Form III)
   d. Supporting Raw Data

INORGANIC DATA PACKAGE
TABLE OF CONTENTS

	DOCUMENTS	Page Numbers
I.	Inorganic Case Narrative	_____ to _____
II.	Cover Page	_____ to _____
III.	Inorganic Analysis a. Data Sheet (Form I-IN)	_____ to _____
IV.	Initial and Continuing Calibration a. Verification (Form IIA-IN)	_____ to _____
V.	CRDL Standards (Form IIB-IN)	_____ to _____
VI.	Blanks (Form III-IN)	_____ to _____
VII.	ICP Interference Check a. Sample (Form IV-IN)	_____ to _____
VIII.	Spike Sample Recovery (Form VA-IN)	_____ to _____
IX.	Post Digest Spike Sample a. Recovery (Form VB-IN)	_____ to _____
X.	Duplicates (Form VI-IN)	_____ to _____
XI.	Lab Control Sample (Form VII-IN)	_____ to _____
XII.	Standard Addition Results (Form VIII-IN)	_____ to _____
XIII.	ICP Serial Dilution (Form IX-IN)	_____ to _____
XIV.	Instrument Detection Limits (Form X-IN)	_____ to _____
XV.	ICP Interelement Correction Factors (Forms XIA-IN and XIB-IN)	_____ to _____
XVI.	ICP Linear Ranges (Form XII-IN)	_____ to _____
XVII.	ICP Raw Data	_____ to _____
XVIII.	Furnace Raw Data	_____ to _____
XIX.	Mercury Raw Data	_____ to _____
XX.	Cyanide Raw Data	_____ to _____
XXI.	Sulfide Raw Data	_____ to _____

INORGANIC DATA PACKAGE
TABLE OF CONTENTS
(Continued)

DOCUMENTS	Page Numbers
XXII. Digestion/Distillation Logs	_____ to _____
a. Furnace	
b. ICP	
c. Mercury	
d. Sulfide	

TABLE 10-2

DEFINITIONS OF DATA QUALIFIERS FOR ALL QUALIFIER FIELDS	
Qualifier	**Description**
A	Org: TIC is a suspected aldol-condensation product
B	Ino: CLP result < CRDL but > IDL Org: Detected in blank
C	Org: For pesticides/PCBs, identification confirmed by GC/MS
D	Sample dilution was necessary for this analyte/compound
E	Ino: Result estimated due to interference (Must be explained in case narrative)
F	Org: Result exceeds calibration range Org: For dioxins/furans, estimated maximum concentration (possibility of a false positive or false negative)
G	Greater than (>) value reported
J	Estimated value
L	Not analyzed; data expected was lost
M	Ino: Outside duplicate injection precision control limits
N	Ino: Spiked sample recovery outside control limits
P	Org: For pesticides/PCBs, results > 25% different between the two GC column results
Q	Outside control limit
R	Unreliable - Compound may be present or absent
S	Ino: Determined by Method of Standard Addition (MSA)
T	Calculated value
U	Compound/analyte was analyzed for, but not detected
V	Org: Identification not confirmed; second column not requested
W	Ino: Post-digestion spike for AA outside control limits
X	As defined by lab in case narrative
Y	As defined by lab in case narrative
Z	As defined by lab in case narrative

11.0 LABORATORY QUALITY CONTROL CHECKS

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. Laboratory quality control checks are part of each laboratory analysis. Without the proper quality control procedures, analyst, and method, performance could not be measured.

11.1 Trip Blanks

PURPOSE: The trip blank is to be used when sampling for volatile organics. The purpose is to determine if contamination has occurred as a result of improper sample container cleaning, contaminated blank source water, sample contamination during storage and transportation due to exposure to volatile organics (e.g., gasoline fumes) and other environmental conditions during the sampling event.

PREPARATION: Trip blanks are prepared prior to the sampling event by the laboratory providing sample containers. Water trip blanks are used for samples of all matrices (water, soil, sediment, sludge, etc.). The water must be free of volatile organic contaminants. Any appropriate preservatives must be added at the time that 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 <u>not</u> to be opened in the field. They are to be transferred to the sample cooler designated for volatile sample storage and accompany the samples to the laboratory.

FREQUENCY: One trip blank for each volatile organic analysis 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 each trip blank.

11.2 Holding Blanks

PURPOSE: Volatile refrigerator holding blanks will serve as a control to detect any volatile contamination introduced from one sample to another via the air in the refrigerators.

PREPARATION: Holding blanks are prepared from water which is free of volatile organic contaminants. Any appropriate preservative must be added at the time that blanks are prepared. The sample containers are sealed and transferred to the refrigerator. The blanks will be analyzed after a residence time of 14 days since this is equal to the maximum permissible time for sample analysis.

FREQUENCY: One holding blank for each volatile refrigerator storage area will be analyzed. The holding blanks will be analyzed on Mondays against the Appendix IX list by VOA-GC/MS.

11.3 Laboratory Quality Control

Calibrations — Per SW-846 methods and/or Section 8.

Method Blanks — A method blank will be run for each batch of 20 samples. Blank control limits are based on CLP guidelines.

Surrogates — The CLP SOW 2/88 spiking surrogates will be added to all samples, matrix spikes and blanks for all semivolatiles, volatiles, chlorinated pesticides/PCBs, organophosphorus pesticides, and chlorinated herbicides analyses. Surrogate spiking compounds and control limits are given in Tables 5-1 and 5-2.

Laboratory Control Samples — Blank spikes will be analyzed with each batch of samples processed.

Matrix Spikes — Sample specific matrix spike/matrix spike duplicate spikes will be run with each batch or at a frequency of 5% of samples. The CLP SOW 2/88 Matrix Spiking compounds will be used for analysis where applicable for all GC/MS semivolatile, volatile, chlorinated pesticides/PCBs, organophosphorus pesticides and chlorinated herbicides analysis (by GC). All spike concentrations and compound lists are identified in the appropriate SL SOP. The five "fingerprint" compounds for semivolatile GC/MS will be spiked by adding 1 mL of a spike solution containing 100 µg/mL of each of the "fingerprint" compounds except tofranil at a concentration of 200 µg/mL. Metals and cyanide will be spiked per SL SOP. Matrix spike control limits are given in Tables 5-1 and 5-2.

Since site specific (Non-batch) QC is required, matrix spike/duplicates will be conducted on replicate samples provided by the client for aqueous samples. The client will select one sample for each batch of 20 samples and submit three replicates of all containers. (Two of these replicates are to be used for matrix spikes and will be labeled with the same information as the samples plus "for MS" will be added to the Sample I.D.). If sufficient sample is not available for matrix spikes/duplicates, the project manager will notify the CIBA-GEIGY NSCA and laboratory generated matrices will be provided.

Matrix spikes will not be analyzed at a dilution to get non-spiked or spiked targets within the calibration range. If it is feasible to analyze the spikes at undiluted concentrations without impacting the instrumentation, the concentration and % recovery will be calculated from the undiluted analysis and the problem noted in the narrative.

Precision data will be obtained from matrix spike/matrix spike duplicates. Control limits are given in Tables 5-1 and 5-2.

12.0 PERFORMANCE AND SYSTEM AUDITS

External systems audits of the analytical laboratory have been conducted by the U.S. EPA CRL Region V for Appendix IX and TCL/TAL analysis of aqueous and nonaqueous matrices.

12.1 Internal Systems Audits

12.1.1 Annual Corporate Audits

An internal systems audit for compliance with this QAPjP will be performed within two months prior to the tentative start date of sampling. A copy of the internal systems audit report will be submitted to CIBA-GEIGY NSCA.

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 EMPLOYMENT/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.

12.1.2 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.

12.2 External System Audits

Savannah Laboratories will submit to an external on-site systems audit by CIBA-GEIGY to ensure compliance to this QAPjP.

12.3 Performance Audits

12.3.1 Internal Performance Audits

The laboratory QA manager schedules blind audit samples into the work flow. Each major method is tested by at least two internal audit samples annually. Sample identifications are treated as real samples and are logged in as client samples. 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 quarterly QA reports to management.

12.3.2 External Performance Audit

All facilities participate in the following performance evaluation audits:

1. Performance Evaluation Samples for Drinking Water (WS Series).
2. Performance Evaluation Samples for environmental analysis (WP Series).

Results from these performance audits will be submitted to CIBA-GEIGY NSCA.

13.0 PREVENTIVE MAINTENANCE

Regular inspection, maintenance, cleaning, and servicing of all equipment is performed according to the manufacturer's recommendations. Maintenance logs are kept near the instrument indicating problems and steps taken to correct these problems following the detailed procedures and troubleshooting sections of the instruments' manual. Maintenance contracts are carried for most instruments 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. Routine maintenance procedures for laboratory instrumentation are given in Figure 13-1. Routine repairs and maintenance are performed by in-house personnel.

The Savannah Division of SL 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 Savannah Laboratories location. CIBA-GEIGY will be notified and approval granted before samples are shipped to another facility. All proper intra-laboratory chain-of-custody procedures are followed as given in Section 7.0.

FIGURE 13-1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
ICAP JARRELL ASH 61						
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 22 SPECTROPHOTOMETER FURNACE AA						
Sapphire Window	X					Remove and clean with N-Propanol.
Flow Rate	X					Place 10 mL DI water in a 10-mL cyclinder. Push Neb. Air button and run one minute. Flow should be 2.5 to 3.5 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.
VARIAN-ZEEMAN						
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.
PERKIN ELMER SPECTROPHOTOMETER 2380-1 AND 2380-2 FURNACE AA						
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.

FIGURE 13-1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
Filters		X				Remove filter from instrument, clean with water and mild soap.
D2 Arc Lamp				X		Check lamp. Adjust or replace as necessary.
CONDUCTANCE METER YSI 35				X		Inspect and replatinize cell as necessary.
FISHER AND ORION pH METERS	X					Inspect probe membrane, filling solution level.
ISO TEMP 500 OVEN	X					Verify correct temperature with calibrated thermometer.
AE200/AE160 METTLER ANALYTICAL BALANCES		X				Check calibration with class S standard metric weights. Annual inspection.
TOP LOADER METTLER PE 1600	X					Check calibration with class S standard metric weights. Annual inspection.
TRAACS 800						
Pump Platen		X				Inspect weekly and replace as required.
Pump Tubes	X					Inspect and replace as needed.
Flow Cell		X				Inspect and clean.
LABCONCO TKN BLOCK DIGESTOR				X		Check calibration against thermometer.
PE35/MR301 SPECTROPHOTOMETER				X		Quarterly check for wavelength verification.
BOD INCUBATOR PRECISION LOW TEMPERATURE	X					Temperature checked twice daily.
VARIAN 3700 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.
EC Detector					X	Semiannually cleaned and leak tested by Varian.
FID Detector					X	In-house cleaning as needed.
Carrier Gases		X				Tanks are changed when pressure reads 500 to ensure purity.

FIGURE 13-1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
Oxygen Trap				X		Inspect and replace as necessary.
GAS CHROMATOGRAPH VARIAN 3700 AND 3300 - 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 Detector	X					Checked daily for proper operation and response.
PID Detector	X					Checked daily for proper operation and response.
GC/MS HEWLETT PACKARD 5970/5890						
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 TEKMAR 2000/2016/LSC2						
Sorbent Trap	X					Checked daily. Replace and condition as necessary.
Purge Flow	X					Checked daily, adjust as needed.

FIGURE 13-1

LABORATORY EQUIPMENT PREVENTIVE MAINTENANCE SCHEDULE

EQUIPMENT ITEM	Service Interval					SERVICE LEVEL
	D	W	M	Q	A	
Gas Tank	X					Check daily.
DOHRMANN DC-80 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

14.0 ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

All data generated in this investigation will be assessed for its representativeness, accuracy, and precision. The completeness of the data will be determined by comparing the acquired data to the stated project objectives. Calculations are provided in this QAPjP in Section 5, pages 1 of 30 and 3 of 30, respectively.

As described in previous sections of this QA plan, precision and accuracy are routinely assessed by the computerized Laboratory Information Management System (LIMS) (See Figure 5-1). Criteria in Tables 5-1 and 5-2 will be used for this assessment.

15.0 CORRECTIVE ACTION

Corrective action will be taken when data is determined to be questionable or QC data is out of control. For each incident a QA Nonconformance/ Corrective Action Report (see Figure 15-1) is completed and filed in the lab QA notebooks. All Corrective Action Reports (CAR) are filed in the departmental corrective action notebook which has a pending section and completed section. Follow-up is checked weekly by the department manager and monthly by the QA manager. Pursuant to Section 3, page 5 and Section 8, page 12 of the National Service Contract of 6/91, CIBA-GEIGY will be notified when necessary.

Figure 5-1 shows the steps where checks are made on QC. In addition to the daily QC checks described in Figure 5-1, corrective actions are initiated by the system audits, interlaboratory audits, and results on round-robin or certification audits.

If corrective action is required, there will be a review of raw data calculations and review of procedures, methods, operating condition of the instrument and all calibration data available. If this does not resolve the problem, analysis of the lot (samples plus QC samples) are repeated (if sample volume permits).

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.

FIGURE 15.1

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.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The laboratory QA Manager will review QC notebooks and control criteria and perform a system audit. Section managers will review the notebooks, control criteria, and all QA nonconformance/corrective action reports on a monthly basis. The purpose of this review is to determine if corrective action has been implemented.

Non-implementations of corrective action will be listed on the QA Surveillance Reports (Figure 16-1) with deadlines for implementation. QA Surveillance Reports with non-implementation will be filed by the QA Manager in a working file. These reports will not be signed and filed as complete by QC coordinators or QA managers until all corrective actions are implemented. CIBA-GEIGY NSCA will be notified immediately of QA Surveillance Reports which affect the Cranston samples.

Monthly reports (Figure 16-2) will be submitted to CIBA-GEIGY per protocol established in the National Service Contract of 6/91, Exhibit 5. Audit results will be submitted as an attachment to Performance Monitoring Reports.

Figure 16-1

QA-SURVEILLANCE REPORT

DATE: _____

ACTIVITIES: _____

ANALYST: _____ SUPERVISOR: _____

QC COORDINATOR: _____ QA MANAGER: _____

OBSERVATIONS/ACTION TAKEN:

FINDINGS/DEFICIENCIES/ACTION RECOMMENDED:

NONCONFORMANCES/ACTION RECOMMENDED:

GENERAL COMMENTS/ACTION TAKEN:

MONTHLY PROGRESS REPORT

Savannah Laboratories, Savannah Division
Project Manager:
Date:
Report Period:

WORK COMPLETED:

SL Log #	Work Requested By	Phone #	Employer	Project Description	P. O. No.	TAT (days)	Aver TAT	Max TAT	% On Time	Cost ($)	Unusual Factors

Total: $

NOTE:

WORK IN PROGRESS

SL Log #	Work Requested By	Phone #	Employer	Project Description	P.O. No.	Requested TAT	Projected Delivery Date	Unusual Factors

NOTE:

EXPECTED WORK:

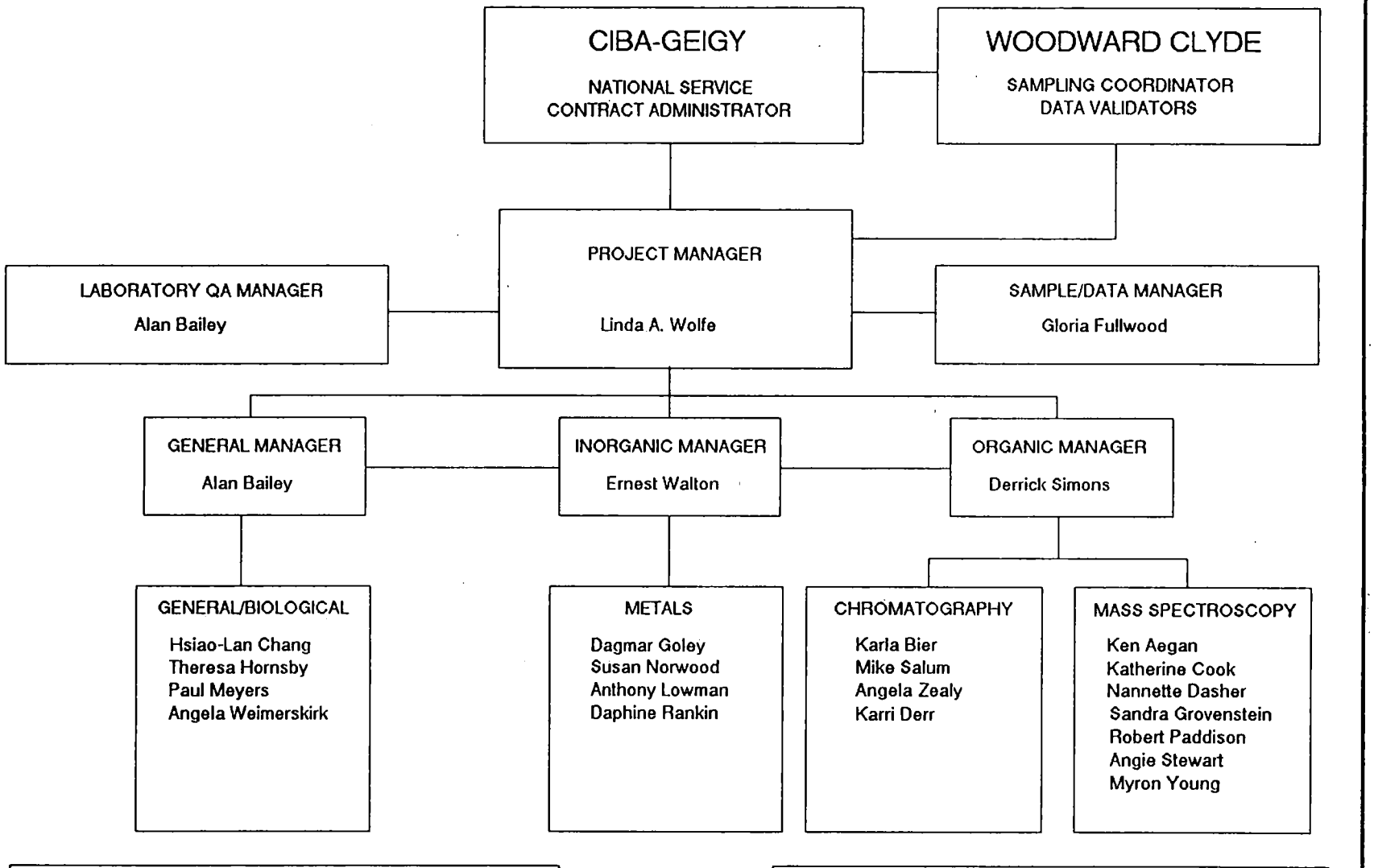
Work Requested By	Phone #	Employer	Project Description	P.O. No.	Requested TAT	Unusual Factors

NOTE:

Figure 16-2

17.0 PERSONNEL QUALIFICATIONS

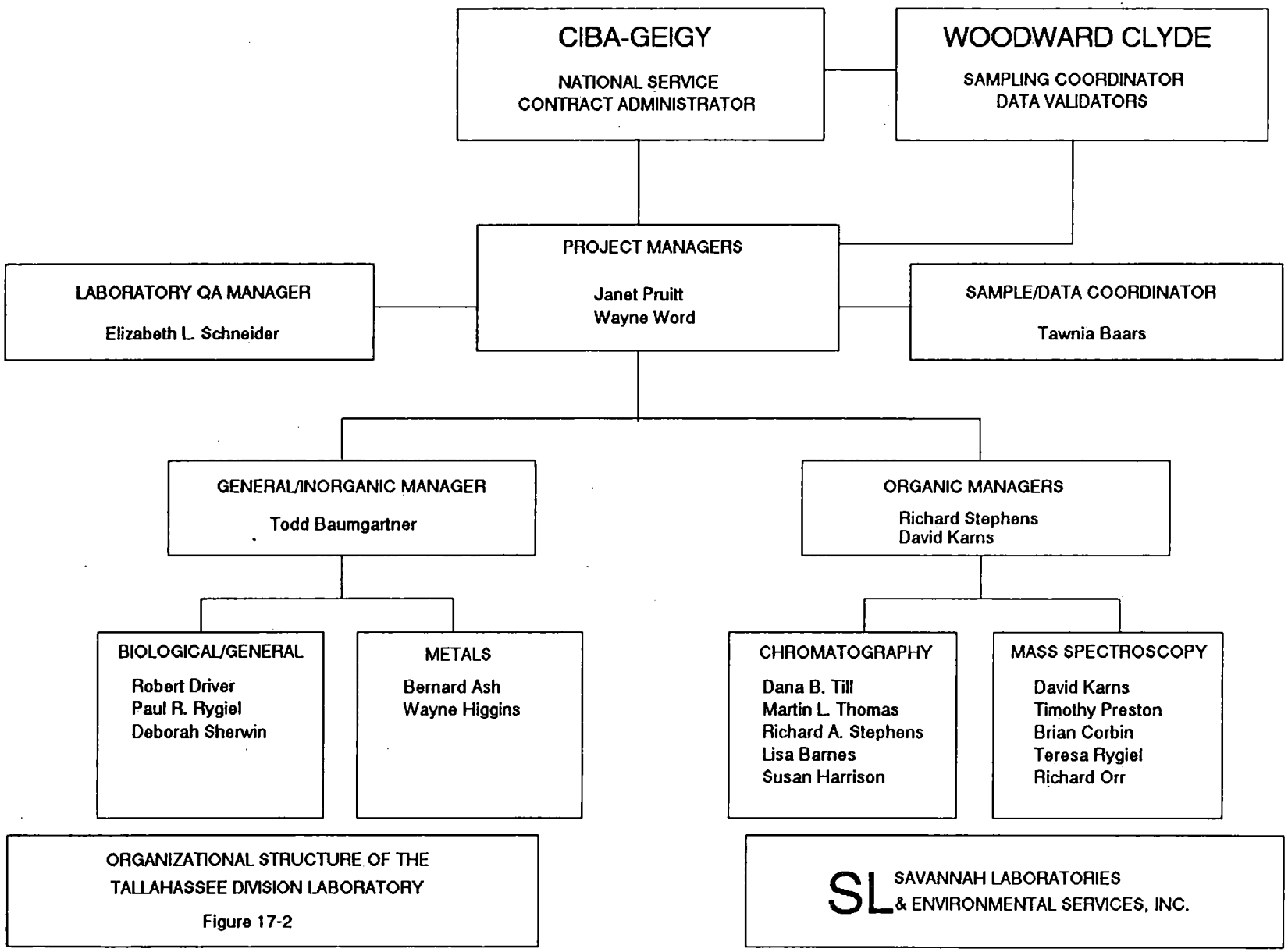
The organizational structure of the Savannah and Tallahassee Divisions are outlined in Figures 17-1 and 17-2.



ORGANIZATIONAL STRUCTURE OF THE
SAVANNAH DIVISION LABORATORY

Figure 17-1

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.



ORGANIZATIONAL STRUCTURE OF THE
TALLAHASSEE DIVISION LABORATORY

Figure 17-2

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	Comptroller
Alan C. Bailey	Ph.D.	Laboratory QA Manager
Steven J. White	BS	Project Manager
Linda A. Wolfe	BS	Project Manager
Beverly Hughes	BS	Project Manager
Larry E. Phillips	BS	Corporate Computer Manager
Sheila B. Hoffman	BS	Data Manager
Gloria Fulwood		Sample Data Manager
Virginia Baisden	MS	Field Sampling Manager
Derrick M. Simons	BS	Corporate Organic Manager
Ernest B. Walton	BS	Corporate Inorganic Manager
Karla J. Bier	BS	Semivolatile GC Manager
Karri L. Derr	BS	Volatile GC Manager
Mike Salum	BS	Organic Extraction Manager
Myron J. Young	BS	Volatile GC/MS Manager
Angela M. Weimerskirk	BS	General Laboratory Manager
Paul E. Meyers	BS	Chemist/Corporate Safety Director
Kenneth R. Aegan	BS	Voaltiles GC/MS Chemist
Llona Bonds		Sample Custodian
Hsaio Lan Chang	MS	Analyst
Katherine M. Cook	BS	Semivolatile GC/MS Chemist
Nannette H. Dasher	BS	Semivolatile GC/MS Supervisor
Dagmar Goley	BS	Inorganic CLP Coordinator
Sandra Grovenstein	BS	Semivolatile GC/MS Supervisor
Keith Hamilton	BS	Volatile GC/MS Supervisor
Theresa Hornsby	BS	General Lab Supervisor
G. Anthony Lowman	BS	Analyst
Susan K. Norwood	BS	ICP/AA Production Supervisor
J. Robert Paddison, Jr.	MS	Volatile GC/MS Supervisor
Ruth D. Rankin	BS	Inorganic Digestion Supervisor
Elizabeth R. Sicay	2 yr. Tech	Analyst
Julie Silvey	BS	AA Supervisor
Angela F. Stewart	BS	Semivolatile GC/MS Supervisor
Lorraine Strong		Assistant to Quality Assurance Manager
Angela Zealy	BS	Semivolatile GC Analyst

TALLAHASSEE DIVISION

EMPLOYEE	DEGREE	TITLE
Thomas L. Stephens	BS	Vice President/Lab Director
Janet B. Pruitt	MS	Lab Director/Project Manager
Wayne Word	BS	Project Manager
C. Henry Beauchamp	BS	Laboratory Manager
Elizabeth Schneider	BS	Quality Assurance Manager
Todd A. Baumgartner	BS	Inorganic Section Manager
Lisa Barnes	BS	Extractions Manager
Carol E. Graham		Technician
Susan Harrison	BS	Chemist
David A. Karns	BS	Semivolatile Organic Manager
Bernard Ash	BS	Chemist
Brian Corbin	BS	Chemist
Robert D. Driver	BS	Analyst
D. Wayne Higgins	BS	Analyst
Darren K. Martin		Field Coordinator
Richard Orr	BS	Chemist
Tim Preston	BS	Semivolatile Supervisor
Paul Rygiel	BS	Chemist
Teresa Rygiel	BS	Chemist
Deborah Sherwin	BS	Biological/General Supervisor
Richard Stephens	BS	Volatile GC and GC/MS Manager
Martin Thomas		Technician
Dana B. Till	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.

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 was 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.

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.

DERRICK M. SIMONS

Corporate Organic Manager/Organic 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 1985, Mr. Simons was a chemist at ESE, Inc., where his duties included the determination of pesticides, PCBs, herbicides, and volatile organic compounds by GC.

In 1985, Mr. Simons joined Environmental Testing and Certification Corporation as a GC/MS chemist in the determination of both volatile and semivolatile organic compounds.

Mr. Simons joined York Laboratories in 1986 as GC and GC/MS group leader for both volatile and semivolatile organic compounds. In 1987, he was promoted to organics lab manager, supervising all GC, GC/MS, and organic extraction personnel. While in that position, he obtained extensive knowledge of SW-846, 40 CFR, and CLP protocols.

Mr. Simons joined Savannah Laboratories in 1990 as Organic Section Manager. His current duties include responsibility for GC, GC/MS, and the organic extraction sections. As well, he is responsible for organic analytical method development, overseeing the training of new personnel, and supervising the maintenance and troubleshooting of GC and GC/MS instrumentation. As Corporate Organic Manager, he is responsible for preparing SOPs, establishing analytical and QA procedures, evaluating instrumentation, and coordinating production among the organic departments.

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.

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.

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.

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.

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.

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 as 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

Semivolatiles GC/MS 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.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.

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.

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.

RUTH D. RANKIN

Inorganic Digestion 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.

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 M. WEIMERSKIRK

General Laboratory Manager, 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.

LLONA BONDS

Sample Custodian, Savannah Division

Ms. Bonds joined Savannah Laboratories in 1982. She has ten years experience in the Chain-of-Custody Department. Her sample custodial duties include receipt of samples, inspection of all samples against client's chain-of-custody, checking sample integrity based on any leakage or damage to sample bottles, and notifying project managers of any problems based on her inspection.

ANGELA F. STEWART

Semivolatile GC/MS Supervisor, 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 and supervision of analyses of samples and reporting of data for semivolatile GC/MS. Her work has provided her with extensive experience employing SW-846, 40 CFR, and CLP protocols.

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.

THOMAS L. STEPHENS

Vice President/Lab Director, 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 presentations 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.

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.

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.

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.

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.

18.0 CHANGES TO QAPjP

Informational changes to the Cranston QAPjP are provided on Tracking Form #3, and technical changes are provided on Tracking Form #4.

Date	Revision	Sections Affected
12/14/92	1*	1, 2, 4, 5, 9, 10, 13, 17, 18
12/14/92	1**	5, 6, 7, 8, 9, 10, 11, 13, 15, 18

* For detail, see Tracking Form # 3, Cranston QAPP, Supplement # 1.

** For detail, see Tracking Form # 4, Cranston QAPP, Supplement # 1.

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CRANSTON QAPjP TRACKING FORM

No. 5
Date: 11/17/92

PERSON REQUESTING REVISION: Diana Baldi and Shelly Eyraud

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
D. Baldi: Ciba-Geigy National Services Contract Administrator
S. Eyraud: Enseco - CAL Project Manager

NATURE OF CHANGE TO QAPjP:
Type: 1. Major____ Minor XX (check one)
2. Informational XX Technical____ (check one)

Section(s) of Document: 2.0, 6.0, 18.0 of the Enseco-California Analytical Laboratory QAPP (Appendix F to the Ciba-Geigy QA Documents: Supplement #1)

REVISION:
Section 2.0, p.1: Update revision numbers for Section 2.0, 6.0 and 18.0.
Section 6.0, p.3 (Table 6.1): Clarify holding times in Table 6.1.
Section 18.0, pp. 1-6: Modify format, include revisions completed November, 1992.

REASON FOR CHANGE:

Clarification of Table 6.1 (no technical changes) with resulting revisions to document.

EFFECTS OF CHANGE:

NONE (Clarification only)

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of the following sections of Appendix F to CIBA-GEIGY QA Documents: Supplement #1: [1] Section 2.0 (pp.1-3), [2] Section 6.0 (pp. 1-3), and [3] Section 18.0 (pp. 1-6). These documents will be accompanied with Cranston QAPP Tracking Form #5 for project-wide distribution for inclusion in Section ~~18.0~~ of the Cranston QA Documents: Supplement #1.

Shelly Eyraud — 11/17/92
Project Manager — Date
Responsibility: Responsible for operation

Diane M. Reber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

USEPA Project Manager — Date

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2.2 DISTRIBUTION LIST FOR QUALITY ASSURANCE PROJECT PLANS

Name	Number of Copies
Diana Baldi, CIBA-GEIGY, Inc.	1
Michael J. Miille, Enseco, Inc.	1
Shelly Eyraud, Enseco-CAL	1
Mark Houlday, Woodward-Clyde	1
Gail Cho Celaschi, Enseco-CAL	1
Walter Berger, Enseco, Inc.	1

6.0 SAMPLING PROCEDURES

The generation of quality data begins with the collection of the sample, and therefore the integrity of the sample collection process is of concern to the laboratory. Samples must be collected in such a way that no foreign material is introduced into the sample and no material of interest escapes from the sample prior to analysis. To ensure sample integrity, the following must be considered:

- Samples must be collected in appropriate containers. In general, glass containers are used for organic parameters (see Table 6.1);
- The sample containers must be properly cleaned to ensure that the sample is not contaminated during the collection process;
- Samples must be preserved appropriately to minimize the loss of materials of interest due to adsorption, chemical or biological degradation, or volatilization (see Table 6.1);
- Appropriate volumes of sample must be collected to ensure that the required detection limits can be met and quality control samples can be analyzed (see Table 6.1);
- Samples must be properly shipped to the laboratory, in the appropriate time frame, to ensure that holding times for the analyses can be met.

Specific site sampling procedures are addressed in the Woodward-CLyde Data Collection Quality Assurance Project Plan: Supplement.

Sample Containers and Preservatives

Enseco can assist in the sample collection process by providing consultation and assistance to client designing sampling programs. Also, Enseco will make available to the client the Enseco "Sample Safe™", a set of sample containers that are properly cleaned and preserved for use in sample collection.

Analysis and extraction holding times are not specified in the 12/90 SOW PCDDs/PCDFs. Instead, the contract stipulates a data package turnaround time of 40 days from the verified time of sample receipt thereby ensuring that all PCDDs/PCDFs extractions, analyses, and reanalyses are completed within a maximum of 40 days. In lieu of analysis holding times, the 40 day turnaround time will be the analysis constraint.

TABLE 6.1

CONTAINERS AND VOLUMES

Parameter	Method Number	Matrix	Container	Preservative	Min. Sample Size	Holding Time
Dioxins/Furans	12/90 SOW	Water	One liter glass	4°C	1000 ml (a)	(c)
	PCDDs/ PCDFs	Soil/Waste	Core tube or glass jar	4°C	50 g (b)	(c)

(a) 2 1-liter glass required for analysis. 4 1-liter glass for samples requiring MS/MSD analysis.
(b) 2 core tubes or glass jars for samples requiring MS/MSD analysis.
(c) No holding times are defined in the SOW; 35 days from VTSR will be the analysis constraint.

Revision Date: December 1991

Section #	Pages	Summary of Revision
Section 16.0		No changes.
Section 17.0	17-1 to 17-14	New section with organizational charts and resumes.
Section 18.0	18-1 to 18-4	New section summarizing changes to the Quality Assurance Project Plan.
		Modified changes to Sections 2.0, 15.0.

Revision Date: November 1992

Section #	Pages	Summary of Revision
Section 2.0	2-1 to 2-3	Update revision numbers for Sections 2.0, 6.0 and 18.0.
Section 6.0	(Table 6.1) 6-3	Clarify holding times in Table 6.1.
Section 18.0	18-1 to 18-6	Modify format; include revisions completed November, 1992.

Tracking form 6
Appendix G

CRANSTON QAPjP TRACKING FORM

No. 6
Date: 12/10/92

PERSON REQUESTING REVISION: Diana Baldi and John Rissel

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
D. Baldi: CIBA National Service Contract Administrator
J. Rissel: CIBA Corporate Analytical Technology Manager

NATURE OF CHANGE TO QAPjP:
Type: 1. Major____ Minor X (check one)
2. Informational X Technical____ (check one)

Section(s) of Document: Appendix G - Sections 1,2,3,4,8,10,12,16,17,18 of CIBA-GEIGY Environmental Testing Laboratory QAPP

REVISION:

See attachment for detail of changes

REASON FOR CHANGE:

See attachment for reasons for changes

EFFECTS OF CHANGE:

The changes are minor and have little or no impact on the project.

NECESSARY CORRECTIVE ACTION(S):

Project-wide distribution of the following sections of Appendix G to CIBA-GEIGY QA Documents: Supplement #1: Sections 1,2,3,4,8,10,12,16,17,18. These sections will be accompanied by Cranston QAPP Tracking Form No. 6 for project-wide distribution for inclusion in Section 18 of the Cranston QA Documents: Supplement #1.

Ken Dyer FOR JOHN RISSEL — December 15, 1992
Project Manager — Date
Responsibility: CIBA Corporate Analytical Technology Manager

Diane M. Leber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

NOT REQUIRED
USEPA Project Manager — Date

Printed on Recycled Paper

CHANGES TO CIBA-GEIGY CORPORATE ENVIRONMENTAL TESTING LABORATORY (ETL) QAPP (APP G OF CRANSTON QAPP)

1. The following revisions reflect personnel changes at ETL. The changes have little to no impact to the project. The following pages are affected by the changes:

   Section 1, p. 1
   Section 2, p. 2
   Section 4, p. 5
   Section 17, pgs. 1, 2, 3

   a. Denis Mitchell, ext. 2283, replaces John Rissel as Laboratory Manager.

   b. Dan Britton, ext. 2418, replaces Denis Mitchell as Laboratory Supervisor.

   c. Name change of Kimberly Glenn to Kimberly Smith.

2. The following revisions were made to correct omissions/typographical errors or other minor changes in the original document. Effects of these changes are insignificant with regard to the project.

a.	Section 2, page 1	Revision updates are reflected in the Table of Contents.
b.	Section 3, page 1	Change reflects additional states in which laboratory is certified.
c.	Section 8, page 1	Change indicates the replacement of the ICP with a new one.
d.	Section 10, page 1 and Section 16, page 2	Change indicates computer upgrade for the LIMS.
e.	Section 12, page 1	Change reflects additional states in which laboratory is certified and changes in pending lab audit status.
f.	Section 16, page 2	Change reflects a change in SOP number brought about by a change in the numbering system.
g.	Section 18, page 1	Change reflects the chronicle of revisions to QAPP by date and affected sections.

Printed on Recycled Paper

CHANGES TO CRANSTON QA DOCUMENT: SUPPLEMENT #1

1. Cranston QAPP Tracking Form 6 is inserted in Section 18.0.

Printed on Recycled Paper

Quality Assurance Project Plan

for

RCRA Facility Investigation of CIBA-GEIGY Facility in Cranston, RI

submitted by

CIBA-GEIGY CORPORATION
CORPORATE ENVIRONMENTAL TECHNOLOGY
ENVIRONMENTAL TESTING LABORATORY
Route 37 West
Toms River, NJ 08754

Approval:

D. Mitchell
Denis Mitchell
Laboratory Manager

12/10/92
Date

Frank Saksa
Frank Saksa
Quality Assurance Officer

10 Dec 92
Date

Diana Baldi
Diana Baldi
National Service Contract Administrator

12/17/92
Date

2.0 TABLE OF CONTENTS

SECTION		REVISION	PAGE
1.0	Title Page	1	1-1
2.0	Table of Contents	1	2-1
3.0	Project Description	1	3-1
4.0	Project Organization and Responsibilities	1	4-1
5.0	Quality Assurance Objectives	0	5-1
6.0	Sampling Procedures	0	6-1
7.0	Sample Custody	0	7-1
8.0	Calibration Procedures and Frequency (Lab and Field)	1	8-1
9.0	Analytical Procedures	0	9-1
10.0	Data Reduction, Validation, and Reporting	1	10-1
11.0	Internal QC Checks	0	11-1
12.0	Performance and Systems Audits	1	12-1
13.0	Preventive Maintenance	0	13-1
14.0	Specific SOPs Used to Assess Data Precision, Accuracy, Representativeness, and Completeness	0	14-1
15.0	Corrective Action for Out-of-Control Situations	0	15-1
16.0	QA Reporting Procedures	1	16-1
17.0	Laboratory Personnel	1	17-1
18.0	Revisions to QAPjP	1	18-1

Appendices:

Sampling/Handling Requirements

2.1 Distribution:

Mark Houlday
Woodward-Clyde Consultants
201 Willowbrook Boulevard
Post Office Box 290
Wayne, NJ 07470
Voice: (201) 785-0700
FAX: (201) 785-0023

CIBA-GEIGY Corporation
PO Box 71
Route 37 West
Toms River, NJ 08754

Denis Mitchell
Laboratory Manager
Voice: (908) 349-5200 X2283
FAX: (908) 505-9195

Kimberly Smith
Program Coordinator
Voice: (908) 349-5200 X2386
FAX: (908) 505-9195

Dan Britton
Laboratory Supervisor
Voice: (908) 349-5200 X2418
FAX: (908) 505-9195

Dorren McNichols
Laboratory Supervisor
Voice: (908) 349-5200 X2439
FAX: (908) 505-9195

Frank Saksa
Quality Assurance Officer
Voice: (908) 349-5200 X2789
FAX: (908) 505-9195

Diana Baldi
NSCA
CIBA-GEIGY Corporation
410 Swing Road
Greensboro, NC 27409
Voice: (919) 632-7506
FAX: (919) 632-2048

3.0 PROJECT DESCRIPTION

See the main document "Quality Assurance Documents: Supplement #1 (January 1992)" for the project description.

Environmental Testing Laboratory

The Environmental Testing Laboratory (ETL) is part of the Analytical Technology Group in the Corporate Environmental Technology Center (ETC). ETL is a high throughput, certified compliance laboratory capable of routine to moderately sophisticated analytical support. This laboratory utilizes standard procedures accepted by regulatory agencies and is accredited in multiple states. The lab is capable of implementing and producing EPA Contract Laboratory Program (CLP) deliverables. ETL intends to perform the Water Quality analyses for Phase II of the RCRA Facility Investigation at the Cranston, Rhode Island site. The laboratory is located in Toms River, New Jersey. This project would specifically involve the metals laboratory and the wet chemistry laboratory. This document will apply to the analysis of water quality parameters by ETL.

The laboratory is certified in New Jersey, North Carolina, South Carolina, Pennsylvania, Delaware, Connecticut, Alabama, Massachusetts and Iowa. Selection of states or agencies for certification has been based on the needs of the corporation to date.

ETL holds certification in the areas of organics, metals, classical chemistry and bioassay and is capable of providing full service compliance monitoring.

4.0 PROJECT ORGANIZATION

Please refer to the following organization charts. Figure 4.1 shows the organization of Corporate Environmental Technology. Figure 4.2 illustrates the three sections within the Analytical Technology Group and the communication channels for the Cranston project. Figure 4.3 shows the ETL staff related to the Cranston project. Immediately prior to sampling and during the sampling event, communication will be via three-way calls among Woodward-Clyde, ETL and the NSCA.

ORGANIZATIONAL CHART

CORPORATE ENVIRONMENTAL TECHNOLOGY

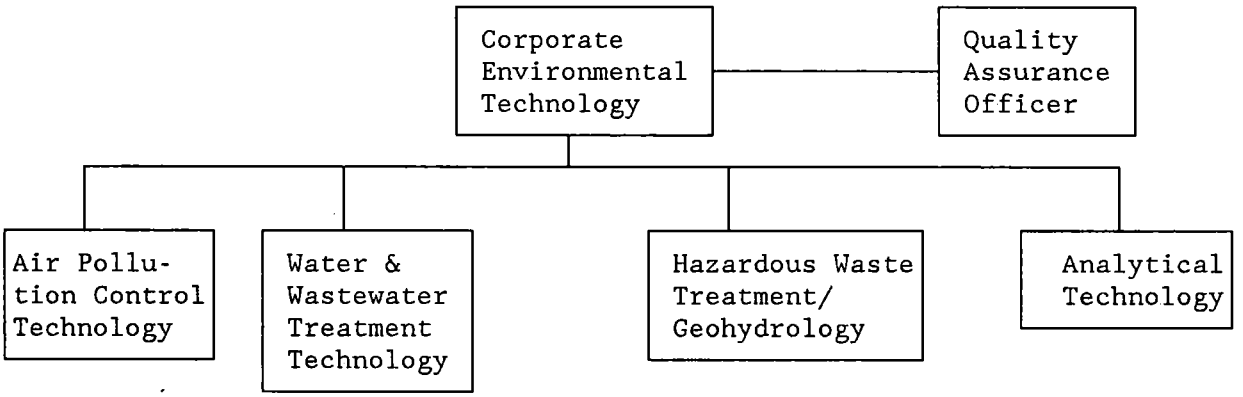

Figure 4.1

ORGANIZATIONAL CHART

ANALYTICAL TECHNOLOGY/
WOODWARD-CLYDE CONSULTANTS

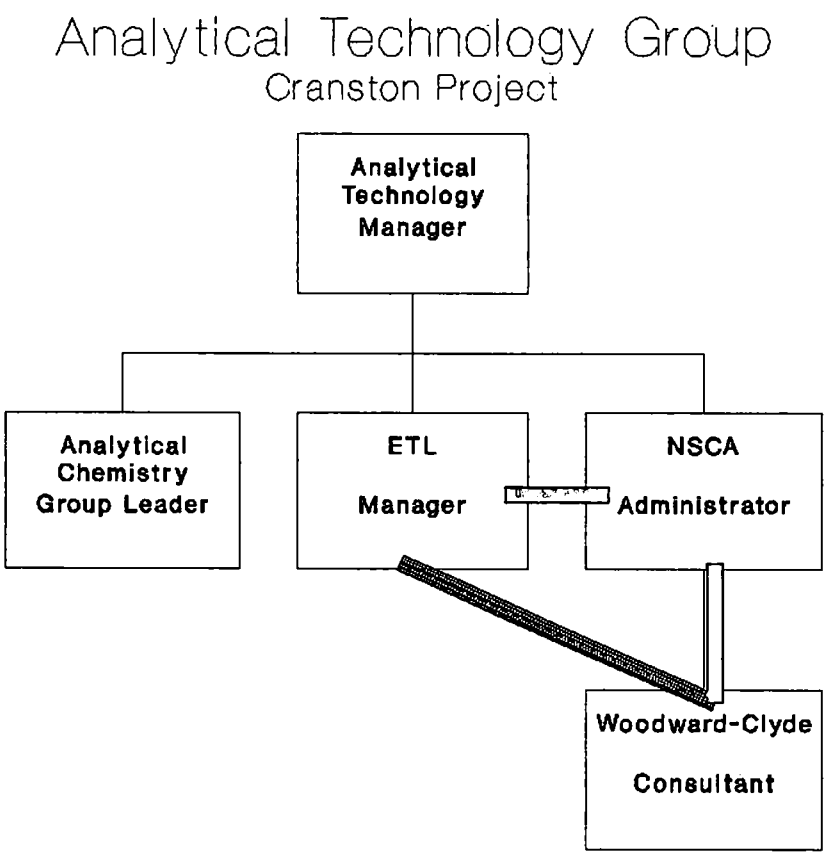

Figure 4.2

ORGANIZATION CHART

ENVIRONMENTAL TESTING LABORATORY

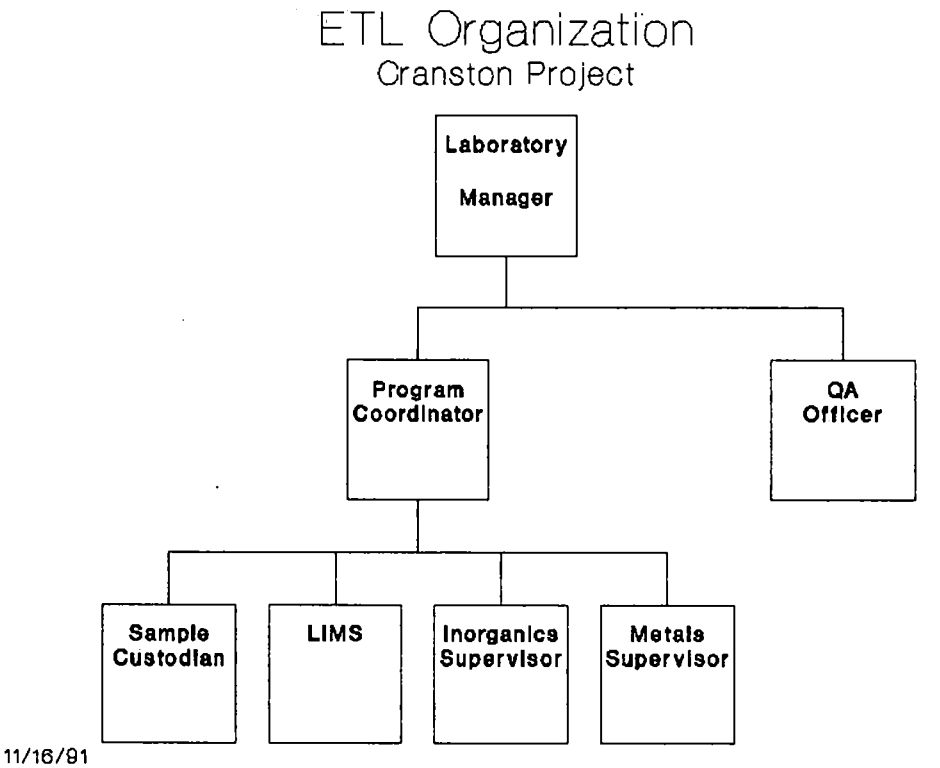

Figure 4.3

Contractual Contact:	Laboratory Manager ex 2283
Technical Contact:	Program Coordinator ex 2386
Sampling Contact:	Sample Custodian ex 2775

All personnel may be reached at the following:

CIBA-GEIGY Corporation
PO Box 71
Route 37 West
Toms River,
New Jersey
08754

908-349-5200 (voice)
908-505-9195 (facsimile)

8.0 CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures are determined by the method used, the instrument manufacturers recommendations and the specific requirements of the project. Table 8-1 lists the parameters tested, the EPA Method used and the instruments used at ETL.

Table 8-1

Methods and Types of Instruments

Parameter	EPA Method	Instrument	Manufacturer	Model
BOD_5	405.1	DO Meter	YSI	58
TSS	160.2	Balance	Mettler	AE 240
TDS	160.1	Balance	Mettler	AE 240
COD	410.4	Spectrophotometer	B&L	Spec 20
TOC	415.1	TOC Analyzer	Shimadzu	TOC500
TKN	351.3	ISE	Orion	EA-940
NH_3	350.3	ISE	Orion	EA-940
PO_4	365.2	Spectrophotometer	Hach	DR/2000
NO_3/NO_2	353.1	AutoAnalyzer	Technicon	ModelII
Ca	200.7	ICAP	ARL	3580
Mg	200.7	ICAP	ARL	3580
Na	200.7	ICAP	ARL	3580
K	258.1	Flame AA	P-E	3100
Fe	200.7	ICAP	ARL	3580
Mn	200.7	ICAP	ARL	3580
Cl	300.0	Ion Chromatograph	Dionex	4000i
SO_4	300.0	Ion Chromatograph	Dionex	4000i
Alk	310.1	Auto-Titrator	Mettler	DL40GP
TPHC	418.1	Spectrophotometer	P-E	1420
O&G	413.2	Spectrophotometer	P-E	1420

All instruments are calibrated initially using a blank and a minimum of five standards, except alkalinity titrations. This multi-point calibration is repeated as required by the method listed in Table 8-1 and Section 5 or whenever a new standard source is used (whichever is more frequent). The calibration is confirmed by analyzing a standard reference material purchased from a different source (EPA, ERA, etc.). For metals analyses, the instrument is calibrated daily. For the remaining analyses, calibrations are confirmed daily by running one mid-range standard, which must meet acceptance criteria. If the mid-range standard is not within 10% of its absorbance value from the original calibration, the full calibration is repeated. Table 8-2 lists the frequency of calibration, the number and range of concentrations of standards used.

Table 8-2: Frequency of Calibrations and Concentrations of Standards used for Calibration Listed by Method

			CONCENTRATION OF STANDARDS	
Parameter	Standards	Frequency	Initial Calibration Range (mg/L)	Calibration Verification Standard (mg/L)
BOD_5	8	Quarterly	20-400	200
TSS	5	Quarterly	5-53	10
TDS	5	Quarterly	60-587	293
COD	5	Quarterly	10-125	50
TOC	5	Quarterly	20-150	100
TOC (Low level)	5	Quarterly	1-10	5
TKN	7	Quarterly	2-100	20
NH_3	6	Quarterly	0.05-10	5
PO_4	5	Quarterly	0.05-5.0	1.5
NO_3/NO_2	5	Quarterly	0.058-0.30	0.2
Ca	5	Daily	10-50	NA
Mg	5	Daily	10-50	NA
Na	5	Daily	10-50	NA
K	5	Daily	2-10	NA
Fe	5	Daily	2-10	NA
Mn	5	Daily	0.4-2.0	NA
Cl	5	Daily	0.5-4.0	NA
SO_4	5	Daily	0.5-7.0	NA
Alk	1	Daily	100	100
TPHC	5	Quarterly	0.8-8.0	5
O&G	5	Quarterly	0.8-8.0	5

10. DATA REDUCTION, VALIDATION, AND REPORTING

10.1 Data Reduction and Validation

All analytical data generated by the ETL are checked at several levels for a variety of criteria. These criteria generally include but are not limited to conformance to method Standard Operating Procedure (SOP), meeting holding times, QC precision and accuracy criteria, blank criteria, significant figures and general sense of the reported values. The data validation process consists of data generation and reduction, as described below.

The analyst generating the analytical data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in laboratory method SOPs. Each analyst reviews the quality of his or her work based on an established set of guidelines. The analyst reviews the data package to ensure that:

- Sample preparation information is correct and complete;
- Analysis information is correct and complete;
- The appropriate SOPs have been followed;
- Analytical results are correct and complete;
- QC samples are within established control limits;
- Blanks are within established limits;
- Special sample preparation and analytical requirements have been met; and
- Documentation is complete (all anomalies in the preparation and analysis have been documented, holding times have been met, etc.) These data reduction and validation steps are performed and documented by the analyst. At this point, the analyst enters the data into the Laboratory Information Management System (LIMS). ETL LIMS resides on a VAX® 4200 computer which employs Beckman Lab Manager® software. The analyst then passes the data summary to his supervisor, who performs an additional review, based upon the project requirements.

The second level review is performed by the supervisor to provide an independent review of the data package. This review is also conducted according to an established set of guidelines and is structured to ensure that:

- Calibration data are scientifically sound, appropriate to the method, and completely documented;
- QC samples are within established guidelines;
- Qualitative identification of sample components is correct;
- The data are ready for incorporation into the final report; and
- The data package is complete and ready for data archive.

The results undergo a third level of review by the program coordinator, who is responsible for sample control, LIMS, and report generation. The data that were entered into the LIMS are directly printed or the data are electronically placed in a reporting template on a personal computer. This transfer eliminates transcription errors.

The Laboratory Manager reviews and signs the report to ensure that the data meet the reporting criteria and overall objectives of the client before the report is released, serving as a fourth level of review.

Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of the data is essential in ensuring that data of high quality are generated consistently.

10.2 Data Reporting

A variety of reporting formats are available. For this project, the hard copy report will be organized as follows:

Title Page, Methodology/Terms: Description of sample types, method references and definitions. Any problems encountered and general comments are provided in a narrative.

Laboratory Chronicle: Sample dates, extraction dates, analysis dates and sample IDs are given in this section.

Analytical Data: Results are reported by sample or by test. The ETL reporting limit for each analyte is also given.

QC Information: The results (Percent Recovery and Relative Percent Difference) of the spiked sample pairs analyzed with the project are listed, together with the control limits. Also, the analytical results for method blanks generated during analysis of organic and metals parameters are given.

Results of any duplicates, matrix spikes, matrix spike duplicates surrogates, or other project-specific QC are also reported.

Chain of Custody: A copy of the chain of custody pertaining to the reported samples is included with the report.

Custom Services: Special services including data interpretation, special consultation, and raw data packages (when requested) are included.

A disk deliverable is required for this project. The same data listed above are provided in a project defined format on a 3.5 inch high density diskette. The required information is provided in two files in an ASCII delimited format with out leading zeros and without leading or trailing spaces in any of the records. This format allows direct uploading of sampling and analytical information to CIBA-GEIGY's Environmental Compliance Monitoring System remediation module.

12. PERFORMANCE AND SYSTEMS AUDITS

The CIBA-GEIGY Corporate Environmental Testing Laboratory (ETL) is currently certified in New Jersey, North Carolina, South Carolina, Pennsylvania, Delaware, Connecticut, Alabama, Massachusetts and Iowa. In view of the rigor of the resident state's certification program (New Jersey), most other states offer certification through reciprocity. As such, the ETL is subject to external, unannounced site visits by regulatory, certifying agencies, primarily the New Jersey Department of Environmental Protection and Energy (NJDEPE). ETL underwent such an audit in April of 1991, incurring no deficiencies, only recommendations. Official results of this audit are available for inspection.

As a certified laboratory, ETL participates in USEPA Water Supply (WS) and Water Pollution (WP) semi-annual rounds of performance evaluation sample studies, as well as an annual audit of National Pollution Discharge Elimination System (NPDES) permit holders. The laboratory has an outstanding record of performance on these studies for the past five years. These results are also available for inspection.

Additionally, ETL routinely undergoes internal procedural and safety audits.

16. QA REPORTING PROCEDURES

The distribution of Quality Assurance Officer (QAO) audit findings is a valuable tool in maintaining maximum validity of reported values and for measuring the overall effectiveness of the QA program. It serves as an instrument for evaluating the program design, identifying problems and trends and planning for future needs. The QAO submits monthly reports to the Director, Corporate Environmental Technology. These reports include:

- The results of internal systems audits, including any corrective actions taken;
- Performance evaluation scores and commentaries;
- Results of site visits and audits by regulatory agencies and clients;
- Performance for major clients, based upon their feedback through questionnaires distributed for service critique;
- Problems encountered and corrective actions taken;
- Holding time violations;
- Comments and recommendations; and
- A summary of the QA data audits conducted.

The QAO submits monthly reports to the Director on the status of the QA Program. These reports summarize the information gathered through the laboratory reporting system and contain a thorough review and evaluation of ETL operations.

A copy of the systems audit(s) specific to Cranston defined in Section 12 will be submitted to the QAO and NSCA. QAPjP revisions will be circulated based upon distribution list in Section 2.

It is the responsibility of ETL to be in compliance with this Quality Assurance Project Plan. The NSCA will be promptly notified of any excursions or changes in personnel.

LABORATORY DOCUMENTATION

Complete and accurate documentation of analytical and procedural information is an important part of the QA program. The following describes different types of documentation used at ETL.

SOPs

Detail of analytical and QC protocols are contained in SOPs. SOPs are documents that contain detailed information on the requirements for the correct performance of a laboratory procedure. The format for these SOPs is given in CIBA-GEIGY SOP No. 1005.0, Standard Operating Procedures for the Environmental Technology Department of CIBA-GEIGY Corporation, available for inspection.

All SOPs are approved by the QAO. The distribution of current SOPs and archiving of outdated ones is controlled through the QAO.

LIMS

ETL uses a customized, commercial Laboratory Information Management System (LIMS) as the primary database for final results. The LIMS software is Beckman LabManager®; the computer is a VAX®4200. Other data are archived on magnetic tape or disk.

Laboratory Notebooks

Laboratory notebooks are used to document information that cannot easily be recorded in the LIMS or archived on magnetic tape or disk (e.g., method/data not covered by SOPs or worksheets). Information typically recorded in laboratory notebooks includes unusual observations or occurrences in the analysis of samples, or methods development information. Each page in a laboratory notebook is initialed and dated as information is entered, if assigned to more than one analyst. Notebooks used by ETL personnel contain pre-numbered pages and all entries are made in ink. Raw data printouts for some analyses may be taped directly into the notebooks. Filled notebooks are archived in the ETL files in a secure area.

17. CURRENT PERSONNEL FOR KEY POSITIONS

Key personnel directly responsible for overall sampling and analytical project coordination include:

Denis Mitchell
Laboratory Manager
Voice: (908) 349-5200 X2283
FAX: (908) 505-9195

Kimberly Smith
Program Coordinator
Voice: (908) 349-5200 X2386
FAX: (908) 505-9195

Edward Hewitt
Sample Coordinator
Voice: (908) 349-5200 X2723
FAX: (908) 505-9195

Key personnel directly responsible for analyses of the samples include:

Dan Britton
Laboratory Supervisor
Voice: (908) 349-5200 X2418
FAX: (908) 505-9195

Dorren McNichols
Laboratory Supervisor
Voice: (908) 349-5200 X2439
FAX: (908) 505-9195

All of the above personnel are located at:

CIBA-GEIGY Corporation
PO Box 71
Route 37 West
Toms River, NJ 08754

The following pages are qualification summaries of key personnel involved in the Cranston project.

Denis Mitchell
CIBA-GEIGY Corporation
P. O. Box 71
Toms River, NJ 08754

EDUCATION:
B.S. Chemistry, Mt. St. Marys College
Emmitsburg, MD 1958

WORK EXPERIENCE:
1965 to Present: Laboratory Supervisor, CIBA-GEIGY Corporation, Toms River, New Jersey
1963 to 1965: Laboratory Supervisor, Tenneco Chemical Corporation
1955 to 1963: Laboratory Supervisor, International Flavors and Fragrances

PROFESSIONAL ASSOCIATIONS:
American Chemical Society

Kimberly A. Smith
CIBA-GEIGY Corporation
P. O. Box 71
Toms River, NJ 08754

EDUCATION:
B.S. Chemistry, University of Connecticut, Storrs, Connecticut 1983
M.B.A. Monmouth College, Long Branch, New Jersey 1990

WORK EXPERIENCE:
1983 to Present: Program Coordinator, CIBA-GEIGY Corporation, Toms River, New Jersey

COURSES:
- Quality Improvement Through Defect Prevention
- Management Skills for Women Supervisors
- Supervisors Labor Relations Training
- Dionex Ion Chromatography Course
- Braun-Luebbe Technicon Autoanalyzer Course
- Leeman Labs ICP Course
- Tekmar VOC Course

Dan Britton
CIBA-GEIGY Corporation
P. O. Box 71
Toms River, NJ 08754

EDUCATION:
B.S, M.S, Chemistry, Rutgers University
New Brunswick, NJ 1972

WORK EXPERIENCE:
1973 to Present: Laboratory Supervisor, CIBA-GEIGY Corporation, Toms River, New Jersey
1969 to 1973: Medical Laboratory Technician, USAF
1968 to 1969: Laboratory Supervisor, CIBA-GEIGY Corporation, Toms River, New Jersey

PROFESSIONAL ASSOCIATIONS:
American Chemical Society

DORREN K. McNICHOLS
CIBA-GEIGY Corporation
P. O. Box 71
Toms River, New Jersey 08754

EDUCATION:
B.S. Chemistry, College of Mount Saint Vincent 1972

WORK EXPERIENCE:
1978 to Present: Laboratory Supervisor, CIBA-GEIGY Corporation, Toms River, New Jersey
1973 to 1977: Laboratory Technician, SEL-REX, Incorporated, Nutley, New Jersey

COURSES:
Attended Ocean County College for Computer Science. Completed training in Machine Management and Organization, BASIC, COBOL and Advanced COBOL Computer Languages.

18. LIST OF CHANGES TO THE QAPjP

This section is intended to summarize the changes that are incorporated over time. It will also document the project requirements over time.

Date	Revision	Sections Affected
12/10/92	1*	1,2,3,4,8,10,12,16,17,18

*For detail, see tracking form #6, Cranston QAPP, Supplement #1.

Tracking form 7
Appendix B

CRANSTON QAPjP TRACKING FORM

No. 7
Date: 12/14/92

PERSON REQUESTING REVISION: Mark Houlday; Diana Baldi

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
M. Houlday - Project Manager, Woodward-Clyde Consultants
D. Baldi - CIBA-GEIGY National Services Contract Administrator
NATURE OF CHANGE TO QAPjP:
Type: 1. Major____ Minor XX (check one)
2. Informational____ Technical XX (check one)

Section(s): Attachment A (Organic Analyses, Laboratory Data Review, USEPA Region I Worksheets Edited for Appendix IX Compounds)
of Document: of Appendix B (Woodward-Clyde Data Collection QA Project Plan) of the CIBA-GEIGY QA Documents: Supplement #1.

REVISION: p. 27 of Attachment A (referred to above) is amended to include validators' qualifiers to be used in cases of diluted samples;
Title page of Attachment A (referred to above) is amended to indicate (by footnote) that only p. 27 is revised as of December, 1992.

REASON FOR CHANGE: To distinguish data qualification of results for diluted and undiluted samples (organochlorine pesticides/PCBs)

EFFECTS OF CHANGE: Will eliminate possible rejection of non-detected results reported for diluted samples with less than 10 percent surrogate compound recoveries

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of title page and of page 27 of Attachment A (Organic Analyses, Laboratory Data Review, USEPA Region I Worksheets Edited for Appendix IX Compounds) of Appendix B (Woodward-Clyde Data Collection QA Project Plan) of the CIBA-GEIGY QA Documents: Supplement #1. (Due to the fact that the affected portion of the document is an attachment and is 35 pages in length, only these two pages will be reissued at this time.) The revised pages will be accompanied by Cranston QAPP Tracking Form #13 for project-wide distribution for inclusion in Section 18.0 of the Cranston QA Documents: Supplement #1.

Mark Houlday — December 16, 1992
Project Manager — Date
Responsibility: Woodward-Clyde Project Manager

Diane M. Lebes — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

USEPA Project Manager — Date

ORGANIC ANALYSES

LABORATORY DATA REVIEW

USEPA REGION I WORKSHEETS

EDITED FOR APPENDIX IX COMPOUNDS

REVISION I*

Prepared by:

WOODWARD-CLYDE CONSULTANTS
201 WILLOWBROOK BOULEVARD
WAYNE, NEW JERSEY 07470

Prepared for:

CIBA-GEIGY CORPORATION
410 SWING ROAD
GREENSBORO, NORTH CAROLINA 27419

JANUARY 1992

* (p. 27 only was revised December 1992)

C.2 Method 8080 (Organochlorine Pesticide and PCBs)
The surrogate standard is dibutylchlorendate.
For waters the acceptance window is 24-154%
For solids the acceptance window is 20-150%

Surrogate Actions:

	Percent Recovery		
Condition for undiluted samples	<10%	10%-R(MIN)	>R(MAX)
Positive Sample Results	J	J	J
Non-detected Results	R	UJ	advisory only
Condition for diluted samples			
Positive Sample Results	J	J	J
Non-detected Results	J	J	advisory only

NAME: CIBA GEIGY
I.D. NO.: RID 001104323
FILE LOC: R-a
OTHER: Covers

USER'S GUIDE TO IMPLEMENTING CHANGES TO CRANSTON QUALITY ASSURANCE DOCUMENTS AS REQUIRED BY TRACKING FORM NOS. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 & 14

The following instructions will facilitate the necessary steps to complete the changes required by Tracking Form Nos. 3 through 14:

You will need to have available the Part 1 and Part 2 notebooks of the Cranston Quality Assurance Documents - Supplement #1.

TRACKING FORM NO. 3 and 4: SAVANNAH LABS TECHNICAL AND INFORMATIONAL CHANGES

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form Nos. 3 and 4.

B. The entire Appendix C (Savannah Laboratories and Environmental Services, Inc., Quality Assurance Project Plan) is revised. Replace your entire Appendix C with the enclosed copy.

TRACKING FORM NO. 5: ENSECO-CAL TECHNICAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 5.

B. In the Enseco-California Analytical Laboratory Quality Assurance Project Plan (Appendix F of the Cranston Quality Assurance Documents: Supplement #1), replace Sections 2, 6 and 18 with the enclosed copies.

TRACKING FORM NO. 6: ETL INFORMATIONAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 6.

B. In the CIBA-GEIGY Corporation Corporate Environmental Testing Laboratory Quality Assurance Project Plan (Appendix G of the Cranston Quality Assurance Documents: Supplement #1), replace Sections 1, 2, 3, 4, 8, 10, 12, 16, 17 and 18 with the enclosed copies.

TRACKING FORM NO. 7: WOODWARD-CLYDE CONSULTANTS TECHNICAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 7.

B. In the Woodward-Clyde Consultants Data Collection QA Project Plan (Appendix B of the Cranston Quality Assurance Documents: Supplement #1), replace the following pages in Attachment A: title page and page 27.

TRACKING FORM NO. 8: IT CORP. INFORMATIONAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 8.

B. In the IT Environmental Technology Laboratory Geotechnical Laboratory Operations Quality Assurance Project Plan (Appendix J of the Cranston Quality Assurance Documents: Supplement #1), replace the table of contents and Sections 16 and 27 with the enclosed copies.

TRACKING FORM NO. 9: NORTHEAST INFORMATIONAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 9.

B. In the Northeast Analytical, Inc., Quality Assurance Project Plan (Appendix M of the Cranston Quality Assurance Documents: Supplement #1), replace the entire last section entitled "Laboratory Facilities, Instrumentation, and Personnel" with the enclosed copy (30 pages).

TRACKING FORM NOS. 10 & 11: TRIANGLE LABS - TECHNICAL AND INFORMATIONAL CHANGES

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form Nos. 10 and 11.

B. In the Triangle Labs of Houston, Inc., Quality Assurance Project Plan (Appendix E of the Cranston Quality Assurance Documents: Supplement #1), replace sections 2, 8, 14, and 17 with the enclosed copies.

TRACKING FORM NO. 12: PACE, INC. - TECHNICAL CHANGE

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form No. 12.

B. In the Pace, Inc., Quality Assurance Project Plan (Appendix D of the Cranston Quality Assurance Documents: Supplement #1), replace sections 2, 5, and 9 with the enclosed copies.

TRACKING FORM NOS. 13 & 14: CIBA-GEIGY - TECHNICAL AND INFORMATIONAL CHANGES

A. In the main document (Cranston Quality Assurance Documents: Supplement #1), Section 18.0, insert Tracking Form Nos. 13 and 14.

B. In the same document (Cranston Quality Assurance Documents: Supplement #1), replace sections 2, 4, 5, 9, 13, 14, and 17 with the enclosed copies.

12/28/92DBpm
B:\CHG\GUIDE3.CHG

REC'D 12-30-92
F.B.

LIST OF REVISIONS TO CRANSTON QUALITY ASSURANCE DOCUMENTS: SUPPLEMENT NO. 1 ISSUED BY CRANSTON QAPjP TRACKING FORMS 3 - 14

TRACKING FORM #	VENDOR	APPENDIX[1]	SECTION(S) OF DOCUMENT REISSUED	DISTRIBUTION	
				ENTIRE DOCUMENT	PARTIAL DOCUMENT
3 & 4	Savannah Laboratories	C	Entire, Savannah Laboratories QAPjP	X	
5	Enseco-CAL	F	Section 2.0, 6.0, and 18.0 of Enseco-CAL QAPjP	X	
6	CIBA-GEIGY Environmental Testing Laboratory	G	Sections 1, 2, 3, 4, 8, 10, 12, 16, 17 and 18 of CIBA-GEIGY Environmental Testing Laboratory QAPjP	X	
7	Woodward-Clyde Consultants	B	Title page and p. 27 to Attachment A of Woodward-Clyde Consultants QAPjP	X	X
8	IT Corp. Envir. Tech. Development Ctr. (Geotechnical Lab)	J	Table of Contents and Sections 16.0 and 17.0 of IT Corp. QAPjP	X	
9	Northeast Analytical, Inc.	M	Last section ("Laboratory Facilities, Instrumentation, and Personnel") of Northeast Analytical, Inc., QAPjP	X	
10 & 11	Triangle Laboratories of Houston, Inc.	E	Sections 2, 8, 14 and 17 of Triangle Laboratories QAPjP,	X	
12	PACE, Inc.	D	Sections 2, 5, and 9 of PACE, Inc., QAPjP	X	
13 & 14	CIBA-GEIGY	(main document)	Sections 2.0, 4.0, 5.0, 9.0, 13.0, 14.0 and 17.0	X	X

CRAN:B:\CHG\TF3_14.TAB

[1]References to appendices in this column refer specifically to appendices to the Cranston Quality Assurance Documents: Supplement #1.

Tracking forms 3 & 4
Appendix C

CRANSTON QAPjP TRACKING FORM **NUMBER 3**
Date: 12/14/92

PERSON(S) REQUESTING REVISION: Diana Baldi and Linda Wolfe

RESPONSIBILITY OF REQUESTOR(s) IN CRANSTON PROJECT:

D. Baldi: CIBA-GEIGY National Service Contract Administrator
L. Wolfe: Savannah Labs Project Manager

NATURE OF CHANGE TO QAPjP:

Type: 1. Major ☐ Minor ☒ (check one)
2. Informational ☒ Technical ☐ (check one)

Section(s): See attachment for list of Document Savannah Labs QAPjP (Appendix C)

REVISION: See attachment for list

REASON FOR CHANGE: Reasons are listed with each change in the attachment

EFFECTS OF CHANGE: Net effect of each change is listed in the attachment

NECESSARY CORRECTIVE ACTION(S): Project-wide re-distribution of entire document with changes to the following sections of Savannah Laboratory QAPjP (Appendix C) Sections 1, 2, 4, 5, 9, 10, 13, 17, and 18 and evaluation of affected sections in CIBA-GEIGY QA Documents Supplement #1 are needed. Since QAPjP Change Form #4 requires EPA approval and many of the same sections require re-distribution based on those technical changes, we recommend implementation of the above informational changes concurrently with the implementation of the technical changes. The concurrent implementation will simplify the distribution of changes. The above sections will be accompanied by Cranston QAPP Tracking Form No. 3 for inclusion in Section 18 of the Cranston QA Documents: Supplement #1.

Linda P. Wolfe — 12/14/92
Project Manager — Date
Responsibility: Savannah Labs Project Manager

Diana Baldi — 12/15/92
Project Manager — Date
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M. Reber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

NOT REQUIRED
USEPA Project Manager — Date

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

1. The following revisions reflect personnel changes at Savannah Laboratories. The changes have little to no impact on the project. The following pages are affected by the changes:

Section 1, page 1
Section 2, page 2
Section 4, page 4
Section 17, pages 2, 4, 5, 9, 10, 13, 22

a. Alan C. Bailey replaces Kimberly D'Anne Cribb as QA Manager. Kimberly D'Anne Cribb is no longer employed by Savannah Laboratories.

b. Title change of Ernest B. Walton from Inorganics Manager to Corporate Inorganic Manager.

c. Title change of Kenneth R. Aegan from Volatiles GC Manager to Volatiles GC/MS Chemist.

d. Title change of Karri L. Derr from Volatiles GC/MS Supervisor to Volatiles GC Manager.

e. Angela M. Weimerskirk replaces Alan C. Bailey as General Laboratory Manager. Alan C. Bailey is now the QA Manager.

f. Theresa Hornsby replaces Angela M. Weimerskirk as General Laboratory Supervisor. Angela M. Weimerskirk is now the General Laboratory Manager.

g. Lorraine Strong replaces Leah Player as assistant to Quality Assurance Manager.

h. Title change of Dagmar Goley from Digest Supervisor to Inorganic CLP Coordinator.

i. Title change of Ruth D. Rankin from AA Supervisor to Inorganics Digestion Supervisor.

j. Name change of Susan Harris to Susan Norwood.

k. Title change of Susan Norwood from ICP Supervisor to ICP/AA Production Supervisor.

l. Title change of Larry E. Phillips from Computer Manager to Corporate Computer Manager.

m. Title change of Angela F. Stewart from Semivolatile GC/MS chemist to Semivolatile GC/MS Supervisor.

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

n. Remove Miles Tihansky from Listing of Technical Employees. He is no longer employed by Savannah Laboratories.

o. Remove Wuge Chu from Listing of Technical Employees. She is no longer employed by Savannah Laboratories.

p. Title change of Thomas L. Stephens from Lab Director/Project Manager to Vice President/Lab Director.

q. Title change of Janet B. Pruitt from Assistant Lab Director/Project Manager to Lab Director/Project Manager.

r. Title change of David A. Karns from GC/MS Manager to Semivolatile Organic Manager.

s. Title change of Tim Preston from Chemist to Semivolatiles Supervisor.

t. Title change of Richard Stephens from Volatiles Supervisor to Volatiles GC and GC/MS Manager.

u. Remove Joseph North from organizational chart for the Tallahassee Divisions. Joseph North is no longer employed by Savannah Laboratories.

v. Name change for Teresa Phelps (Tallahassee Division) to Teresa Rygiel on organizational chart.

w. Remove Elizabeth C. Foster from organizational chart and Listing of Technical Employees (Tallahassee Division) and replace with Lisa Barnes.

x. Title correction of Dana Till on resume from Organic Division Manager to Chemist.

y. Derrick Simons' title on organizational chart is revised from Organic Manager to Corporate Organic Manager.

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

2. The following revisions were made to correct omissions/typographical errors in the original document. Effects of these changes are insignificant in regard to the project.

a.	Section 5, page 1:	VS in the RPD calculation is corrected to V2
b.	Section 5, page 4:	Potassium, sodium, calcium, and magnesium are not on the Appendix IX list and have been deleted.
c.	Section 5, page 7:	The PQL for 4,4'-DDD is corrected from 0.010 μg/L to 0.10 μg/L.
d.	Section 5, page 9: & page 22:	Method for all parameters listed is corrected from 8150 to 8151.
e.	Section 5, page 19 :	The parameter listed is corrected from tetrachloro-n-xylene (TCX) to tetrachloro-m-xylene (TCMX).
f.	Section 5, page 29:	SLI has been corrected to SL
g.	Section 9, pages 3 & 4:	The units for the range of the standards for the five-point calibration has been corrected from ng to ng/mL
h.	Section 9, page 4:	The misspelling of acetonitrile has been corrected.
i.	Section 9, page 6:	Glassware used for volatile organics will be rinsed with methanol <u>not</u> acetone and methylene chloride.
j.	Section 10, page 4:	The Surrogate Recovery Summary was listed twice as (Form V) and (Form II). It will be listed as only Form II
k.	Section 10, page 7:	"Form <u>10</u>" is changed to "Form <u>X</u>".
l.	Section 13, page 1:	SLI has been corrected to SL.
m.	Section 17, page 2:	Elizabeth R. Sicay has been added to organizational chart
n.	Section 17, page 3:	Richard Stephens and David Karns replace Dana Till as Organic Manager on the organizational structure

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

o.	Section 17, page 4:	Gloria Fulwood has been added to technical list
p.	Section 17, page 5:	Susan Harrison has been added to technical list
q.	Section 17, page 5:	Richard Orr has been added to technical list
r.	Section 17, page 5:	Brian Corbin has been added to technical list
s.	Section 17, page 5:	Add Teresa Rygiel to Listing of Technical Employees.
t.	Section 17, pages 2&4:	Julie Silvey has been added to organizational chart and listing of technical employees for the Savannah Division.
u.	Section 17, pages 2&4:	Keith Hamilton has been added to organizational chart and listing of technical employees for the Savannah Division.
v.	Section 17, page 4:	Add Jay W. Andrews to the Savannah Division listing of technical employees as Comptroller.
w.	Section 17, page 18:	Resume has been included for Katherine M. Cook.
x.	Section 17, page 18:	Resume has been included for Angela F. Stewart.

3. Due to changes indicated in this Cranston QAPjP Tracking Form, Section 18, page 1 is amended. Tracking Form 3 is inserted in Section 18.

CRANSTON QAPjP TRACKING FORM

NUMBER 4
Date: 12/14/92

PERSON(S) REQUESTING REVISION: Diana Baldi and Linda Wolfe

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:

D. Baldi: CIBA-GEIGY National Service Contract Administrator
L. Wolfe: Savannah Labs Project Manager

NATURE OF CHANGE TO QAPjP:

Type:	1. Major ☒	Minor ☐	(check one)
	2. Informational ☐	Technical ☒	(check one)

Section(s): See attachment for list of Document Savannah Labs QAPjP (Appendix C)

REVISION: See attachment for list

REASON FOR CHANGE: Reasons are listed with each change in the attachment

EFFECTS OF CHANGE: Net effect of each change is listed in the attachment

NECESSARY CORRECTIVE ACTION(S): Project-wide re-distribution of entire document with changes made to the following sections of Savannah Laboratory QAPjP Sections 5, 6, 7, 8, 9, 10, 11, 13, 15, and 18 and evaluation of affected sections in the QA Documents Supplement #1 are needed. As per QAPjP Change Form #3, it is recommended that the implementation and distribution of Change #4 be concurrent with Change #3 to simplify the distribution of changes. The above sections will be accompanied by Cranston QAPP Tracking Form No. 4 for inclusion in Section 18 of the Cranston QA Documents: Supplement #1.

Linda A. Wolfe — 12/14/92
Project Manager — Date
Responsibility: Savannah Labs Project Manager

Diana Baldi — 12/15/92
Project Manager — Date
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M. Leber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

USEPA Project Manager — Date

Changes to SL QA Plan (Appendix C) of
Cranston QA Document (Supplement 1)

ATTACHMENT TO CRANSTON QAPjP CHANGE FORM #4: TECHNICAL CHANGES

1. The following revisions clarify isomer identification for the compounds listed.

   a. Section 5, pages 13 and 26: Dimethoxyacetophenone changed to 3,4-Dimethoxyacetophenone to report the available standard.

   b. Section 5, page 14: Methyl benzenesolfonamide changed to 2&4-Methyl benzenesulfonamide to report both isomers.

   REASON FOR CHANGE: To prevent misidentification of isomers.

   EFFECTS OF CHANGE: Clarify isomer identification.

2. Section 5, pages 15, 16, 28, and 29: All references to Tinuvin have been changed to specify Tinuvin 328.

   REASON FOR CHANGE: Revision in project scope requested by EPA.

   EFFECTS OF CHANGE: Tinuvin data from Phase I and Phase II will not be comparable.

3. Section 5, pages 4 and 17: Tin will be a matrix spiking compound. Accuracy and precision values have been added.

   REASON FOR CHANGE: To provide quality control information for Tin.

   EFFECTS OF CHANGE: Additional information will be available to verify Tin results.

4. Section 5, page 11: The prep method for Oxy-bis(ethanol) is changed from 5030 to MOD 8015*****DAI/SL.

   REASON FOR CHANGE: Oxy-bis (ethanol) cannot be determined by purge and trap.

   EFFECT OF CHANGE: To identify the appropriate method for determination of oxy-bis (ethanol)

5. Section 5, page 23: The analysis method for Oxy-bis(ethanol) is changed from 8240 to Modified 8015***** DAI/SL.

   REASON FOR CHANGE: Oxy-bis(ethanol) cannot be determined by purge and trap.

   EFFECT OF CHANGE: To identify the appropriate method for determination of Oxy-bis(ethanol).

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

6. Section 5, page 27: 2&4-Methylbenzenesulfamide has been added to the parameter list with the following information: Method: 8270*****(3550) and a PQL of 330 μg/kg.

   REASON FOR CHANGE: Inadvertent deletion in original document.

   EFFECT OF CHANGE: Complete analyte list for Method 8270.

7. Section 6, page 2: Preservation for chlorinated pesticides, OP pesticides, and chlorinated herbicides has been revised from pH 5-9 to <u>no</u> preservative.

   REASON FOR CHANGE: Typographical error.

   EFFECT OF CHANGE: Correct preservation provided.

8. Section 7, page 4: Sample disposal specifications are revised.

   REASON FOR CHANGE: Increased management control of lab.

   EFFECT OF CHANGE: They will be handled as hazardous waste.

9. Section 7, page 4: Samples may be transferred to the Tallahassee Division of Savannah Labs **ONLY** after approval from the NSCA.

   REASON FOR CHANGE: The oversight of the laboratories conducting the analyses is done by the NSCA.

   EFFECT OF CHANGE: Increased management control of lab.

10. Section 8, page 4:
    (1) The specification: "continuing: 1 pt. every 12 hours (CLP)" in the Calibration Frequency/Number of Standards for the HP 5970 has been deleted.

    (2) The HP 5971 laboratory instrument and the associated calibration procedures have been added to Table 8-2.

    (3) Varian 3300 GC is changed to Varian 3600 GC.

    (4) "Plot curve of response vs. conc." for the standard source for the Varian 3600 has been moved to Calibration Acceptance Criteria column.

Changes to SL QA Plan (Appendix C) of
Cranston QA Document (Supplement 1)

REASONS FOR CHANGES:

(1) Refers to CLP protocol which does not apply to the SW-846 methods used for this project.

(2) New instrument added to the laboratory

(3) Typographical error

(4) Typographical error

EFFECT OF CHANGES:

(1) Appropriate analytical protocol cited.

(2) Increased analytical capability.

(3) None

(4) None

11. Section 8, page 2:

(1) Change the total number of instruments for GC/MS semivolatile from 10 to 11, and add 1-HP-5971 instrument to Savannah division GC/MS Semivolatile Department.

(2) Change the total number of instruments for GC/MS volatiles from 9 to 10, and change 1-HP 5971 to reflect 2-HP5971 instruments in the Savannah division GC/MS Volatile Department.

(3) Under Savannah division Gas Chromatography Semivolatile Department, change 1-Varian 3300 to 1-Varian 3600.

(4) Change the total number of atomic absorption furnace/flame instruments from 17 to 18. Addition of two (2) Jarrell Ash 4000 furnaces to the Savannah division. Decrease the number of Varian 400Z furnaces from 2 to 1.

REASONS FOR CHANGES:

(1) To reflect addition of instrument to GC/MS Semivolatile Department of the Savannah division.

(2) To reflect addition of instrument to GC/MS Volatile Department of the Savannah division.

(3) Typographical error.

(4) Reflect the addition of the Jarrell Ash 4000 furnace and correct typographical error of quantity of Varian 400Z furnaces.

EFFECT OF CHANGES:

(1) Addition of instrumentation to handle client work load.

(2) Addition of instrumentation to handle client work load.

(3) None

(4) Addition of instrumentation to meet client workload.

12. Section 9, page 1: Corrected spelling of decafluorotriphenylphosphine.

REASON FOR CHANGE: Typographical error.

EFFECT OF CHANGE: None

13. Section 9, page 2: Procedure for the quantitation of butazolidin has been revised to include a separate standard to be maintained.

REASON FOR CHANGE: Butazolidin degrades over time when in solution with the other Appendix IX additional compounds and CIBA-GEIGY fingerprint compounds.

EFFECT OF CHANGE: Accurate quantitation of butazolidin.

14. Section 9, pages 3 and 4: Oxy-bis(ethanol) will be determined by direct aqueous injection when requested.

REASON FOR CHANGE: To include method for determination of oxy bis (ethanol).

EFFECT OF CHANGE: Correctly identify appropriate method.

15. Section 9, page 4:

(1) The compounds listed as exceptions to the range specified for the standards for the five-point calibration have been changed to include 2-methyl-2-propionitrile instead of chloroform (with a range of 80 ng/mL - 800 ng/mL).

(2) Information has been added to accommodate procedure for analysis of oxy-bis (ethanol).

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

REASONS FOR CHANGE:

(1) The standard solution list of compounds was incorrect.

(2) To include a protocol to follow for the analysis of oxy-bis (ethanol) by direct aqueous injection.

EFFECTS OF CHANGE:

(1) None

(2) Establishes protocol and criteria for the analysis of oxy-bis (ethanol).

16. Section 9, page 4: The concentration range for acetonitrile should be 500 ng/mL - 5000 ng/mL.

REASON FOR CHANGE: Typographical error.

EFFECT OF CHANGE: To indicate correct concentration range.

17. Section 9, page 4: The statement. "Semivolatile MS analyses will be utilized if n-octane is interfered with by the xylene in the standard mix", has been deleted.

REASON FOR CHANGE: Xylene has been demonstrated not to interfere with n-octane, therefore, semivolatile GC/MS analyses (Method 8270) will not be needed; volatiles GC/MS (Method 8240) will be utilized.

EFFECT OF CHANGE: Method identification for analyses of n-octane.

18. Section 9, page 5:

(1) Retention time windows have been defined for chlorinated pesticides.

(2) Criteria for use of average RF for quantitation defined.

REASON FOR CHANGES:

(1) Omission in original document.

(2) Omission in original document.

EFFECT OF CHANGES:

(1) Definition of retention time windows.

(2) Definition of criteria for quantitation from average RF.

19. Section 9, page 6: Addition of the initial and continuing calibration requirements for mercury.

REASON FOR CHANGE: Omission in original document.

EFFECT OF CHANGE: Mercury calibration criteria defined.

20. Section 10, page 2: Several of the equations in this table have been revised.

(a) BNA extractable by GC/MS parameter calculations:

(1) Water concentration (µg/L) change from

$$\frac{As}{Ais} \otimes \frac{Cis}{RF}$$

to

$$\frac{As}{Ais} \otimes \frac{Cis}{RF} \otimes \frac{final\ volume\ (mL)}{initial\ volume\ (L)} \otimes Dilution\ factor$$

(2) Sediment concentration (µg/kg) change from

$$\frac{\mu g\ of\ internal\ standard}{(kg\ of\ sample)\ (\%\ solids \otimes 0.01)} \otimes \frac{As}{Ais} \otimes \frac{1}{RF}$$

to

$$\frac{As}{Ais} \otimes \frac{Cis}{RF} \otimes \frac{final\ volume\ (mL)}{initial\ weight\ (kg)} \otimes \frac{dilution\ factor}{\%\ solid \otimes 0.01}$$

Cis = Concentration of the internal standard µg/mL)

(b) VOCs by GC parameter calculations:

(1) Response factor (RF) changed from

$$\frac{\mu L\ of\ compound\ to\ be\ measured}{peak\ height}$$

to internal standard method

$$\frac{peak\ height\ analyte}{peak\ height\ ISTD} \otimes \frac{conc.\ (ng/mL)\ ISTD}{conc.\ (ng/mL)\ anlayte}$$

(2) Water concentration (µg/L) changed from

$$RF \otimes \text{peak height} \otimes \text{dilution factor}$$

to

$$\frac{\text{peak height analyte}}{\text{peak height ISTD}} \otimes \frac{\text{conc. (ng) ISTD}}{\text{sample amount (mL) analyte}} \otimes \frac{\text{dilution factor}}{\text{RF analyte}}$$

(3) Sediment concentration (µg/kg) changed from

$$RF \otimes \frac{\text{peak height} \otimes \text{liter equivalent of standard volume}}{(\text{kg of sample})\ (\%\ \text{solids} \otimes .01)}$$

to

$$\frac{\text{peak height analyte}}{\text{peak height ISTD}} \otimes \frac{\text{conc. ISTD (ng)}}{\text{sample amount (g)}} \otimes \frac{\text{dilution factor}}{\text{RF analyte}} \otimes \frac{1}{\%\ \text{solid} \otimes 0.01}$$

(c) VOC by GC/MS parameter calculations changed from See Section on BN/A to See Section of VOCs by GC except substitute area of characteristic ion for peak height.

(d) Pesticides/PCBs and other GC procedures parameter calculations change from the use of peak height to peak area and the multiplication of dilution factor to equations to both water and sediment calculations.

REASON FOR CHANGE: Incomplete equations were provided in original QAPjP.

EFFECT OF CHANGE: Actual equations utilized in calculation are provided.

21. Section 10, page 4: A Blank Association Form has been added to assist the data validator.

REASON FOR CHANGE: Requested by data validator.

EFFECT OF CHANGE: Assist validator.

22. Section 10, page 4: The location of pH verification in the package has been indicated.

REASON FOR CHANGE: To assist the data validator in verifying preservation of the VOA samples.

EFFECT OF CHANGE: Unnecessary qualification of aromatic compounds based on a 7-day holding time will be avoided since the holding time for a preserved sample is 14 days.

23. Section 10, pages 4, 5, 6, 7, and 8. Table of contents has been revised for 8240, 8270, 8080, 8151, and 8141.

REASON FOR CHANGE: To provide more detail of data package and its contents.

EFFECT OF CHANGE: Data package deliverables more defined and easily located in package.

24. Section 10, page 11: Insertion of Table 10-2.

REASON FOR CHANGE: To provide a list of data qualifiers and their definitions.

EFFECT OF CHANGE: Acceptable data qualifiers are identified.

25. Section 11, page 2: The following information has been added.

    a. Matrix spike levels for low- and high-level concentration organics will be referenced.

    b. Statement to indicate adding fingerprint compounds to matrix spike samples and the spike level.

    c. MS/MSD spike concentrations will be referenced for both organics and inorganics.

REASON FOR CHANGE: Clarification of additional quality control.

EFFECT: None

26. Section 13, page 2: Removal of D2 Arc lamp from Preventive Maintenance Schedule for the Smith-Hieftje 22 spectrophotometer furnace.

REASON FOR CHANGE: Smith Hieftje 22 furnace does not use D2 arc lamp for background correction.

EFFECT OF CHANGE: Correctly identify the equipment for preventive maintenance.

27. Section 15, page 1: A new table has been inserted for Corrective Action.

REASON FOR CHANGE: Laboratory has updated its Corrective Action Report form.

EFFECT OF CHANGE: Improved document control within the laboratory.

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

28. The following Practical Quantitation Limits (PQLs) are revised.

REASON FOR CHANGE: Results of updated Method Detection Limit studies.

EFFECT OF CHANGE: Increased level of confidence in the stated PQLs.

a. Section 5, page 8

i) The PQL for famphur is changed from 2.5 μg/L to 2.0 μg/L

ii) The PQL for methyl parathion is changed from 1.0 μg/L to 0.50 μg/L

iii) The PQL for phorate is changed from 1.5 μg/L to 1.0 μg/L

iv) The PQL for sulfotepp is changed from 1.5 μg/L to 0.50 μg/L

b. Section 5, page 9:

i) The PQL for 2,4-D is changed from 2.0 μg/L to 0.50 μg/L

ii) The PQL for methyl 2,4,5-T is changed from 1.0 μg/L to 0.50 μg/L

iii) The PQL for 2,4,5-TP is changed from 1.0 μg/L to 0.50 μg/L

c. Section 5, page 10: 2-Butanone PQL value is changed from 100 μg/L to 25 μg/L.

d. Section 5, page 11: The PQL value for n-Octane is changed from ND to 10 μg/L.

e. Section 5, page 11: The PQL value for Oxy-bis(ethanol) is changed from ND to 10,000 μg/L.

f. Section 5, page 12:

i) The PQL for 1,1-Biphenyl is changed from ND to 10 μg/L.

ii) The PQL for 2 Cyclohexane-1-ol is changed from ND to 10 μg/L.

iii) The PQL for 2 Cyclohexane-1-one is changed from ND to 10 μg/L.

iv) The PQL for 2,5-Cyclohexadine-1,4-dione is changed from ND to 10 μg/L.

v) The PQL for butazolidin is changed from 500 μg/L to 50 μg/L.

g. Section 5, page 13:

i) The PQL for 3,4-Dimethoxyacetophenone is changed from ND to 10 μg/L.

ii) The PQL for dinoseb is changed from ND to 10 μg/L.

h. Section 5. page 14:

i) The PQL for Irgasan is changed from 100 μg/L to 10 μg/L.

ii) The PQL for 2&4-Methyl benzenesulfonamide is changed from ND to 10 μg/L.

iii) The PQL for 1-Naphthylamine is changed from 300 μg/L to 10 μg/L.

i. Section 5, page 15:

i) The PQL for Propazine is changed from 200 μg/L to 20 μg/L.

ii) The PQL for Tinuvin 328 is 10 μg/L. (Original entry of 100 μg/L was for Tinuvin 327.)

iii) The PQL for Tofranil is changed from 50 μg/L to 100 μg/L.

j. Section 5, page 20:

i) The PQL for methyl parathion is changed from 33 μg/kg to 17 μg/kg.

ii) The PQL for sulfotepp is changed from 33 μg/kg to 17 μg/kg.

k. Section 5, page 21:

i) The PQL for 2,4-D has been changed from 50 μg/kg to 17 μg/kg.

ii) The PQL for 2,4,5-T has been changed from 50 μg/kg to 17 μg/kg.

iii) The PQL for 2,4,5-TP has been changed from 50 μg/kg to 17 μg/kg.

l. Section 5, page 23:

i) The PQL for trans-1,4-Dichloro-2-butene is changed from 50 μg/L to 5.0 μg/L.

m. Section 5, page 24:

i) The PQL for n-Octane is changed from ND to 10 μg/kg.

ii) The PQL for Oxy-bis(ethanol) is changed from ND to 10,000 μg/kg.

n. Section 5, page 25:

i) The PQL for 1,1-Biphenyl is changed from ND to 330 μg/kg.

ii) The PQL for Butazolidin is changed from 17000 μg/kg to 1700 μg/kg.

iii) The PQL for 2-Cyclohexane-1-ol is changed from ND to 330 μg/kg.

iv) The PQL for 2-Cyclohexane-1-one is changed from ND to 330 μg/kg.

v) The PQL for 2,5-Cyclohexane-1,4-dione is changed from ND to 330 μg/kg.

o. Section 5, page 26: The PQL for 3,4-Dimethoxyacetophenone is changed from ND to 330 μg/kg.

p. Section 5, page 27:

i) The PQL for Irgasan DP-300 is changed from 3300 μg/kg to 330 μg/kg.

ii) The PQL for 2,3,4,6-tetrachlorophenol is changed from 330 μg/kg to 1700 μg/kg.

q. Section 5, page 20:

(i) The PQL for dimethoate is changed from 2000 μg/kg to 330 μg/kg.

29. Section 5, page 4: The preparation method for lead is changed from 3010 to 3020.

REASON FOR CHANGE: Typographical error.

EFFECT OF CHANGE: Correct preparation procedure is provided.

Changes to SL QA Plan (Appendix C) of Cranston QA Document (Supplement 1)

30. Section 5, page 7: Change accuracy control limit for surrogate TCMX from 60-160 to 60-150.

    REASON FOR CHANGE: Typographical error.

    EFFECT OF CHANGE: Reflect correct limits.

31. Section 5, pages 8 and 20: The following spike compounds, accuracy and precision limits are revised for Method 8141.

    REASON FOR CHANGE: Compounds which were selected demonstrated poor and erratic performance; therefore, the erratic recoveries of these compounds cannot be traced to matrix effect.

    (a) Disulfoton and sulfotepp have been removed as matrix spike compounds.

    (b) Methyl parathion and thionazin have been added as matrix spike compounds.

    (c) Liquid and solid accuracy and precision control limits have been removed for disulfoton and sulfotepp.

    (d) Liquid and solid accuracy and precision control limits have been added for methyl parathion and thionazin.

    EFFECT OF CHANGE: Ability to assess the effect of matrix on the method performance.

32. Section 5, pages 8 and 20: 8141 surrogate compound ronnel has been replaced with triphenylphosphate and control limits have changed accordingly.

    REASON FOR CHANGE: Ronnel is a target compound for the 8141 list and cannot be used as a surrogate in this analysis.

    EFFECT OF CHANGE: Allow consistency in spiking of OP pesticides within Savannah Laboratories for multiple projects.

33. Due to changes indicated in the Cranston QAPjP Tracking Form, Section 18, page 1 is amended. Tracking Form 4 is inserted in Section 18.

    REASON FOR CHANGE: Changes indicated in Cranston QAPjP tracking form.

    EFFECT OF CHANGE: Increase accuracy of Cranston QAPjP.

Tracking Form 8
Appendix J

RECEIVED

DEC 0 2 1992

CRANSTON QAPjP TRACKING FORM

No. 8
Date: Nov. 16, 1992

PERSON REQUESTING REVISION: Coy Lauer

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT: IT Corp. Environmental Technology Development Center (ETDC) Quality Assurance Officer. (Geotechnical Laboratory)

NATURE OF CHANGE TO QAPjP:

Type: 1. Major____ Minor X (check one)
2. Informational X Technical____ (check one)

Section(s): of Document: Appendix J (IT ETDC QAPjP) of Cranston QA document: Supplement No. 1: Table of Contents, Section 16.0, Section 17.0.

REVISIONS:

1. Revise Table of Contents to correct section and subsection numbering.
2. Section 16.0: Delete Key Personnel section on page 4 and move it to Section 17.0.
3. Section 17.0: Change to:
   QA Officer - Coy Lauer
   Geotechnical Laboratory Technician - Alan Khonsari

REASON FOR CHANGE:

1. To correct errors in document issued 1/21/92.
2. To correct errors in document issued 1/21/92.
3. To update list of personnel.

EFFECTS OF CHANGE: NONE

NECESSARY CORRECTIVE ACTIONS: Project wide distribution of the following sections of Appendix J:

1. Table of Contents, pages 2-4.
2. Section 16.0, pages 1-3.
3. Section 17.0, page 1

These documents will be accompanied with Cranston QAPjP Tracking Form #8, for section 18 of the main document (Cranston QA documents: Supplement No. 1).

Diana Goldi
Project Manager — Date: 12/17/92
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M Leber
CIBA-GEIGY Project Coordinator — Date: 12/18/92

APPROVED (if technical change)

NOT REQUIRED
USEPA Project Manager — Date

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TDL-GEO 16.0 TRAINING

Training and qualifications of all technical personnel is documented with resumes and individual training records. Resumes include academic credentials, employment history, experience and professional registrations. An individual training record is kept for each technical employee showing on-the-job training and courses taken. Personnel qualification records are signed by supervisors or qualified persons indicating the procedures which he/she is qualified to perform. Specific training procedures and documentation are covered in laboratory SOPs.

TDL-GEO 16.1 PERSONNEL TRAINING AND QUALIFICATION

All Quality related activities performed by IT shall be accomplished by personnel qualified on the basis of education, experience, and training.

TDL-GEO 16.2 PROJECT STAFF TRAINING

TDL-GEO 16.2.1 General training in the requirements of the Quality Assurance Program is required of all personnel. Formal training sessions are conducted and documented by the Quality Control Coordinator. The training program shall address: regulatory requirements (as appropriate); basic quality control practices, including checks and balances inherent in the system; responsibilities of the project staff; responsibilities of the quality assurance personnel; and the performance of audits.

TDL-GEO 16.2.2 New technical employees are given training in quality assurance practices and policies. The training must take place soon after the new employee begins work at IT, preferably the first week of employment. It is the joint responsibility of the Laboratory Director and the Quality Control Coordinator to implement this training. New employee training is documented by the Quality Control Coordinator.

TDL-GEO 16.2.3 Quality assurance training documentation includes the name(s) of those trained, date(s) of training, and topics covered in training. The documentation is maintained in the Quality /Operations files.

TDL-GEO 16.2.4 For projects requiring a departure from standard Quality Level 1 practices, the Project Manager is responsible for reviewing the revised practices with members of the project staff. At the request of the Project Manager, this will be done by the Quality Control Coordinator or senior members of the project staff. Project-specific reviews shall include contractural and regulatory requirements, amendments of standard practice adopted for the project, project-specific procedures,

and project-specific quality assurance documents. As necessary, quality assurance documents or summaries will be issued to the project staff. The review is documented by a memorandum to the project file. The documentation includes the date of the review, the topics discussed, and the names of the participating project staff.

TDL-GEO 16.3 PROJECT STAFF QUALIFICATIONS

TDL-GEO 16.3.1 Project staffs are primarily composed of professional personnel who are engineers or scientists. Such personnel shall be assigned duties within the capabilities of their education and experience by the Laboratory Director or Group Manager. The Project Manager shall be appointed by the Laboratory Director or Group Manager. Qualifications of all personnel shall be documented by resumes which include academic credentials, employment history, experience, and professional registrations. Resumes are maintained in the Quality/Operations files.

TDL-GEO 16.3.2 Technicians and support personnel performing a technical function for a project are qualified through experience which is indicated in their resumes. These personnel shall be assigned by the Laboratory Director or Project Manager based on their capabilities. Technicians and support personnel shall be supervised in their activities by experienced personnel until the Project Manager approves independent performance of their duties.

TDL-GEO 16.3.3 If subcontractors are used by IT on a project, the Project Manager is responsible for establishing the necessary qualifications of subcontractor personnel and verifying their capability. Qualifications shall be established in the procurement documents.

TDL-GEO 16.3.4 If a project requires personnel with specific certifications (such as engineering registration in a given state or technical certification by a state or national organization), personnel meeting the necessary qualifications will be provided by IT.

TDL-GEO 16.4 QUALITY ASSURANCE PERSONNEL, TRAINING AND QUALIFICATIONS

TDL-GEO 16.4.1 Quality assurance personnel qualifications shall be documented in resumes as for professional personnel.

TDL-GEO 16.4.2 If audits are required for projects governed by USNRC quality assurance requirements (10 CFR 50, Appendix B), lead auditors shall be qualified in accordance with ANSI NQA-1, Supplement 2S-3. Qualifications shall be performed by the Director of ITAS Quality and Compliance.

TDL-GEO 16.5 SUBCONTRACTOR PERSONNEL, TRAINING AND QUALIFICATIONS

TDL-GEO 16.5.1 If specific qualifications are required of subcontractor personnel, it is the responsibility of the Project Manager to impose such qualification requirements upon the subcontractor through procurement documents, specifications, and other means, and to verify fulfillment. Necessary qualifications may be due to accepted standard of practice, regulation (such as engineering registration), technician registration and/or certification, or craft requirements (such as welder certification).

TDL-GEO 16.5.2 As appropriate for a specific project, the Project Manager is responsible for the training of subcontractor personnel with regard to IT quality-related requirements. The Project Manager is also responsible for documenting this training.

TDL-GEO 16.6 EXTERNAL TRAINING

TDL-GEO 16.6.1 Group training sessions are documented with training attendance rosters

TDL-GEO 16.6.2 Group training attendance rosters are stored in the Quality/Operations files.

TDL-GEO 17.0 KEY PERSONNEL

The organization and key personnel of the geotechnical group are listed below:

IT/ETDC Laboratory Manager - Tom Geisler

- Administrative Assistant - Barbara Conard
- Health Physics (Radiation Safety Officer) - Keith Hood
- Geotechnical Project Manager - Beverly Leamon
- Geotechnical Laboratory Manager - Ralph Cole
- Geotechnical Laboratory Technician - Alan Khonsari

*
*
*** QA Officer - Coy Lauer

Tracking Form 9
Appendix M

CRANSTON QAPjP TRACKING FORM

No. #9
Date: 11/24/92

PERSON REQUESTING REVISION: Robert E. Wagner

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT: PROJECT MANAGER AND LAB DIRECTOR OF NORTHEAST ANALYTICAL, INC.

NATURE OF CHANGE TO QAPjP:

Type: 1. Major____ Minor X (check one)
2. Informational X Technical____ (check one)

Section(s) of Document: Laboratory Facilities, Instrumentation, and Personnel Section (last section) in Northeast Analytical QAP, Appendix M of Cranston QA Documents: Supplement #1

REVISION: Revise last section, "Laboratory Facilities, Instrumentation, and Personnel", to update personnel and instrumentation since initial submission of QAP to Ciba-Geigy.

REASON FOR CHANGE: Personnel addition, job function changes, new equipment purchases.

EFFECTS OF CHANGE: No effect to analysis being supplied as stated in original QAP.

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of entire last section entitled "Laboratory Facilities, Instrumentation, and Personnel" of Appendix M (Northeast Analytical QAP). This revised section will be accompanied by Cranston QAPP Tracking Form No.9 for inclusion in Section 18 of Cranston QA Documents: Supplement #1.

Robert E. Wagner
Project Manager
Responsibility: Laboratory Director

11/24/92
Date

Diane M. Leber
CIBA-GEIGY Project Coordinator

12/18/92
Date

APPROVED (if technical change):

NOT REQUIRED
USEPA Project Manager

Date

LABORATORY FACILITIES, INSTRUMENTATION, AND PERSONNEL

FACILITIES:

Northeast Analytical Inc. has a modern 6000 sq. ft. laboratory located in the city of Schenectady, NY. The Lab is centrally located and in close proximity to the cities of Albany and Troy, and 3.5 hours North of New York City. Both rail and air transport are within 20 minutes.

Currently the laboratory specializes in high resolution, trace PCB analysis on soil, sediment, water, biota, and oil. The main laboratory occupies 1100 sq. ft. with a separate data control room for data acquisition and management. Quality control office, main reception area and stock room are also located on the third floor level.

The second floor level houses Northeast Analytical's Trace Level Water laboratory, along with our Metals laboratory. Other facilities include a 10' x 14' walk-in cooler, 12' x 14' walk-in freezer, storage area, waste storage area, and ultra pure 18 meg water system. Also on the second floor is our instrumentation lab where GC/MS and Purge and Trap equipment is located.

CERTIFICATION:

Northeast Analytical, Inc. is certified by the State of New York Department of Health under the Environmental Laboratory Approval Program.

INSTRUMENTATION:

- Varian 3400 Gas Chromatograph equipped with Varian 8035 Autosampler (60 position), two Ni-63 electron capture detectors, SPI injector, and Universal injector

- Varian 3400 Gas Chromatograph equipped with Varian 8035 Autosampler (60 position), Ni-63 electron capture detector, FID detector, SPI injector, and Megabore injector

- Varian 3400 Gas Chromatograph equipped with PID detector, HECD detector, cryogenic controlled oven, and two universal injectors

- Tekmar LSC 2000 Purge and Trap Unit

- Tekmar ALS 2016, 16 stage Purge and Trap Autosampler

- Tekmar 1000M Capillary Cryogenic Interface for capillary column purge and trap

- Varian 3400 Gas Chromatograph equipped with Varian 8035 Autosampler (60 position), 2 Ni-63 electron capture detectors, split/splitless injector, and universal injector

- Varian 3400 Gas Chromatograph equipped with 8100 Autosampler (48 position, low level), with Ni-63 electron capture detector and FID detector, split/splitless injector and universal injector

- Varian 3400 Gas Chromatograph equipped with 8100 Autosampler (48 position, low level), FID Detector, ECD Detector, SPI injector, and split/splitless injector

- Zymark Turbovap (3 units), 6-position solvent evaporation device

- Varian SpectrAA-400 Flame Atomic Absorption Spectrometer equipped with Austin 286 personal computer, Varian PSC-56 programmable sample changer (66 position), and Varian VGA-76 cold vapor generator accessory

- Varian SpectrAA-400 Graphite Furnace Atomic Absorption Spectrometer, equipped with IBM 286 personal computer, Zeeman background correction, Super lamp accessory, and Varian 50 position autosampler

- Varian Saturn II GC/MS equipped with Varian 3400 GC, Compaq 386-20 computer, Tekmar LSC-2000 and ALS-2016 Purge and Trap Autosampler, Libraries include (NIST, TX, GP and TR)

INSTRUMENTATION:

- Varian Saturn II GC/MS equipped with Varian 3400 GC, Compac 386-20 computer, 8100 Autosampler (48 position, low level), Chemical Ionization option
- Thermolyne Model 30400 Furnace
- Dynamic Solutions Maxima 820 Workstation for gas chromatograph data management, equipped with NEC 286 personal computer
- Dynamic Solutions Maxima 820 Workstation for gas chromatograph data management, equipped with Austin 386 personal computer
- Novel Network accessing the following computers: 2-ACMA 486-33, 2-Bitwise 386-33, 1-Austin 386-25, 2-Bitwise 386-25, 1-Austin 386-20, 1-NEC-286, and 1-Austin 286 computer
- Bruning Model 912 High Speed X-Y Plotter
- Fisher Model 200 Oven
- VWR Model 1370GD Oven
- VWR Model 1370FO Oven
- Mettler PJ3600 DeltaRange Balance
- A and D Model ER-180A Balance
- Okidata OL820 Lazer Printer
- Nec P5200 Line Printer
- Nec P6200 Line Printer (3 units)

PERSONNEL:

Northeast Analytical's major function is to provide high quality analytical testing services. To meet and maintain quality services, Northeast Analytical employs advanced degreed scientists well versed in environmental and analytical chemistry. The experience of the Senior Chemists plays an important role in project supervision and the training of Lab Technicians to perform chemical analyses correctly and produce highly respected analytical information.

Resumes for Northeast Analytical's staff are presented on the following pages.

ROBERT E. WAGNER: LABORATORY DIRECTOR

PROFESSIONAL EXPERIENCE:

1989-Present: **Lab Director**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Lab Director of Northeast Analytical, Inc.; supervises and manages laboratory staff in the chemical analysis of various environmental samples for PCB, pesticides/herbicides, inorganic, GC/MS and volatiles; develops and implements analytical methods and procedures; instruct laboratory analysts; project manager responsibilities; responsible for review of all data and QA/QC programs; long range planning; client relations; equipment evaluation and recommendation; maintain laboratory certification programs.

1981-1989: **Associate Staff Analytical Chemist**
General Electric Company
Research & Development Center
P.O. Box 8; 1 River Road
Schenectady, New York 12301

Employed in the field of environmental chemistry (PCB, PCDF, DIOXIN) and analytical polymer chemistry (trace analysis, residue solvent characterization, toxic component analysis). Involved with development of multi-component analysis and synthetic chemistry of standards. Isolation and fractionation of environmental residues from complex matrices. Development of state of the art analytical techniques with high resolution capillary gas chromatography utilizing a variety of detectors (ECD, FID, TCD, HECD). Knowledge of GC and HPLC (H/P, Varian, Shimadzu) and integration systems. In-depth maintenance capability to board level and hands-on hardware configuration.

1978-1981: **Biochemistry Project Supervisor**
Albany Medical College of Union University
Albany, New York 12208

Coordinated and developed a federally funded research project investigating the aging process using hamsters as models. Companion study explored the effects of lipid enriched diets on the lifespan of these animals. Supervised three technicians in the daily work routine. Also conducted clinical research to develop a quick and accurate determination of serum bilirubin levels based on a fluorescence quenching method.

1975-1978: **Biochemistry Technician**
Albany Medical College of Union University
Albany, New York 12208

Technician on above mentioned federal research project. Prepared enzyme complexes from various organ tissue for extensive biochemical analysis. Experience with centrifuges, A.A., Spectrophotometers, and fluorometer.

EDUCATION:

1975: **B.S. Chemistry**
SUNY at Pottsdam
Potsdam, New York

PROFESSIONAL AFFILIATIONS:

American Chemical Society
Schenectady Chamber of Commerce

PUBLICATIONS:

1984

J.F. Brown Jr., R.E. Wagner, D.L. Bedard, M.J. Brennan, J.C. Carnahan, R.J. May, and T.J. Tofflemire; "PCB Transformations in Upper Hudson Sediments". Northeast Environmental Science, Vol. 3, No. 384, p.167-179, 1984.

R.E. Wagner and J.C. Carnahan; "Capillary GC-Quantitation of Polychlorinated Biphenyls". Presented before the Varian Chromatography Symposium, April 1984.

1985

B.J. Vivier and R.E. Wagner; "Gas Chromatography Date Reduction Software". GE CR&D Memo Report #MOR-85-024, Class 2, March 1985.

J.F. Brown Jr., R.E. Wagner, D.L. Bedard, M.J. Brennan, J.C. Carnahan, R.J. May, and T.J. Tofflemire; "PCB Dechlorination in Upper Hudson Sediments". Presented before the Division of Environmental Chemistry, American Chemical Society 189th National Meeting, Miami, Florida, Vol. 25, No. 1, Paper #12, p.35-37, April 29-May 3, 1985.

R.E. Wagner, J.C. Carnahan and R.J. May; "Calibration Method for PCB Analysis by Capillary GC and Electron Capture Detection". Presented before the Division of Analytical Chemistry, American Chemical Society 189th National Meeting, Miami, Florida, Paper #201, April 28-May 3, 1985.

R.E. Wagner and J.C. Carnahan; "An Internal Standard for Capillary GC Analysis of PCB Mixtures". Presented before the Division of Analytical Chemistry, American Chemical Society 189th National Meeting, Miami, Florida, Paper #202, April 28-May 3, 1985.

D.L. Bedard, L.H. Bopp, M.J. Brennan, R.E. Brooks, J.F. Brown Jr., J.C. Carnhan, D.T. Gibson, M.L. Haberl, C. Johnson, S.H. Lockwood, K.L. Longley, R.J. May, D.P. Mobley, L.M. Nadium, M.J. Schocker, T. Su, R. Unterman, R.E. Wagner, and G.W. Yeager; General Electric Company Research and Development Program for the Destruction of PCBs, Fourth Progress Report, 6/1/84-6/1/85.

R.E. Wagner and J.C. Carnahan; "An Internal Standard for Capillary GC Analysis of PCB Mixtures". Presented before the General Electric Company-Wide Materials Characterization Symposium, 7th Meeting, April 22-24, 1985.

R.E. Wagner and J.C. Carnahan; "Internal Standard for Capillary GC Analysis of PCB Mixtures". Presented before the Varian Chromatography Symposium, March 1985.

J.F. Brown Jr., D.L. Bedard, L.H. Bopp, J.C. Carnahan, R.W. Lawton, R.D. Unterman, and R.E. Wagner; "Human and Environmental Biodegradation of PCBs". Presented before the EPRI PCB Conference, Seattle, Washington, October 22, 1985.

J.F. Brown Jr., D.L. Bedard, J.C. Carnahan, R.W. Lawton, R.E. Wagner; "Environmental Dechlorination of PCBs". Presented before the Society for Environmental Toxicology and Chemistry Meeting, St. Louis, Missouri, November 11, 1985.

1986

J.F. Brown Jr., R.E. Wagner; "Polychlorinated Biphenyl (PCB) Movement and Transformation in Acushnet Estuary Sediments". A draft manuscript prepared for RTE Aerovox Corporation and GE/CEIP to be eventually written into two or more scientific paper discripting the above title. 9/26/86.

1987

D.L. Bedard, M.J. Brennan, R.E. Wagner, M.L. Haberl, and J.F. Brown Jr.; "Extensive Degradation of Aroclors and Environmentally Transformed PCBs by ALCALIGENES EUTROPHUS H850". Applied and Environmental Microbiology, Vol. 53(5), p.1103-1112, May 1987.

J.F. Brown Jr., R.E.Wagner, H. Feng, D.L. Bedard, M.J. Brennan, J.C. Carnahan, and R.J. May; "Environmental Dechlorination of PCBs". Environmental Toxicology and Chemistry, Vol. 6(8), p.579-593, August 1989.

J.F. Brown Jr., D.L. Bedard, M.J. Brennan, J.C. Carnahan, H. Feng, R.E. Wagner; "Polychlorinated Biphenyl Dechlorination in Aquatic Sediments". Science, Vol. 236, p.709-712, May 1987.

J.F. Brown Jr., J.C. Carnahan, S.B. Dorn, J.T. Groves, W.V. Ligon, Jr., R.J. May, R.E. Wagner, and S.B. Hamilton; "The Levels of Toxic PCDF Congeners in Used and Unused PCB Dielectric Fluids". Dioxin '87 - Seventh International Symposium, Las Vegas, Nevada, Oct. 4-9, 1987.

J.F. Brown Jr., and R.E. Wagner; "PCB Dechlorination in Marine Sediments". Abstracts of Papers at the 8th Annual Meeting of the Society for Environmental Toxicology and Chemistry, Pensacola, FL, No. 136, 1987.

1988

J.F. Brown Jr., R.W. Lawton, M.R. Ross, J. Feingold, R.E. Wagner, and S.B. Hamilton; "The Persistence of PCB Congeners in Normal and PCDF-Poisoned Humans". Presented before the DIOXIN '88 Conference, Umea, Sweden, August 21-26, 1988.

J.F. Brown Jr., and R.E. Wagner; "A Simple Index for Summarizing the Alteration State of Environmental PCB Mixtures". Presented before the Society for Environmental Toxicology and Chemistry Meeting, November 1988.

J.F. Brown Jr., J.C. Carnahan, S.B. Dorn, J.T. Groves, M.V. Ligon, R.J. May, R.E. Wagner, and S.B. Hamilton; "Levels of Bioactive PCDF Congeners in PCB Dielectric Fluids from Capacitors and Transformers". Chemoshere.

J.F. Brown Jr., R.E. Wagner, and D.L. Bedard; "PCB Dechlorination in Hudson River Sediment". Science, Vol.240, 1988, p.1674-1676.

1990

J.F. Brown Jr., and R.E. Wagner; "PCB Movement, Dechlorination, and Detoxication in the Acushnet Estuary". Environ. Tox. and Chem., Vol.9, p.1215-1233, 1990.

ROBERT W. STOLL: FINANCIAL MANAGER

PROFESSIONAL EXPERIENCE:

1989-Present: **Financial Manager**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Financial Manager of Northeast Analytical, Inc. Supervises administrative personnel; performs all ordering and purchasing; accounting and business management responsibilities; interfaces with daily lab activities; long range planning; client relations; equipment and annual budget regulation; staffing; project manager on laboratory programs.

1985-1989: **Process Engineer**
General Electric Company
Product Operations Department (POD)
Research and Development Center
P.O. Box 8; 1 River Road
Schenectady, New York 12301

Responsible for the operation of the Thin Film Deposition Area of the liquid Crystal Display Pilot Line. Characterization and process control on all films used in the fabrication of Thin Film Field Effect Transistors using Sputtering, Evaporation, and PECVD. Responsible for the daily work routine of four technicians, as well as the equipment, facilities and operator
specification for the US factory design.

1980-1985: **Associate Staff Chemist**
General Electric Company
Research and Development Center
P.O. Box 8; 1 River Road
Schenectady, New York 12301

CVD Tungsten Project: Developed a unique CVD reactor that was capable of selectively depositing tungsten in 2 micron, straight side wall vias; at deposition rates in excess of 1000A/min. The technology was sold to GENUS Corp. Developed both selective and non-selective tungsten processes using surface pretreatments to either enhance or hinder deposition. Analyzed and developed a method of relieving the tungsten film stress which was responsible for the spontaneous delamination of tungsten films on glass surfaces.

Fumed Silica Project: Designed a high temperature infrared flow cell (750C) and a fluidized bed reactor to study the kinetics of fumed silica using a variety of silylating agents. Analyses were conducted using an Nicolet 7199 FT-IR spectrometer and a Micromeritics Digisorb 2500 Surface Area Analyzer. Responsible for the operation and maintenance of both machines.

Translex Project: Synthesis of polycarbonate via the melt polymerization method. The polymers were analyzed for impurities and thermal degradation products utilizing GC, HPLC, and NMR.

1979-1980: **Research Technician**
State University of New York at Albany
1400 Washington Avenue
Albany, New York 12222

Provided technical support for a federally funded research project investigating the aging process using hamsters as models. Companion study explored the effect of lipid enriched diets on the lifespan of these animals. Prepared enzyme complexes from the heart organ for extensive biochemical analysis. Experience with centrifuges, A.A., spectrophotometers, fluorometers, and oxygraphs.

1976-1977: **Chemical Laboratory Technician**
Corning Glass Works
Sullivan Park Research and Development
Painted Post, New York 14870

Responsible for the precision hydrofluoric acid etching of Vycor glass tubes. Operated two computerized lathes used to place layers of BC13, GeCl4, and PCL5 on the inside of the Vycor tubes, which were later drawn into optical waveguide fibers.

1972-1975: **Inventory Management Specialist**
Military Service
United States Air Force
Rank: Sergeant E-4

Non-commissioned officer in charge of the Base Composite Tool Kit Program. Duties involved meeting with representatives of the base maintenance organizations to determine their tool requirements. Maintaining and updating all records for each composite tool kit. Supervised two airman in their daily routine.

EDUCATION:

1979: **B.S. Chemistry**
SUNY at Albany
Albany, New York

PUBLICATIONS:

Co-author of one journal article and four published proceedings of meetings.

PATENTS:

Method for Treating Fumed Silica (U.S.Pat.4,554,147)

Enhancing the Selectivity of Tungsten Deposition on Conductor and Semi-conductor Surfaces (U.S.Pat.4,552,783)

Selective Chemical Vapor Deposition Apparatus (U.S.Pat.4,653,428)

Method for Selective Deposition of Tungsten by Chemical Vapor Deposition onto Metal and Semi-conductor Surfaces (U.S.Pat.4,471,928)

GREGORY A. YOGIS: ***LABORATORY MANAGER***

PROFESSIONAL EXPERIENCE:

1991-PRESENT: **Laboratory Manager**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Supervises the organic section and coordination of inorganic laboratory functions. Responsible for the organization, directing, and controlling of all activities related to the operation of the organic section. Provides training, technical expertise and guidance to staff and clients. Assures that all analyses of samples meet contractual commitments, are performed in accordance with applicable state and federal methodology and within guidelines of the laboratory quality assurance program. Supervision responsibilities include sample management, extraction, GC, GC/MS, inorganics, and data deliverables.

Other duties include supervison of the laboratory Novel local area network, laboratory personal computers and data archive systems, computer programing, and computer data deliverables.

1987-1991: **Supervisor, Gas Chromatography/Senior Chemist**
ABB Environmental Services, Inc.
Portland, Maine

Supervised analytical section: Training, quality assurance/control, scheduling, and review. Analytical methods: Extensive method development, analysis and troubleshooting utilizing 500, 600, and SW-846, USEPA CLP and NYS-DEC CLP series methods. Developed and conducted soil gas field methods and other screening programs. Coordinated laboratory information systems: Setup and support of laboratory computer software and hardware, including implementation, coordination and troubleshooting of USEPA/CLP GC and GC/MS computer format deliverables. GC/MS analysis, using GC/MS VOA methods 624 and 8240. Laboratory Safety Officer: Developed and coordinated lab health and safety programs.

1984-1987: **Research Associate**
State University of New York
Research Center at Oswego
Oswego, New York

Pesticide/PCB Analytical Method Development: Biogeochemical uptake studies of organochlorine contaminants. Extensive GC and extraction method development. Laboratory Supervision: Assisted in laboratory management and supervised and instructed technical assistants. Remote sensing: Extensive bioacoustic method development and field work. USEPA water chemistry and computer data programming and analysis.

1983-1986: **Thesis Research/Teaching Assistant**
Chemistry Department
State University of New York at Oswego
Oswego, New York

Thesis research: Kinetic studies of Cobalt III complexes. Computer-Instrument Interfacing: Developed a software based interface system to allow computer data aquisition and processing. Chemistry Instruction and Laboratory Supervision: Instructed and evaluated college chemistry labs and classes.

1980-1981: **Research Assistant**
Chemistry Department
State University of New York at Oswego
Oswego, New York

Electrochemical Analysis: Developed analytical methods for the use of ion-selective electrodes in non-aqueous stability studies

EDUCATION:

1987: M.S. Chemistry
SUNY at Oswego
Oswego, New York

1981: B.S. Chemistry
Minor: Mathematics
SUNY at Brockport
Brockport, New York

PUBLICATIONS:

Yogis, G.A.; "Hydrocarbon analyses: methods, case histories and comments". Presented at the 13th annual meeting of the Association of Maine Environmental Laboratories. Augusta, Maine. March 26, 1991.

Yogis, G.A.: "Introduction to computer interfacing: an absorbance-time data acquisition experiment". Presented at Quest Meeting, Oswego, New York. April 8, 1987.

Yogis, G.A., R.J. Scrudato and W.H. McDowell; "Mirex in sediment and biota of Lake Ontario". Presented at the International Association for Great Lakes Research, 29th Conference, Toronto, Canada. May 26→29, 1986.

McDowell, W.H., R.J. Scrudato and G.A. Yogis; "Mirex/photomirex ratio in Lake Ontario". Presented at the International Association for Great Lakes Research, 29th Conference, Toronto, Canada. May 26→29, 1986.

Unger, P.A., S.B. Brandt and G.A. Yogis; "Acoustic assessment of fish stocks in small lakes; effects of fish and zooplankton distributions". Presented at American Fisheries Society, New York Chapter, Rome, New York, 1987.

Bixler, J.W., M. Cobb, R. French, T. O'Toole, J. Schudel and G.A. Yogis; "Stability sequences of cadmium (II) and zinc (II) monohalide complexes in alcohols and binary solvents mixtures containing methanol, dimethylsulfoxide, acetonitrile and water". Inorganica Chemica Acta, 128:105-111, 1987.

SCOTT K. O'NEIL: GC SECTION SUPERVISOR

PROFESSIONAL EXPERIENCE:

1990-Present: **GC Section Supervisor**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Involved in organics analysis; data interpretation; computer assisted chromatographic review and editing; maintain and utilize gas chromatographic instrumentation; edit, review and package final reports; archive sample extracts and maintain computer files; apply expertise in PCB and Pesticide residue analysis to complex sample matrices.

1988-1990: **Senior Biochemical Technician**
Health Research Inc.
Wadsworth Center Laboratories and Research
Empire State Plaza
Albany, New York 12201

Under the general supervision of a Senior Scientist, developed an experimental model and procedures for studying the effects of PCBs on the neurotransmitters and their metabolites in developing rodent brain tissue.

1984-1987: **Senior Chemist**
Sterling Drug Inc.
East Greenbush Plant
Rensselaer, New York

Under the general supervision of the Laboratory Manager, supervised a staff of 10 chemists and 3 technicians in the performance of quality control testing on pharmaceutical raw and finished materials. Maintained responsibility for method development, training, and instrumentation operability. In addition, assisted Laboratory Manager in budget development, purchasing, and manpower efficiency studies.

1979-1983: **Analytical Chemist**
Sterling Drug Inc.
East Greenbush Plant
Rensselaer, New York

Developed and implemented techniques for the quality control analysis of active ingredients in solid and liquid pharmaceutical dosage forms. Methodologies included: High performance liquid Chromatography; Gas-Liquid Chromatography; and Atomic Absorption Spectrophotometry. Conducted training for other staff in the above areas. Implemented maintenance and repair program for instrumentation used in the above areas.

1975-1979: **Research Technician**
Department of Drug Metabolism
Sterling-Winthrop Research Institute
Rensselaer, New York

Under the general supervision of a senior researcher, developed, validated, documented, and published methodology for the microanalysis of experimental pharmaceutical compounds in human and animal body tissues and fluids.

1975-1975: **Laboratory Technician**
NYS Health Department
New Scotland Avenue
Albany, New York

Conducted hemaglutination inhibition and compliment fixation tests on various species of serum samples for encephalitis antibodies. Collected samples from wild mammals in a field environment.

EDUCATION:

1975: A.A.S. Medical Laboratory Technology
Hudson Valley Community College
Troy, New York

1976-1980: Continuing Education
20 Undergraduate Hours

PUBLICATIONS:

F.H. Lee, R. Koss, S.K. O'Neil, M.P. Kullberg, M. McGrath and J. Edelson; "High-Performance Liquid Chromatographic Determination of Plasma and Urinary 1-Ethyl-1, 4Dihydro-4-Oxo-1, 8-Naphthyridine-3, 7 Dicarboxylic Acid". Journal of Chromatography, 152 {1978} 145.

M.P. Kullberg, R. Koss, S.K. O'Neil, and J.Edelson; "High-Performance Liquid Chromatographic Analysis of Rosoxacin and its N-Oxide Metabolite in Plasma and Urine". Journal of Chromatography, 173 {1979} 155.

G.B. Park, R.F. Koss, S.K. O'Neil, G.P. Palace, and J. Edelson; "Determination of Sulfinalol Hydrochloride in Human Plasma and Urine by Liquid Chromatography with Amperometric Detection." Analytical Chemistry, Vol. 53, No. 4, April 1981, 605.

ANTHONY T. FAYO: GC/MS SUPERVISOR

PROFESSIONAL EXPERIENCE:

1992-Present: **GC/MS SUPERVISOR**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for completion of routine sample analysis in GC/MS section. Additionally involved in all phases of instrumentation (ie. purchase, maintanence, setup, support, trouble shooting). Directly responsible for client deliverables and support, including new business, GC/MS, expansion and maintaining all certifications.

1990-1992: **GC/MS (Group Leader)**
Pace Inc.
Wappingers Falls, New York

Analysis of soil and water based organic samples {both volatile and semi-volatile} using Gas Chromatography and Mass Spectrometry instruments. Methodologies include: CLP, SW-846, 625 and 624, as well as specific "client tailored" analysis {ie. Pesticides by MS}. Required the use of Hewlett-Packard Aquarius software on HP-RTE data system to interupt sample data.

Researched and reported unknown peaks that appeared on the data chromatogram that were not stored in the computers initial target compound library. Prepared stock standards of various compounds to assist in the identification of specific compounds in a given sample. Working knowledge of Wordperfect and Advancelink programs used to download data from RTE systems to floppy disks. Promoted to Group Leader in GC/MS department reporting directly to GC/MS Supervisor. Through HP courses, obtained certification as MS data interpretation specialist.

1989-1990: **GC/MS Analytical Chemist**
Camo, Laboratories, Inc.
Poughkeepsie, New York

Worked with Varian, Finnegan/MAT, and Hewlett Packard Gas Chromatography instruments as well as Finnegan/MAT and Hewlett Packard Mass Spectrometers. Also, the Tekmar LSC 2000 Liquid Sample Concentrator and Tekmar 4200 Volatile Autosampler System. Responsible for analysis of environmental based samples using the Finnegan OWA 1020 GC/MS system for volatile analysis and Finnegan Incos 50-Varian 3400 GC/MS system for Base Neutral analysis. Data reported and processed using Finnegan Autoquan and QA Report software.

EDUCATION:

1987: **A.A.S. Physics**
Dutchess Community College: Poughkeepsie, NY

1989: **B.S. Physics**
SUNY at Albany: Albany, NY

THOMAS C. HYNES: INORGANICS SECTION SUPERVISOR

PROFESSIONAL EXPERIENCE:

PRESENT: **Inorganics Section Supervisor**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the organization of the inorganic laboratory. Responsible for atomic absorbtion instrumentation (ie. purchase, maintainence, installation, support, and trouble shooting.) Involved in client deliverables and support, including new business, inorganics section expansion, and maintaining all certifications. Function as TCLP Coordinator, Supervising all TCLP extractions for metals, semi-volatiles, volatiles, herbicides, and pesticides.

1990-1992: **Chemist II/Metals Supervisor**
CTM Analytical Laboratories
15 Century Hill Drive
Latham, New York 12110

Responsible for the analysis of environmental samples using ICAP, Graphite Furnace AA and Flame AA techniques. Supervised and trained personnel in metals analysis and sample preparation.

1986-1989: **Chemist I/Wet Chemistry Supervisor**
CTM Analytical Laboratories

Responsible for the analysis of environmental samples using UV and IR Spectroscopy, gravimetry, and titration techniques. Supervised and trained personnel in wet chemistry procedures and sample preparation.

EDUCATION:

1985: **B.S. Chemistry**
SUNY at Plattsburgh
Plattsburgh, NY

JOHN B. MILLER: CHEMIST

PROFESSIONAL EXPERIENCE:

1991-PRESENT: **Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the preparation of samples for analysis in organics section. Prepares final extracts for packed column PCB analysis and quantifies total PCB by packed column method. Prepares sample extracts for high resolution or total PCB analysis.

1989-1990: **Engineering Technician/Field Services**
Empire Soils Investigation, Inc.
Ballston Spa, New York

Asbestos air monitoring, steel and rebar inspections, fire proofing inspections, soil collection, handling, storage, and testing (standard and modified proctors, sieve analysis), Density/moisture soil testing, concrete cylinder testing and inspection. Customer service representative. Inspection of installation of sanitary storm and water lines.

1987-1989: **Environmental Chemist/Field Chemist**
Clean Harbours, Inc.
Braintree, Massachusetts

Environmental site assessments; toxic/hazardous spill response team, QA/QC of field sampling; collection, handling, storage and transport to analytical labs. Assisted in the development, construction and maintenance of various monitoring wells, oil/water separators and air strippers. Customer service representative. Familiar with, EPA methodology, OSHA regulations, Federal and State hazardous materials laws, MSDS (health and safety), and manifest and chain of custody procedures.

EDUCATION:

1985: **B.S. Chemistry**
B.S. Environmental Engineering
Rensselaer Polytechnic Institute
Troy, New York

1981: University of North Carolina/Chapel Hill
Major: Chemistry

CERTIFICATIONS:

40 hour Hazard Materials Training Course. Troxler Certified (Atomic/Radioactive gauge used to determine the dry density/moisture content of a pre-determined layer of soil). New York State Asbestos Handlers License.

WILLIAM A. KOTAS: CHEMIST

PROFESSIONAL EXPERIENCE:

1991-PRESENT: **Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the preparation of samples for analysis in organics section. Reviews and compiles sample quality control information in organics sections. Implements and develops software programs for computer-local area network and oversees network operations. Performs analysis on soil and water samples for volatile organic compounds.

1990: **Microscopist/Analyst**
Entek Environmental & Technical Services
Troy, New York

Performed analysis of air and bulk materials for the presence of asbestos fibers by Phase Contrast and Polarized Light Microscopy. Assisted in the development of a comprehensive training examination for new analysts.

1988-1990: **Environ. Analyst/Quality Control Coordinator**
Professional Service Industries
Pittsburg Testing Lab Division
Albany, New York

Analyzed air and bulk samples for asbestos. Collected and compiled quality control data generated by each analyst. Assisted laboratory manager in daily operations and client relations.

EDUCATION:

1990: **B.S. Physics**
Minor: Chemistry
SUNY at Albany
Albany, New York

1985: **A.S. Mathematics/Science**
(Graduated with honors)
Hudson Valley Community College

INGA C. HOTALING: CHEMIST

PROFESSIONAL EXPERIENCE:

1991-PRESENT: **Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsibilities include extraction and purification of water samples for High Resolution PCB analysis. Preparation and analysis of environmental samples for metals using Graphite Furance AA and Flame AA instrumentation.

1989-1991: **Stallion Manager**
Highcliff Farm
Division of Tri-Noble Stable
Delanson, New York

Provided and maintained high quality care for thoroughbred breeding stallions and surroundings. Assisted with surgeries, semen evaluation, transtrachea wash, plasma transfusion, vaccination, x-rays, and administered medication.

1986-1989: **Broodmare Manager**
Schoenborn Brothers Farm
Climax, New York

Responsibilities included organization of daily work schedule, mare and foal care, sales preparation, and assistance in veterinarian reproductive work.

1986: **Chemical Laboratory Assistant**
Smith & Smith Environmental Laboratory
Sierra Vista, Arizona

Initiated GC procedure for testing of herbicides in soil and sludges. Completed bacteriological and chemical water analysis. Other duties included water sample collection and preparation.

1983-1985: **Chemical Laboratory Assistant**
National Agricultural
Research & Development Institute
Augustenberg, Germany

Planned and carried out analytical procedures in connection with several research grants which included studies of heavy metals in sewage sludge and their effect in agriculture. Uptake of heavy metals by crops in relation to their concentration in the soil solution. Determination of pesticides and PCBs in municipal waste waters and the uptake of strontium-90 in agricultural crops in connection to heavy metal content and soil type.

EDUCATION: **1983:** Karl-Engler School
National Agricultural
Research & Development Institute
Augustenberg, Germany

MARK F. McTAGUE: CHEMIST

PROFESSIONAL EXPERIENCE:

1991-Present: **Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the preparation of samples for analysis in organics section. Performs GC analysis on water and soil samples for volatile organics. Extracts and analyzes oil and grease samples. Member of safety committee. Performs sample extracts on medium and high level PCBs. Instruct chemists on preparation and extraction techniques.

1989-1989: **Alcon Laboratories**
Toxicology Department
2600 South Freeway
Fortworth, Texas

Assisted in preparation and execution of toxicology studies including dosing and restraining of animals and necropsy. Conceptualized and implemented a time-saving computerized archival system for slides and tissues. Developed and performed numerous biochemical assays.

EDUCATION:

1991: **B.S. Biology**
Minor: Chemistry
SUNY at Albany
Albany, New York

LAN VITITOW: ***CHEMIST***

PROFESSIONAL EXPERIENCE:

1992- PRESENT: **Associate Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the extraction and purification of water samples for High Resolution PCB analysis. Responsible for herbicide analysis, including extraction and instrumental analysis.

1990-1992: **Analytical Chemist**
Environment One Corporation
2773 Balltown Road
Schenectady, NY 12309

Performed analysis of pesticides, PCBs, herbicides, phthalates, phenols and hydrocarbons in water, oil, air and soil samples. Methods of extraction included, steam distillation, soxhlet, sonication, liquid/liquid, charcoal tube desorption. Prepared standards and samples for analysis. Preformed extract clean up to remove substances for instrumental analysis of organics. Performed data interpretation and calculations. Wet chemical analysis including titration for Nitrate, Sulfate and Cyanides, chemical oxygen demand, and total organic compounds. Used Omega data management program. Operated electron capture GC and FID GC (Perkin Elmer), Digester, Dohrman Carbon Analyzer, and spectrophotometers. Participate in NYS DOH, NIOSH & EPA proficiency tests. Performed internal QA/QC test using surrogate spikes and standard mixtures to obtain percent recovery. Worked independently and with other chemist.

1985-1985: **Lab Assistant**
Albany Medical Center

Selected to participate in coop-education work program. Assigned to medical laboratory. Prepared tissue and blood samples for medical analysis. Prepared and filed medical records. Performed library searches for medical references.

EDUCATION:

1990: **B.S. Chemistry**
Minor: Mathematics
SUNY at Albany
Albany, New York

BRIAN SAUNDERS : CHEMIST

PROFESSIONAL EXPERIENCE:

1992- PRESENT: **Chemist**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Responsible for the extraction and preparation of water samples, soil samples, oil samples, and wipe samples for High Resolution Congener Specific PCB analysis. Responsible for TCLP, Pesticide And BNA extraction.

1990-Present: **Aide-de-Camp**
HHC 42nd ID, NYARNG
Glenmore Armory
Troy, N.Y. 12180
Rank: 1st Lieutenant: 0-2

Provide the Assistant Division Commander-Maneuver (ADC-M) with any type of support in the performance of his duties. Coordinate all travel arrangements, supervise his personal staff, and coordinate official functions. Supervise the preparation of the ADC-M'S correspondence, and update his calender with the Secretary General Staff (SGS). Ensure the ADC-M is on time to all required appearances, and perform additional duties as required.

1990-1992: **Platoon Leader**
E. Co. 42nd MSB, 42nd ID, NYARNG
125 Washington Blvd.
Schenectady, N.Y. 12305

Responsible for the effectiveness, efficiency, and readiness of the Land Combat Maintenance Platoon. Provide leadership to the soldiers of the platoon to insure they are effectively trained and developed. Maintain platoon equipment including vehicles, generators, and sensitive electronic equipment. Additional duties include perimeter defense officer, safety officer, PT officer, convoy officer, NBC officer, and weight control officer.

1988: **U.S. Army ROTC Advanced Camp Ft. Bragg, NC.**

1987: **U.S. Army Basic Combat Training Ft. Dix, NJ.**

EDUCATION:

1990: **B.A. Biology**
Potsdam College (SUNY)
Potsdam, N.Y. 13676

U.S. Army Ordnance Officer Basic Course
91C-Missle Material Maintenance Mngt.Course
Red Stone Arsenal
Huntsville, AL

TRACY M. BENGTSON: SAMPLE CUSTODIAN

PROFESSIONAL EXPERIENCE:

1990-PRESENT: **Sample Custodian**
Northeast Analytical, Inc.
301 Nott Street
Schenectady, New York 12305

Sample Management responsibilities include initialization and tracking of sample flow, sample log-in, storage, and disposal. Maintenance and tracking of freezer archive projects. Maintenance of sample tracking logbooks, chain of custody and manifest documentation, MSDS log, and client records. Prepares client deliverables and certificates of analysis. Prepares samples for shipment following NYS DOT Hazardous Material Protocols and shipping regulations, and is responsible for maintenance of such records. Responsible for laboratory sample bottle preparation, strictly adhering to methodology requirements. Familiar with EPA methodology, Federal and State hazardous materials laws, manifest and chain of custody documentation and procedures. Other duties include client relations, all ELAP correspondence and administrative assistant responsibilities.

3/89-11/89: **Administrative Assistant**
Martin E. Keller
Morris Road
Schenectady, New York

Administrative responsibilities included office management, employee/employer relations with union representatives and arbitrators, initiation and processing of client quotations, data processing, all stock purchasing, telephone communications {including delinquent accounts management}, and client relations.

1/85-5/86: **Department Supervisor/Coordinator**
Harold's Army & Navy Department Store
Oneonta, New York

Managed and Supervised three individual associates in maintainence and stocking of store merchandise. Directly responsible for merchandise assessments for purchasing recommendations to store manager on a bi-monthly basis. Responsible for store layout and collaboration on advertising. Responsible for maintainence of merchandise records and inventory.

6/83-9/84: **Executive Secretary**
Cooperstown Central High School
Cooperstown, New York

Secretarial responsibilities included office management, direct responsibility for presidential and vice presidential relations with students and staff. Set up of yearly student handbook and yearbook layout supervision. Data processing, office supply purchasing, switchboard operations, telephone communication, and client relations.

MARY STOLL:	***LABORATORY DATA PACKAGER***
WENDY LEE-WAGNER:	***LABORATORY DATA PACKAGER***
ANITA BRUNO:	***LABORATORY ASSISTANT***

NORTHEAST ANALYTICAL SUMMARY OF QUALIFICATIONS AND SERVICES

- Experienced staff of chemists.
- Modern instrumentation including atomic absorption spectrophotometer, gas chromatograph, and gas chromatograph/mass spectrometer.
- NYSDOH ELAP certified laboratory.
- PCB congener specific analysis.
- Volatile organic compound determination in water and soil.
- TCLP extraction and analysis.
- Computer generated reports customized to client deliverables.

Tracking Forms 10 & 11
Appendix E

CRANSTON QAPjP TRACKING FORM

No. 10
Date: 12/15/92

PERSON REQUESTING REVISION: Diana Baldi, David Walters

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
Diana Baldi: CIBA-GEIGY National Services Contract Administrator
David Walters: TRIANGLE LABORATORIES OF HOUSTON, INC., Laboratory Manager

NATURE OF CHANGE TO QAPjP:
Type: 1. Major____ Minor X (check one)
2. Informational____ Technical X (check one)

Section(s): Sections 2, 8, and 14
of Document Triangle Laboratories of Houston, Inc., QAPP (Appendix E of Cranston QA Documents: Supplement #1)

REVISION: Revise Section 2 to update revision numbers in pertinent sections; revise Section 8 (p. 1) fo specify the frequency of mass spectrometer tuning, and; revise Section 14 (p. 1) to substitute percent RPD for percent RSD

REASON FOR CHANGE: Requested by USEPA

EFFECTS OF CHANGE: Clarification of procedure and of precision determination; no other effects

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of Sections 2, 8, and 14 of Appendix E (Triangle Laboratories of Houston, Inc., QAPP) of Cranston QA Documents: Supplement #1. These revised sections will be accompanied with Cranston QAPP Tracking Form No. 10 for inclusion in Section 18 of Cranston QA Documents: Supplement #1.

Diana Baldi — 12/17/92
Project Manager — Date
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M. Leber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

USEPA Project Manager — Date

CRANSTON QAPjP TRACKING FORM

No. 11
Date: 12/15/92

PERSON REQUESTING REVISION: Diana Baldi, David Walters

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
Diana Baldi: CIBA-GEIGY National Services Contract Administrator
David Walters: TRIANGLE LABORATORIES OF HOUSTON, INC., Laboratory Manager

NATURE OF CHANGE TO QAPjP:
Type: 1. Major____ Minor X (check one)
2. Informational X Technical____ (check one)

Section(s): Section 17
of Document of Triangle Laboratories of Houston, Inc., QAPP (Appendix E of Cranston Qa Documents: Supplement #1)

REVISION: Revise Section 17 to update organizational charts and resumes

REASON FOR CHANGE: Update personnel status

EFFECTS OF CHANGE: Clarification of personnel and responsibilities

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of Section 17 of Appendix E (Triangle Laboratories of Houston, Inc., QAPP) of Cranston QA Documents: Supplement #1. This revised section will be accompanied with Cranston QAPP Tracking Form No. 11 for inclusion in Section 18.0 of Cranston QA Documents: Supplement #1.

[NOTE: This tracking form is being issued concurrently with Tracking Form #10. The revision number of Section 17 has been incorporated into the Section 2 changes listed in Tracking Form #10.]

Diana Baldi
Project Manager
Responsibility: CIBA-GEIGY National Service Contract Administrator

12/17/92
Date

Diane M. Reber
CIBA-GEIGY Project Coordinator

12/18/92
Date

APPROVED (if technical change):

NOT REQUIRED

USEPA Project Manager

Date

Section	Revision	Pages
1. Title Page	0	1-1
2. Table of Contents	1	2-1
3. Project Description	0	3-1
4. Project Organization	0	4-1
5. Quality Assurance Objectives	0	5-1
6. Sampling Procedures	0	6-1
7. Sample Custody	0	7-1
8. Calibration Procedures and Frequency	1	8-1
9. Analytical Procedures	0	9-1
10. Data Reduction, Validation, and Reporting	0	10-1
11. Internal Quality Control Checks	0	11-1
12. Performance and System Audits	0	12-1
13. Preventative Maintenance	0	13-1
14. Specific SOP's used to assess data, Precision, Accuracy, Representativeness, and Completeness	1	14-1
15. Corrective Action for out-of-control Situations	0	15-1
16. Quality Assurance Reporting Procedures	0	16-1
17. List of Current Personnel	1	17-1
18. List of Changes to the QAPjP	0	18-1

Distribution:

Triangle Laboratories of Houston:

Stephen R. Missler
Xiang-Qiu Liang
Patricia R. Middleditch
Maria Vassiliadou
Saroj A. Parikh
Rose V. West
Rolando A. Diaz

Woodward-Clyde Consultants:

Mark Houlday

CIBA-GEIGY:

Diana Baldi

SECTION 8

CALIBRATION PROCEDURES AND FREQUENCY

8.1 ANALYTICAL INSTRUMENTS

Calibration materials are employed which insure calibration accuracy. Materials are prepared according to prescribed procedures. Only reagents of the highest commercial quality are used for preparation of working standards. Whenever possible, the working standards are analyzed against primary standards obtained from the EPA. Only high quality volumetric glassware and balances are used for standard preparation. Our balances receive regular maintenance and are calibrated against Class S weights prior to preparation of standard solutions.

8.1.1 GC/MS Tuning Conditions and Mass Calibration

The high resolution mass spectrometer is tuned to give the required static resolving power. The instrument is then mass calibrated using PFK each 12 hours of operation.

8.1.2 GC/MS Calibration Curves

All instruments are subjected to initial calibration procedures, the details of which will be specified in Sections 8.2.2.1 and 8.2.2.2. Curves have a minimum of five points and include a response factor for each analyte (see Table 8-3 for calibration standard concentrations).

Continuing calibration is demonstrated on a daily basis. The maximum time between demonstrations of continuing calibrations is 12 hours. The exact specifications for continuing calibration are as specified in the SOW 12/90 and require response factors to agree with-in 30% of the initial calibration value. In the event that continuing calibration cannot be demonstrated after corrective action (such as retuning instruments, maintenance of chromatographic columns, etc.), a new initial calibration curve will be generated.All standards and samples will have internal standards added at a level approximating the mid point of the calibration curve. The response factor will be calculated from:

$$RF = A_S C_{IS} / A_{IS} C_S$$

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where:

A_{IS} is the area of the internal standard

A_S is the area of the target compound

C_{IS} is the amount of internal standard

C_S is the amount of the target compound

The response factor is used to demonstrate linearity in initial calibrations, continuing calibration and to determine the concentrations of analytes.

8.2 Accuracy

8.2.1 Reference Materials

Only the highest quality chemicals will be used for reference materials. Where practical, standard solutions will be traceable to EPA primary references or NBS standard reference materials. Triangle Labs' procedures call for the use of a series of labeled and unlabeled PCDD/PCDF standards. The former are obtained in solution while the latter are purchased in the crystalline form so that weighed standard solutions can be prepared. The preparation of any standard solution is performed by the Supervisor of the Sample Preparation Laboratory, witnessed by another qualified chemist and is recorded in the spiking solution log book. The calculations are verified by the Quality Assurance Officer. Traceability of the standard solutions is facilitated by the use of codes that unambiguously identify the standard solutions.

The solutions are made in tridecane and stored at room temperature away from light. The solutions are frequently examined for possible deterioration or evaporation primarily when new batches of sample fortification or calibration solutions are prepared. A new set of calibration solutions will be prepared whenever a new sample fortification solution is used during the sample extraction. The preparation of a new sample fortification will be required when at least one of the component primary standard solution is replaced by another batch.

Standard solutions presenting signs of deterioration or the integrity of which can no longer be assured will be replaced at once.

8.2.2 System Performance and Calibration Checks

The instrumental performance requirements of the EPA will be followed. In general, this will result in an initial calibration of each instrument and a regular (daily) demonstration of continuing calibration, and tests designed to demonstrate proper functioning of the chromatographic systems.

8.2.2.1 Initial Calibration

The mass spectrometer response is calibrated by using a set of five initial calibration solutions.

An acceptable calibration must meet the following criteria:

1) The percent relative standard deviations for the mean response factors from each of the unlabeled analytes and of the internal and surrogate standards must be less than 15 percent (Table 8-1).

2) The signal-to-noise ratio (S/N) for the GC signals present in every selected ion current profile must be $\geq$ 2.5 for each analyte and $\geq$ 10 for each standard.

3) The ion abundance ratios must be within the specified control limits (see Table 8-2).

Failure to meet any of the above criteria will result in a corrective action (i.e., locating the source of the problem and adjusting the instrument tuning parameters) before repeating the rejected analysis. Triangle Labs will not analyze sample extracts unless a valid initial calibration is available.

The mean relative response factors are obtained by using the following expression:

$$\overline{RRF(_{\alpha i})} = \frac{1}{n} \sum_{1}^{n} \frac{A_\alpha * Q_\beta}{Q_\alpha * A_\beta}$$

where:

$\overline{RRF}(_{\alpha i})$ represents the mean relative response factor of a particular PCDD/PCDF congener (e.g., $_\alpha$ = TCDD; $_i$ = 2,3,7,8 isomer),

A_α (or A_β) is the integrated ion current of the quantitation ions characteristic of the homologou series,

$Q(_\alpha)$ (or Q_β) is the amount of compound injected onto the GC column, and

n is the total number of data points derived from the initial calibration.

8.2.2.2 Continuing Calibration

A continuing calibration is demonstrated every 12 hours by injecting 2 uL of the mid-concentration range calibration solution. The RRFs are calculated and compared to the mean RRFs obtained during the initial calibration procedure.

For the total homologous PCDD/PCDF concentrations (e.g., total HxCDDs), the RRFs are taken, when applicable, as the average of the RRFs for the individual congeners listed in the continuing calibration reporting form. Note that when only one isomer is present, a discrepancy may appear between the reported concentration for the individual isomer and the total, as a result of using a different RRF.

The continuing calibration delta RRF (on the data sheets) corresponds to the relative percent difference between the daily RRF and the initial calibration RRF.

An acceptable continuing calibration run must meet the following criteria:

1) The measured RRFs (for the unlabeled as well as labeled compounds) obtained during the continuing calibration run must be within 30 percent (Table 8-1) of the mean values established during the initial calibration.

2) The ion-abundance ratios must be within the allowed control limits listed in Table 8-2.

The Quality Assurance Officer approves or rejects the daily continuing calibrations. Should the criteria for acceptable calibration not be met, a new initial calibration will be established before sample extracts can be analyzed.

TABLE 8-1. INITIAL AND CONTINUING CALIBRATIONS RESPONSE FACTORS MINIMUM REQUIREMENTS

Compound	Relative Response Factors I-Cal %RSD	CCAL % D
Unlabeled Analytes		
2,3,7,8-TCDD	15	30
2,3,7,8-TCDF	15	30
1,2,3,7,8-PeCDD	15	30
1,2,3,7,8-PeCDF	15	30
2,3,4,7,8-PeCDF	15	30
1,2,3,4,7,8-HxCDD	15	30
1,2,3,6,7,8-HxCDD	15	30
1,2,3,7,8,9-HxCDD	15	30
1,2,3,4,7,8-HxCDF	15	30
1,2,3,6,7,8-HxCDF	15	30
1,2,3,7,8,9-HxCDF	15	30
2,3,4,6,7,8-HxCDF	15	30
1,2,3,4,6,7,8-HpCDD	15	30
1,2,3,4,6,7,8-HpCDF	15	30
1,2,3,4,7,8,9-HpCDF	15	30
OCDD	15	30
OCDF	15	30
Internal Standards		
$^{13}C_{12}$-2,3,7,8-TCDD	15	30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	15	30
$^{13}C_{12}$-OCDD	15	30
$^{13}C_{12}$-2,3,7,8-TCDF	15	30
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	15	30
Cleanup Standard		
$^{37}Cl_4$-2,3,7,8-TCDD	15	30
Recovery Standards		
$^{13}C_{12}$-1,2,3,4-TCDD		
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD		

TABLE 8-2. ION-ABUNDANCE RATIO ACCEPTABLE RANGES FOR PCDDs AND PCDFs

Number of Cl atoms	Ion Type	Theoretical Ratio	Control Limits Lower	Upper
4	M/M+2	0.77	0.65	0.89
5	M+2/M+4	1.55	1.24	1.86
6	M+2/M+4	1.24	1.05	1.43
7	M+2/M+4	1.04	0.88	1.20
8	M+2/M+4	0.89	0.76	1.02

8.2.2.3 Gas Chromatographic Column Performance Check

At the beginning of every 12-hour shift during which samples are analyzed for tetra- through octachlorinated dibenzodioxins and dibenzofurans, the fused-silica capillary GC column performance (60-m DB-5) is verified by injecting a solution composed of a mixture of selected PCDD/PCDF congeners that (1) allow documentation of the chromatographic resolution between 2,3,7,8-TCDD and the closest eluting TCDD isomers (≤25% valley) and, (2) permit the mass spectrometer operator to identify the various retention time windows for each class of homologous compounds.

Failure to meet the 25% valley criterion will necessitate the replacement of the fused-silica column by a new column if the normal column maintenance operations are unsuccessful. In the case of retention window shifts noted during this performance check, the mass spectrometer operator will repeat the column performance check after adjusting the appropriate mass descriptors' retention time windows during which specific ions are monitored.

A similar GC column performance verification is used for the "confirmation" of 2,3,7,8-TCDF in sample extracts using a second GC column capable of resolving 2,3,7,8-TCDF from its closest eluting congeners.

8.2.2.4 Confirmation Analysis

For samples found to contain 2,3,7,8-TCDF by using the 60-m DB-5 column, the associated sample extracts can be analyzed on a second high-resolution GC column (SP- 2331/DB-17 or DB-225). A GC column performance run precedes the analysis of the extracts

so that the 2,3,7,8-TCDF isomeric specificity can be documented. The results from such "confirmation" analyses should be used in the final report.

Confirmation analysis is performed by using a five point calibration curve, which is validated as described above for the full screen analysis. Triangle Labs will not analyze sample extracts unless valid GC column performance check and instrument response calibration have been acheived.

8.2.3 Analytical Performance

The overall performance of the analysis will be monitored through the regular use of blank samples, internal, surrogate, cleanup, and recovery standards. Wherever applicable, additional QA/QC samples will be analyzed to verify the analytical performance.

8.2.3.1 Laboratory Method Blank: Internal Standard Recoveries

A laboratory method blank consists of a sample that is prepared in an identical manner as a regular sample except the matrix is replaced by sodium sulfate for solid matrices or distilled water for aqueous matrices. The laboratory method blank sample (also known as the "TLH Blank") is fortified, extracted and fractionated along with the field samples at a frequency of one laboratory method blank per batch of 20 (or less) field samples of a given matrix type.

A valid laboratory method blank must present recoveries of the tetra- through octa- chlorinated internal standards between 25% and 150%. In case a laboratory method blank presents recoveries of the internal standards below the QC limits, a S/N ratio $\geq$ 10:1 for the internal standard is required before the laboratory method blank can be considered as a valid sample.

8.2.3.2 Laboratory Method Blank

An acceptable laboratory method blank must not contain any chemical interference or electronic noise at the m/z of the specified unlabeled PCDD/PCDF ions that is greater than 5% of the signal of the appropriate internal standard quantitation ion. A peak that meets identification criteria in the method blank must not exceed 2% of the signal of the appropriate internal standard.

8.2.3.3 Theoretical Method Quantification Limits (TMQL)

One can estimate a limit of quantification (TMQL) for 2,3,7,8-TCDD or 2,3,7,8-TCDF as follows:

The lowest concentration of 2,3,7,8-TCDD available during the establishment of the initial calibration is 0.1 ng/uL. The GC/MS instrumentation is capable of achieving a S/N of 50:1 for these analytes at that concentration. The final extract volume is 100 uL and the initial sample size is 10 g. Thus, the TMQL can be estimated by assuming 25% recovery

$$TMQL = \frac{S \times V}{W \times R} = \frac{0.1 \times 100}{10 \times 0.25} = 4 \text{ ppb}$$

where:

S represents the concentration of 2,3,7,8-TCDD/TCDF in the lowest concentration calibration solution (i.e., 0.1 ng/μL),

V is the final extract volume (μL),

R is the analyte percent recovery, and

W is the sample weight in g.

TMQL is expressed here in parts-per-billion (ppb).

The limit of detection (LOD) of the analytical procedure can be estimated to be one third of the TMQL. Similar calculations can be done to estimate the theoretical LOQ/LOD from MM5 and ambient air (PUF) samples. However, for MM5 and ambient air samples, one must take into consideration that only half of the sample extract is processed through the fractionation and analysis steps.

8.2.3.4 Internal Standard Percent Recoveries

A group of carbon-labeled PCDD/PCDF congeners, representing the tetra- through octachlorinated PCDD/PCDFs, is added to every sample before the extraction. The role of the internal standards is to quantify the indigenous analyte present in the samples (isotope-dilution mass spectrometry) as well as to determine the overall method efficiency. Field sample recoveries for the intenal standards must be between 25% to 150% for the tetra- through octachlorinated compounds.

8.2.3.4.1 Considerations on the Validity of Data from Samples Presenting Low Recoveries

There is a variety of reasons for which a sample may present low recoveries for the labeled standards that are used to monitor the extraction and fractionation efficiencies. A discussion on the sources for low recoveries is beyond the scope of this section.

The objective of this section is, however, to present some considerations concerning the validity of the results reported for such samples. For the purpose of the discussion that follows, low recoveries correspond to recoveries for tetra-octachlorinated congeners found to be below the 25% quality control limit.

Low-recovery sample data are not necessarily invalid data provided certain signal-to-noise ratio conditions are met. If these conditions are not met, all affected samples must be reextracted and analyzed without delay (i.e., 15-day fast-turn-around project). Should the data be rejected for low-recovery reasons, Triangle Laboratories will contact the Client in order to seek an authorization for the reextraction of the affected samples. If a matrix effect is operative, i.e., the repeat analysis leads to low recoveries for a second time, the two analyses (the original and the repeat analyses) will be invoiced as regular samples.

8.2.3.4.2 What Is So Special About S/N > 10:1?

The question remains as to why a S/N $\geq$ 10:1 leads to acceptable data even though the percent recoveries of the internal standards are below the 25% QC lower limit?

From an analytical point of view, it is generally accepted that a GC signal presenting a S/N $\geq$ 2.5:1 is a "detectable" signal. However, certain EPA analytical protocol(s) for the determination of TCDD require a S/N $\geq$ 10:1 in order to be a "quantifiable" signal. Quantitatively, at S/N 2.5:1, the variance associated with the measurement of the peak intensity is expected to be in the order of the peak intensity. On the other hand, at S/N 10:1, the variance associated with the peak intensity measurement is expected to be 25% of the peak intensity. That is, at S/N 10:1, the peak ratios (for example the ones used during isotope dilution techniques or analyte identification) will now have a meaning. The precision in the peak measurement will thus become just acceptable for quantitative analysis at the 10:1 S/N limit.

TABLE 8-3. INITIAL AND CONTINUING CALIBRATION STANDARDS

	CC1 (ng/µl)	CC2 (ng/µl)	CC3 CCAL (ng/µl)	CC4 (ng/µl)	CC5 (ng/µl)
Unlabeled Analytes					
2378-TCDD	0.1	0.25	0.5	1.0	2.0
2378-TCDF	0.1	0.25	0.5	1.0	2.0
12378-PeCDD	0.1	0.25	0.5	1.0	2.0
12378-PeCDF	0.1	0.25	0.5	1.0	2.0
23478-PeCDF	0.1	0.25	0.5	1.0	2.0
123478-HxCDD	0.25	0.625	1.25	2.5	5.0
123678-HxCDD	0.25	0.625	1.25	2.5	5.0
123789-HxCDD	0.25	0.625	1.25	2.5	5.0
123478-HxCDF	0.25	0.625	1.25	2.5	5.0
123678-HxCDF	0.25	0.625	1.25	2.5	5.0
123789-HxCDF	0.25	0.625	1.25	2.5	5.0
234678-HxCDF	0.25	0.625	1.25	2.5	5.0
1234678-HpCDD	0.25	0.625	1.25	2.5	5.0
1234678-HpCDF	0.25	0.625	1.25	2.5	5.0
1234789-HpCDF	0.25	0.625	1.25	2.5	5.0
OCDD	0.5	1.25	2.5	5.0	10.0
OCDF	0.5	1.25	2.5	5.0	10.0
Internal Standards					
$^{13}C_{12}$-2378-TCDD	0.5	0.5	0.5	0.5	0.5
$^{13}C_{12}$-123678-HxCDD	0.5	0.5	0.5	0.5	0.5
$^{13}C_{12}$-OCDD	1.0	1.0	1.0	1.0	1.0
$^{13}C_{12}$-2378-TCDF	0.5	0.5	0.5	0.5	0.5
$^{13}C_{12}$-1234678-HpCDF	1.0	1.0	1.0	1.0	1.0
Cleanup Standard					
$^{37}Cl_4$-2378-TCDD	0.25	0.25	0.25	0.25	0.25
Recovery Standards					
$^{13}C_{12}$-1234-TCDD	0.5	0.5	0.5	0.5	0.5
$^{13}C_{12}$-123789-HxCDD	0.5	0.5	0.5	0.5	0.5

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SECTION 14

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The experimental design allows the data to be grouped into sets that can be analyzed to evaluate data precision and accuracy. The central tendency and dispersion of data is assessed by reviewing the precision and accuracy. These assessments are performed on sets of 10 or more data points at regular frequency intervals by the Quality Assurance Officer.

The data sets are examined for systematic error (i.e., accuracy) by calculation of the arithmetic mean of the surrogate recoveries. Any bias in the measurements will be reflected in deviation of the mean from 100%. Where possible, accuracy is also assessed through the analysis of spiked samples. Once again, bias will be revealed by recoveries significantly different from 100%.

Precision is assessed through the analysis of duplicate samples. The relative percent difference (RPD) is calculated for replicate analyses. The formula for RPD is found on page 5-1 of this document.

TRIANGIE LABS OF HOUSTON, INC. PROPRIETARY INFORMATION

17.TRIANGLE LABS CORPORATE CHART, CRANSTON PROJECT ORGANIZATIONAL CHART, AND RESUMES

The focus of the Triangle Labs QA program is the Quality Assurance Officer. He/She is responsible for the day-to-day oversight of quality assurance activities. The Quality Assurance Officer reports directly to the President of Triangle Labs, and thus is organizationally independent of the Division Managers. Stephen R. Missler, Ph.D., President of Triangle Labs co-founded Triangle Labs in 1989. Prior to 1989, Dr. Missler was a Senior Research Chemist with Texaco Exploration and Production Technology Division, where he developed and directed an active research program addressing problems in the chemical analysis of environmental and petro chemical samples. Dr Missler has also been associated with the U.S. Army Medical Research Institute of Infectious Diseases in Frederick, MD and the U.S. Army Natick R & D Labs in Massachusetts. Dr. Misslers' research with the military was concerned with determination of chemical and biological warfare agents in environmental and biological samples, and with the development of the Military Drug Testing program. Should it prove necessary, he will be available to serve as an expert witness in any legal proceedings supported by data from the analytical laboratory.

TRIANGLE LABORATORIES OF HOUSTON, INC.
Organizational Chart

PRESIDENT
Stephen R. Missler, Ph.D.

SALES AND MARKETING
Bob Nelson

RESEARCH & DEVELOPMENT
Royal B. Freas, Ph.D.

PRODUCTION LABORATORY
David W. Walters, Ph.D.

QUALITY ASSURANCE
Marie Vassiliadou

ADMINISTRATION
Mary Kurth

SAMPLE CUSTODIAN
Rose West

SAMPLE PREPARATION
Curt West

MASS SPECTROMETRY
XiangQiu Liang

DATA PROCESSING
Alex Villalobos

TRIANGLE LABS CRANSTON PROJECT ORGANIZATIONAL CHART

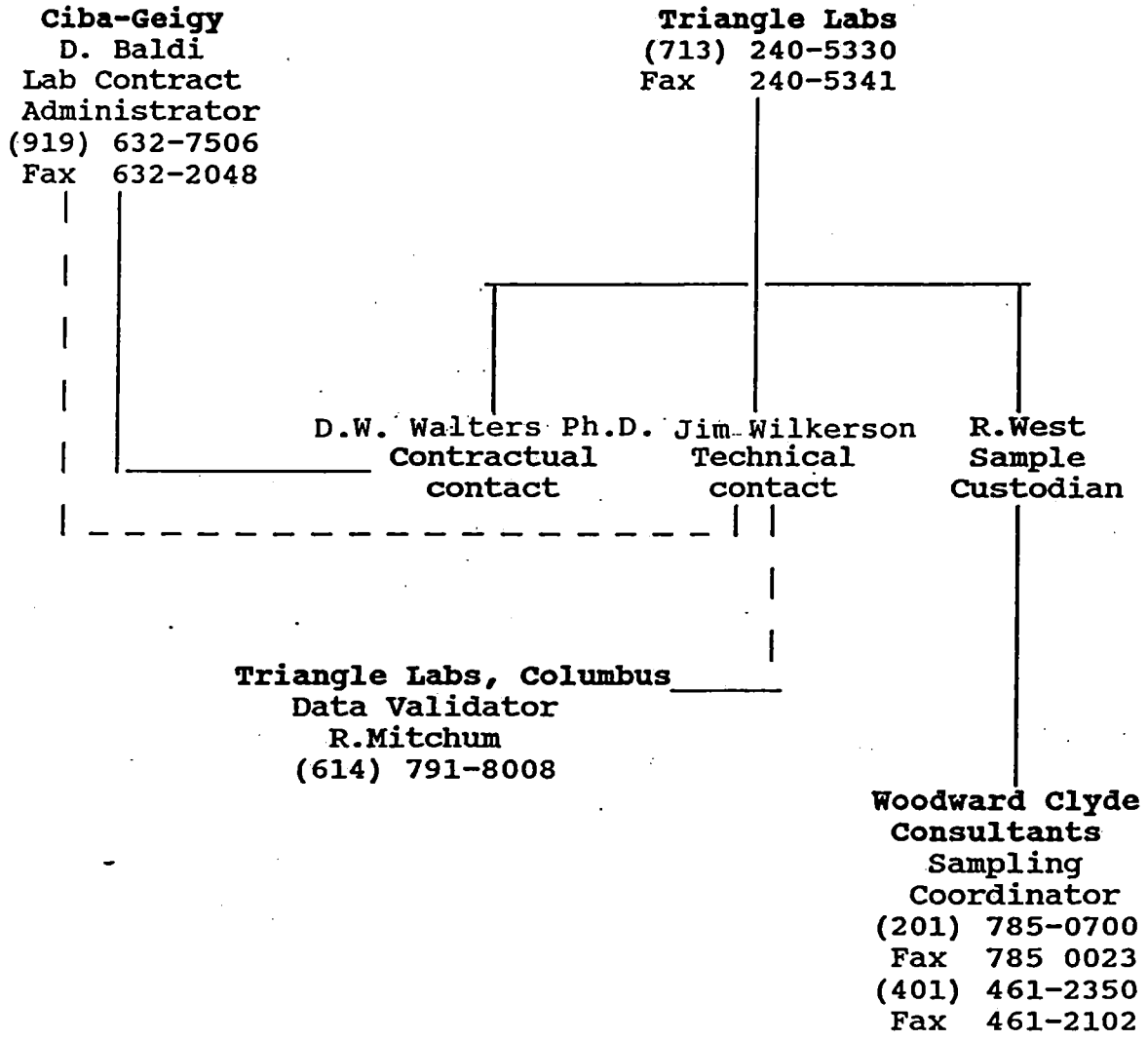

Figure 4-2

TRIANGLE LABS CRANSTON PROJECT ORGANIZATIONAL CHART

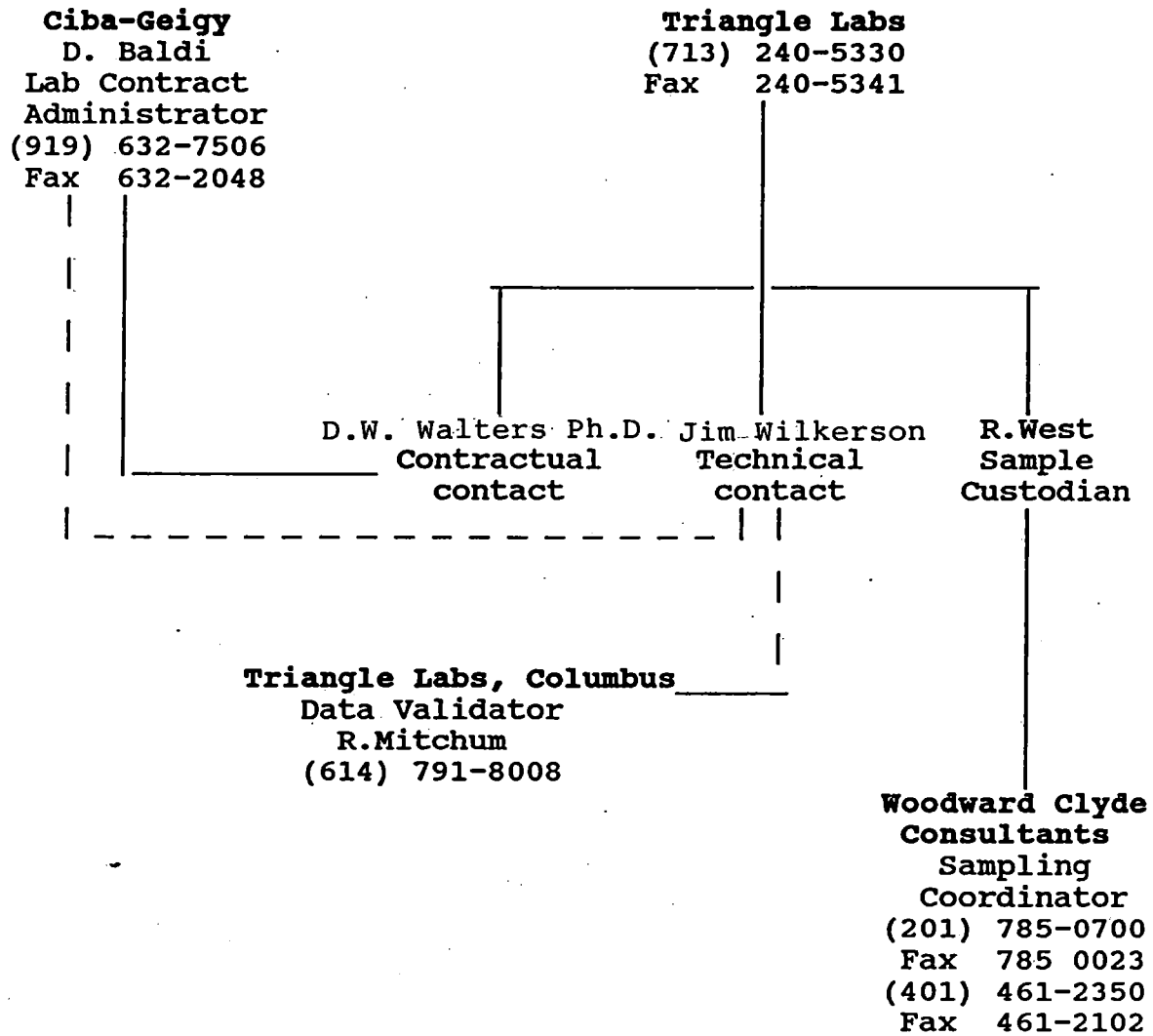

Figure 4-2

TRIANGLE LABORATORIES OF HOUSTON, INC.
Organizational Chart

PRESIDENT
Stephen R. Missler, Ph.D.

- **SALES AND MARKETING** — Bob Nelson
- **RESEARCH & DEVELOPMENT** — Royal B. Freas, Ph.D.
- **PRODUCTION LABORATORY** — David W. Walters, Ph.D.
- **QUALITY ASSURANCE** — Marie Vassiliadou
- **ADMINISTRATION** — Mary Kurth

- **SAMPLE CUSTODIAN** — Rose West
- **SAMPLE PREPARATION** — Curt West
- **MASS SPECTROMETRY** — XiangQiu Liang
- **DATA PROCESSING** — Alex Villalobos

STEPHEN R. MISSLER

EDUCATION

1976	Stephen F. Austin State University, Nacogdoches, Texas Bachelor of Science Degree in Biology
1979	University of Houston, Houston, Texas Doctor of Philosophy Degree in Biophysical Sciences

EMPLOYMENT

1989-present	Triangle Laboratories of Houston, Sugar Land, Texas President Responsible for all operations in the laboratory.
1986-1989	Texaco Exploration and Production Technology Division, Bellaire, Texas Senior Research Chemist
1983-1985	United States Army Medical Research Institute of Infectious Diseases, Fort Detrick, Maryland Chief, Analytical Toxicology Department
1980-1983	United States Army Natick Research and Development Center, Natick, Massachusetts Senior Research Associate, Analytical Chemistry Group and Military Assistant to the Director, Science and Advanced Technology Laboratories (positions held concurrently)
1976-1979	University of Houston, Houston, Texas Graduate Student/Research Assistant, Department of Biophysical Sciences

PUBLICATIONS

B.S. Middleditch, E.S. Chang, B. Basile, and S.R. Missler, "Alkanes in fish from the Buccaneer Oil Field," *Bull. Environ. Contam. Toxicol.* 22:249-257 (1979).

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BOOK

B.S. Middleditch, S.R. Missler, and H.B. Hines, "Mass Spectrometry of Priority Pollutants," Plenum Press, New York, 1981, xii + 308 pp.

PERSONAL AND CONFIDENTIAL

DAVID W. WALTERS, Ph. D.
17607 Hidden Forest
Spring, Texas 77379
(713) 370-9884

Personal Information

DOB: 52/08/26	Citizenship: USA
Marital Status: Married	Birthplace: Austin, TX
Ht/Wt: 5' 11"/210 lbs.	Health: Excellent

Education and Experience:

1990-pres Consultant; Practitioner's Management Svcs., Inc., 12031 Misty Valley, Houston, TX 77066

* Provide consultation to small, physician owned and non-physician owned laboratories in the areas of:
  laboratory operations
  government contracting
  regulatory compliance
  instrument selection and assay validation

1988-91 Half-Owner and Laboratory Director, Precision Medical Laboratory, 510 Bering Drive, #230 Houston, TX 77056

* Directed all aspects of Laboratory Operations including Administration, Technical Operations, Quality Assurance, Regulatory Compliance, Financial, Accounting, and Marketing & Sales.
* Quintupled laboratory revenues within 18 months. Annualized revenues exceeded $500 k.
* Increased test menu by 400%.
* Increased profit margin from -23% to 12%.
* Instituted new programs in Drugs of Abuse testing, Clinical Toxicology, and Government Bidding.

1989-90 Invited Instructor, University of Houston CADAC Program (technical aspects of drug testing)

1988-89 Technical Director, MPC Laboratory, Houston, TX, 77057

* Instituted Drugs of Abuse Testing Program and Toxicology Department to include Clinical, Forensic and Employment Drug Testing.

1987-88 Director, Department of Special Chemistry & Toxicology, MetPath, Inc. Teterboro, NJ

* Directed approximately 75 personnel performing variety of clinical procedures in Toxicology and Special Chemistry.
* $4.5 million cost-center budget.
* Annual revenues in excess of $15 million.

1985-87 Director, Department of Protein Chemistry, United Biomedical, Inc. Lake Success, NY

* Directed epitope research to identity highly

immunoreactive regions of the coat-envelope protein of HIV-I AND HIV-II viruses.
* Techniques included peptide synthesis, HPLC and FPLC separations and purifications, amino acid analysis, various derivatizations and peptide/protein (enzyme) coupling reactions, immunoassay techniques (solid and solution phase), Western Blotting, SDS PAGE, immunoelectrophoresis, etc.

1982-85 Graduate Student, Department of Biochemistry, Baylor College of Medicine, Houston, TX Ph. D. Biochemistry

* Graduate research in enzymology and protein chemistry.
* Thesis produced on enzyme and metabolic regulation via naturally occurring Thiol-Disulfide Exchange Reactions.

1979-82 Research Associate, GENEX Laboratories, Proteins Department, Rockville, MD

* Isolated and characterized proteins and enzymes of potential commercial value from a variety of organizations.

1976-79 Student, University of Texas at Austin, BS, Molecular Biology - graduated with Highest Honors

1973-76 Infantry Officer, United States Marines (Highest rank attained: Captain)

Honors, Awards and Professional Societies

Member - Phi Beta Kappa, Phi Kappa Phi, Phi Eta Sigma, Beta Beta Beta

Member - AACC, ACS

Member - Southwest Association of Toxicology (SAT)

Publications and References - available on request.

Familiar Techniques

- UV-Vis spectrophotometry
- GC Chromatography
- GC/MS (HP) Spectrometry
- HPLC (prep and analytical)
- Thin layer Chromatography
- Ultracentrifugation (prep and analytical)
- Electrochemical Detection
- Column Chromatography (Mol Sieve, Ion-Exch, affinity, antibody)
- Protein Purification & Characterization
- Scientific Programming
- Data Base Management
- Chemical Derivatization
- Protein Couplings
- SDS PAGE (1 & 2D)
- Peptide Systhesis
- Amino Acid Analysis
- Radionuclide use
- Colorimetric assays
- Fluorimetry, FPIA
- EIA, RIA, Immuno-blot Techniques
- Enzyme Kinetics
- Agarose Gel Electrophoresis
- Curve Fitting & Statistical Anal.

Familiar Instruments

- Recording Spectrophotometers (Gilford, Cary, Varian)
- HPLC (HP, Waters, Shimadzu, LKB, ESA, Bio-Rad)
- GC (Varian, HP)
- GC/MS (HP 5890/5970-A, Pascal Chem Station, Target Software)
- Electrochemical Detectors (ESA, Bio-Rad)
- Fluorimeters (Turner)
- Centrifuges (Beckman, Sorvall)
- Various Electrophoresis Devices (Bio-Rad, Helena)
- Clinical Chemistry Analyzers (Hitachi 705, 704, 717; Roche Cobas Bio, Mira, Mira-S, Fara; Olympus 5000, Technicon DAX-95; Abbott TDX, ADX, Spectrum; SYVA
- Clinical Hematology Analyzers (Technicon, Sequoia-Turner)
- Toxi-Lab TLC, HPTLC
- Autosamplers & Computer Aided Integrators
- IBM computers and compatibles

Familiar Software

- Programming Languages
  - Basic, Fortran
- Word Processing
  - Wordstar, Microsoft Word 5.0, Enable
- Telecommunication - Enable
- Relational Databases
  - Enable, Foxbase, FoxPro, Paradox
- Spreadsheets
  - Lotus 1-2-3, Enable, Quatro Pro 3.0
- Graphics
  - Harvard Graphics, Enable Perspective, Quatro Pro 3.0

MARIA VASSILIADOU

EDUCATION

1987 University of Houston, Houston, Texas
Master of Science Degree in Chemistry

1985 University of Houston, Houston, Texas
Bachelor of Science Degree in Chemistry

Enrolled in the Chemistry Ph.D. program at University of Houston (1987-1989)

EMPLOYMENT

1989-present Triangle Laboratories of Houston, Sugar Land, Texas

Quality Assurance/Quality Control Officer (1990-present)

Supervised and performed data validation functions for analysis of polychlorinated dibenzo-*p*-dioxins and dibenzofurans. Assisted in instituting a quality assurance program for the routine analysis of these compounds in environmental samples.

Instrumentation Lab Supervisor and Operator (1989-1990)

Operated and maintained a high resolution mass spectrometer for analysis of environmental samples. .Organised and set up instrumentation and data processing laboratories.

1988-1989 Texaco Chemical Division, Bellaire, Texas

Research Assistant

Performed research in chromatography and mass spectrometry. Operated and maintained a high resolution magnetic sector tandem mass spectrometer. Assisted in developing an interface between a high resolution mass spectrometer and capillary zone electrophoresis. Performed analysis of tracer compounds for oil samples using GC-MS and spectrophotometry.

1985-1987 University of Houston, Houston, Texas

Teaching Assistant

Taught undergraduate laboratory courses.

CURTIS JAMES WEST

503 Southwest Parkway
Oakwood Apartments #219
College Station, Texas 77840
(409) 696-5802

JOB OBJECTIVE: A chemical research position employing organic and analytical techniques.

EDUCATION:

June 1989: ***Bachelor of Arts in Chemistry***
College of Saint Rose, Albany, NY

1989-Present: Texas A&M University
Graduate studies in chemistry

Applicable coursework:
Instrumental Analysis
Organic Qualitative Analysis
-Tested for unknowns
Quantitative Analysis
-Tested for unknowns

WORK EXPERIENCE:

August 1989-Present: Graduate Teaching Assistant in Freshman Chemistry Laboratory, Texas A&M University.

June 1989-August 1989: Restaurant employee, Roys Roundtable Restaurant, Greenville, NY.

June 1989-July 1989: Telephone sales, TRI. Inc., Albany, NY.

June-August 1986, 1987: Golf course maintenance, Pleasant View Lodge, Freehold, NY.

June 1985-August 1985: Production, Becker Electronics, East Durham, NY.

HONORS:

June 1989: Graduated Cum Laude with 3.30 GPA.

Spring, Summer 1989: Deans List.

1986-1989: Local #190 Union Scholarship.

PROFESSIONAL AFFILIATIONS: American Chemical Society, student member.

XIANG-QIU LIANG

EDUCATION

1990	University of Houston, Houston, Texas Master of Science Degree in Chemistry
1982	South China Normal University, Guangdong, China Bachelor of Science Degree in Analytical Chemistry

EMPLOYMENT

1990-present	Triangle Laboratories of Houston, Sugar Land, Texas Instrumentation Laboratory Supervisor Operates mass spectrometer to identify and quantitate trace compounds in complex matrices. Developed routine preventive maintenance procedures and established programs that minimize instrument downtime.
1987-1990	University of Houston, Houston, Texas Research Assistant, Department of Chemistry (1987-1990) Vax operator, Canata Research Computer Center (1989) Teaching Assistance, Department of Chemistry (1987-1988)
1982-1986	South China Normal University, Guangdong, China Lecturer and supervisor of chemical lab
1975-1978	The Nitrogenous Fertilizer Factory of Xinhui, Guangdong, China Technician

PUBLICATIONS

Yu, W., Liang, X.-Q., and Freas, R.B. Unimolecular Dissociation Kinetics and Collision-Induced Dissociation of $[Mn_2(CO)_{10}]^+$: Determination of Individual Bond Dissociation Energies, *J. Phys. Chem.* in press

Liang, X-Q. and Freas, R.B. Fast-Atom Bombardment Tandem Mass Spectrometry of Polypyridyl Ruthenium(II) Complexes, *J. Inorg. Chem.* in press

Liang, X-Q. and Freas, R.B. Collision-Induced Reaction of Coordinatively Unsaturated Manganese and Dimanganese Carbonyl Cluster Fragment Ions in the Gas Phase. *J. Am. Chem. Soc.* in press

PROFESSIONAL SOCIETIES

American Society for Mass Spectrometry
Southwest Texas Mass Spectrometry Discussion Group, Houston, Texas.

ALEX VILLALOBOS

17201 Blackhawk #1104 Friendswood, Texas 77546 (713) 996-9856

Personal

Date of Birth: February 15, 1956
Married with two children
Citizenship: Panamanian
Legal Resident: U.S.
Bilingual: English/Spanish

Career Goal

To become a Registered Pharmacist in Texas

Education

Major - Bachelor of Science in Pharmacy
University of Panama - 1979
Panama City, Panama

Registration

Currently hold valid registration as Pharmacist in Panama

Professional Experience

3/90 to Present

Diagnostic Systems Laboratories
Webster, Texas 77598

Laboratory Technician Iodination

One of my daily responsibilities includes labeling proteins and steroids using the radioisotope Iodine 125. This is accomplished by using liquid and high pressure liquid chromatography. Also testing of the radioactive tracers, standards and controls for further quality control and manufacturing. Finally, preparation of buffers and aliquots of antigen used in the iodinations are effected as needed.

4/87 to 3/90

United States Army
Troop Medical Clinic
Fort Devens, MA

Pharmacy Technician - Rank - Specialist E-4

I was assigned to the position of Pharmacy Technician in an outpatient clinic. Primary responsibility was the filling of patient prescriptions and bulk drug orders.

Cutler Army Community Hospital
Fort Devens, MA

I was assigned the position of Pharmacy Technician. Some of my duties included the filling of prescriptions and the prepacking of drugs. I utilized the TEMPS computer system in the dispensing of these medications.

1979-1986 Department of Public Health
Panama City, Panama

Pharmacist

My primary responsibility was the filling and dispensing of prescriptions for both outpatients and inpatients of this public clinic. Other duties included prepacking and filling of bulk drug orders and compounding medication. I was responsible for the inventory of all control substances as well as other medications.

Special Training

1987 Medical Specialist Course
Fort Sam Houston, TX

1987 Pharmacy Specialist Course
Fort Sam Houston, TX

1989 Sterile Products Course
Fort Sam Houston, TX

References Available upon request

ROSE VIRGINIA WEST

EDUCATION

1989 — Wells College, Aurora, New York
Bachelor of Arts, cum Laude, in Chemistry with a Mathematics minor

Enrolled in the Chemistry Ph.D. program at Texas A & M University, College Station, Texas (1989-1990)

EMPLOYMENT

1990-present — Triangle Laboratories of Houston, Sugar Land, Texas

Sample Custodian

Coordinates receipt and handling of samples within the laboratory. Responsible for proper handling and disposal of hazardous waste materials generated by the laboratory. Extensive training in CLP chain-of-custody and sample receiving procedures.

1989-1990 — Texas A & M University, College Station, Texas

Graduate Assistant, Teaching

Supervised laboratory courses in Freshman Chemistry

1987-1989 — Wells College, Aurora, New York

Research Assistant (1989)

Worked with organic synthesis and a Bio-inorganic system involving iron transfer.

Teaching Assistant (1987-1989)

Prepared laboratory solutions, assisted in lab classes, and aided in proctoring of exams

1988 — Syracuse University, Syracuse, New York

Research Assistant

Worked on the synthesis of small hydrocarbons

HONORS AND AWARDS

Dean's List for work done spring 1986, spring 1988, fall 1988, and spring 1989

Prizes received at graduation are Nancy Ann Reed prize in Chemistry, N. Lansing Zabriskie Prize in Science (in house prizes), and an award from the American Institute of Chemists.

PROFESSIONAL SOCIETIES

American Chemical Society, Student Associate
American Institute of Chemists, Student Member

JAMES OWEN WILKERSON

8941 Gaylord Dr. #205
Houston, TX 77024
(713)240-5330 (d) or (713)467-7571 (e)

CAREER OBJECTIVE:

Environmental Laboratory Management

EDUCATION:

M. S., Biochemistry -- Duke University Medical Center, Durham, NC 1988
-- Recipient, Cellular and Molecular Biology Grant for Post-graduate research (NSF)

B. S., Biochemistry (High Honors). -- University of California, Davis 1978

EXPERIENCE:

1992 Production Manager, Triangle Laboratories of Houston, Sugar Land, TX
Duties: Design and implement systems for chemical analysis product lines, ensuring contract compliance on all issues
Quality Assurance Manager, Triangle Laboratories of Houston
Duties: Design and implement systems to track and ensure adequate quality of chemical analyses within the framework of Total Quality Management and ISO 9000 principles

1991-92 Data Validator, Triangle Laboratories of RTP, Durham, NC
Duties: Implement and monitor data validation guidelines for new product lines in commercial chemical analysis

1990-91 Quality Assurance Officer, Triangle Laboratories of RTP
Duties: Establish and monitor quality guidelines within environmental analysis product lines

1980-89 Research Assistant, Duke University Medical Center and th Veteran's Administration Medical Center, Durham, NC
Duties: Basic research on the biological reductions catalyzed by metaloprotein enzymes. Design, perform, and report results of original experiments.

1979 Laboratory Technician, Department of Biochemistry and Nutrition, UNC-CH, Chapel Hill, NC -- Laboratory of Dr. Mary Ellen Jones

1977-8 Laboratory Technician, Department of Biochemistry and Biophysics, UC-Davis, Davis, CA -- Laboratory of Dr. Jerry Hedrick

1975 Laboratory Technician, Department of Genetics, UC-Davis -- Laboratory of Dr. Fransisco Ayala

1974 Laboratory Technician, U.S. Centers for Disease Control, Atlanta, GA -- Hospital Epidemics Division

LABORATORY TECHNOLOGY SKILLS:

Chromatographies: Liquid, HPLC, thin-layer, GC
Spectroscopies: UV/vis, FTIR, Raman, EPR, NMR, Atomic Absorption, MS, ENDOR, Mössbauer
Assays: Enzyme kinetic, colrimetric, RIA, Isotope dilution
General: Ultracentrifugation, anaerobic manipulation, Electrophoresis, protein purification, chemical separations
Computer-related: various word-processors, spreadsheets, and data bases for DOS, Windows, and Mac systems, various macro languages, Pascal, on-line libraries (BRS, DIALOG, etc.)

REFERENCES: available upon request

from the resumé of :
JAMES OWEN WILKERSON

EXPERIENCE (cont): SEMINARS AND LECTURES DELIVERED

April, 1980 - "Selenium-requiring Enzymes of Biological Oxidation Reactions"

November, 1981 -"New Insights Into the Biochemical Basis of Phagocytosis"

March, 1982 - "The Role of Ubiquinone Binding Proteins in Mitochondrial Electron Transport"

May, 1982 - "Of Facts and Atrifacts: Magnetic Coupling of the Prosthetic Groups of Spinach Nitrite Reductase (NiR)"

March, 1983 - "Nitrosyl Compounds of the Siroheme Enzymes"

March, 1984 - "A Fluoride-induced Low-spin Siroheme Iron (III) in Spinach Nitrite Reductase"

February, 1985 - "Probing a Putative Anion Binding Site on Nitrite Reductase"

January, 1987 - "Specific and Non-specific Ionic Effects on the Activity of Spinach Nitrite Reductase"

April, 1988 - "Some Necessary Elements of the *in vivo* Catalytic Mechanism of Spinach NiR"

from the resumé of:
JAMES OWEN WILKERSON

PUBLICATIONS

Wilkerson, James O., Janick, Peter A., and Siegel, Lewis M., (1983), "Electron Paramagnetic Resonance and Optical Evidence for Interaction Between Siroheme and Tetranuclear Iron-Sulfur Center Prosthetic Groups in Spinach Ferredoxin-Nitrite Reductase", **Biochemistry 22,** 5048.

Siegel, Lewis M., Wilkerson, James O., and Janick, Peter A., (1987), "Structural Studies on the Siroheme [4Fe-4S] Cluster Active Center of Spinach Ferredoxin-Nitrite Reductase and *Escherichia coli* Sulfite Reductase", *in* Inorganic Nitrogen Metabolism, Ullrich, et al., eds., Springer-Verlag, Berlin.

Day, Edmund P., Peterson, Jim, Bonvoisin, Jacques J., Youn, Lawrence J., Wilkerson, James O., and Siegel, Lewis M., (1988), "Magnetization of the Sulfite and Nitrite Complexes of Oxidized Sulfite and Nitrite Reductases: EPR Silent Spin S=1/2 States", **Biochemistry 27,** 2126.

Siegel, Lewis M., and Wilkerson, James O., "Structure and Function of Spinach Nitrite Reductase", *in* Molecular and Gentetic Aspects of Nitrate Assimilation, (1989), Wray, J.L., and Klinghorn, J., eds. pp 263-283.

Cline, John F., Wilkerson, James O., Siegel, Lewis M., and Hoffman, Brian M., "Proton and Nitrogen-14 Electron-Nuclear Double Resonance of Spinach Nitrite Reductase in the Unbound Fe(III) and NO-bound Fe(II) States", **Biochemistry,** submitted.

ABSTRACTS

Salerno, John C., Lambeth, J. David, Lancaster, Jack R., Wilkerson, James O., and Kamin, Henry, (1980), "EPR Studies of the Active Site of Adrenal Cholesterol Hydroxylation", Proceedings of the 22nd Conference of the Rocky Mountain Society of Applied Spectroscopy.

Wilkerson, James O., Janick, P.A., and Siegel, Lewis M., (1983), "Siroheme-Fe4/S4 Interaction in Spinach Nitrite Reductase (NiR)", **Fed. Proc. 42,** 2060.

Tracking Form 12
Appendix D

CRANSTON QAPjP TRACKING FORM

No. 12
Date: 12/15/92

PERSON REQUESTING REVISION: Diana Baldi

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:

Diana Baldi - CIBA-GEIGY National Services Contract Administrator

NATURE OF CHANGE TO QAPjP:

Type: 1. Major X Minor ____ (check one)
2. Informational ____ Technical X (check one)

Section(s) of Document: Sections 2, 5, and 9 of PACE, Inc., Quality Assurance Project Plan (Appendix D of Cranston QA Documents: Supplement #1)

REVISION:
Section 2: Revision numbers and dates have been changed where appropriate.
Section 5: Sulfotepp, Irgasan-DP-300, Tofranil, 2,4,5-T, and Butazolidin have been added as matrix spike compounds to Table 5.3.
Section 9: PQLs stated in Table 9-1 for volatile organic compounds in soil have been lowered.

REASON FOR CHANGE:
Section 2: Revisions have been made to document.
Section 5: The compounds appear in Table 5-1 of the Cranston QA Documents: Supplement #1 but were previously omitted in PACE, Inc.'s QAPP.
Section 9: Review of laboratory's MDL studies allows reporting lower PQLs than originally shown in Table 9-1.

EFFECTS OF CHANGE:
Section 2: No effects will result.
Section 5: All matrix spike compounds listed in the Craston QA Documents: Supplement #1 are now included in the PACE, Inc., QAPP
Section 9: Lower PQLs will meet the objectives of sample collection.

NECESSARY CORRECTIVE ACTION(S):

Project-wide distribution of Sections 2, 5, and 9 of PACE Inc., Quality Assurance Project Plan (Appendix D of Cranston AQ Documents: Supplement #1). These documents will be accompanied with Cranston QAPP Tracking Form No. 12 for project-wide distribution for inclusion in Section 18.0 of the Cranston Quality Assurance Documents: Supplement #1.

Diana Baldi - CIBA-GEIGY National Service Contract Administrator 12-15-92
Project Manager Date

Responsibility: Loretta Clear
PACE, Inc., Project Manager

Diane M. Leber 12/18/92
CIBA-GEIGY Project Coordinator Date

APPROVED (if technical change):

USEPA Project Manager Date

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3. Guide to Organization Charts
5. Chain of Custody
6. Sample I.D. and Condition Form
7. Discrepancy Report Form
8. Sample Tracking Form
16. Laboratory Sample Flow Schematic
17. Information Flow Schematic
18. Standard Log Cards
19. National Certifications
20. State Certifications
21. Audit Information
22. Instrument Maintenance Logbook Form
23. Spike Recovery Control Chart
24. RPD (Duplicate) Control Chart
25. Benz-DS-XLS
26. NO3-NICL-XLS

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8.1 Summary of Calibration Requirements
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2.4 QAPP DISTRIBUTION LIST

Name	Affiliation
William S. Davis	PACE New York
Edward A. Stuber	PACE New York
Carolyn A. Corkey	PACE New York
Gregory T. Grandits	PACE New York
Sharon K. Brakeman	PACE New York
Diane L. Waldschmidt	PACE Pittsburgh
Daneen M. Charlett	PACE Pittsburgh
Frank J. Resnick	PACE Pittsburgh
David L. Berger	PACE Pittsburgh
Loretta A. Clear	PACE Pittsburgh
Mark Houlday	Woodward-Clyde Consultants
Diana Baldi	CIBA-GEIGY

5. QUALITY ASSURANCE OBJECTIVES

The purpose of the plan is to define procedures for the documentation, evaluation, validation, and reporting of data. The objective is to provide a uniform basis for sampling, sample handling, instrument maintenance and calibration, methods control, performance evaluation and analytical data generation and reporting. Specific procedures to be used for sampling, chain of custody, calibration of field instruments (pH, conductivity meters, etc.), laboratory analysis, reporting, internal quality control, audits, preventive maintenance, and corrective actions are described in specific sections of this plan. This section addresses the objectives of accuracy, precision, completeness, representativeness, and comparability.

The quality assurance objective of the laboratories is to provide data of known and documented quality. Data quality is assessed by precision, accuracy, completeness, representativeness, and comparability. The QA protocols used in the laboratories in conjunction with Appendix IX are taken from the following sources: EPA Contract Laboratory Program's Statement of Work (Organics and Inorganics), 40 CFR 136 Methodologies, and SW 846 methodologies which contain detailed descriptions of the quality control measures routinely employed by PACE, Inc. This QAPP outlines these measures and, in addition, project derived requirements as approved by CIGA-GEIGY.

As stated, the objective of the Quality Assurance Program for the laboratory is to provide data of known quality. To accomplish this, PACE will:

Maintain an effective, on-going QA/QC program that measures and verifies laboratory performance.
Provide sufficient flexibility to allow controlled changes in routine methodology to meet the CIBA-GEIGY specific data requirements.
Recognize as soon as possible and provide correction for any factors which adversely affect data quality.
Monitor operational performance of the laboratory on a routine basis and provide corrective action as needed.
Maintain complete records of sample submittal, raw data, laboratory performance, and completed analyses to support reported data.

5.1 LEVEL OF QA EFFORT

The reliability of data generated in the laboratory will be evaluated at the 99% confidence level (mean +/- 3 standard deviations) for control and at the 95% confidence level (mean +/- 2 standard deviations) for warning. Precision of analyses will be evaluated using matrix spike duplicates. Analytical accuracy will be monitored using recovery of analytes from surrogate spikes, matrix spikes, EPA reference check standards, and Performance Evaluation (PE) samples. Quality control measures and frequencies are summarized in Tables 5.1 through 5.8.

5.2 ACCURACY AND PRECISION

The QA objectives for precision and accuracy are to achieve the QC acceptance criteria specified in the proposed analytical procedures. For the organic and inorganic procedures, the precision and accuracy guideline requirements are specified in the individual methods.

Field blanks and duplicates are collected and analyzed to assess field sampling activities. The results check procedural contamination and/or ambient conditions at the site.

Due to the extensive number of organic parameters and potential matrices, the development of precision and accuracy objectives and control limits for every matrix is difficult. This is typically done with (1) matrix spike and matrix spike duplicate compounds which are added to selected samples before extraction and analysis, and/or (2) surrogate spike compounds which are added to every sample, before extraction and analysis. Although the surrogate and matrix spike analyses do not provide statistically valid statements about precision and accuracy for every compound in a sample, they do give the data reviewer enough information to make judgements about precision and accuracy on a sample-by-sample basis.

Inorganic precision and accuracy data are determined by using duplicate samples (precision), matrix spike and laboratory control samples (accuracy). The following procedure is used:

For a duplicate sample analysis, at least one duplicate sample is analyzed per sample matrix type (e.g. water, soil) and concentration (e.g. low, medium) per batch of samples or for each 20 samples received, whichever is more frequent, or as specified by state/project requirements. Samples identified as field blanks can NOT be used for duplicate samples analyses. If two analytical methods are used to obtain the reported values for the same element for a batch of samples (i.e., ICP, GFAA), duplicate samples will be run by each method. The relative percent difference (RPD) for each component is calculated for later use during data assessment.

The QA objectives for accuracy and precision are shown in Tables 5.1 through 5.8. When applicable, control limits established by the EPA CLP are used to judge acceptability of data generated by the laboratories. Where EPA acceptability criteria does not exist, the laboratories will evaluate established control limits derived by previously utilized laboratories in Phase I of the scope at the CIBA-GEIGY Cranston site. Until verified by PACE, the control limits will be considered as advisory limits only and will not automatically initiate a rerun or reanalysis criteria if they are not met.

5.3 COMPLETENESS

Completeness is a measure of all information necessary for a valid scientific study. For completeness, it is expected that the methodology proposed for chemical characterization of the samples collected will provide data meeting QC acceptance criteria following standard laboratory data review and validation for at least 95% of all samples collected. Completeness may also be defined as a comparison of the number of tests successfully completed (with acceptable QC) to the number of tests requested. Discrepancy reports are completed to provide explanation when QC criteria are not met.

Every attempt will be made to generate completely valid data. However, it is recognized that some samples will exhibit highly contaminated matrices necessitating multiple analyses and/or extensive dilutions. As a result of these atypical applications, recoveries and MDLs may be deemed questionable based on internal QC results by the external data validation process. The objective will be to have 95% completeness on samples unaffected by matrix interferences. For fringe area samples and first time samples not showing interferences, completeness should be 100% with a requirement for reanalysis of these critical samples mandatory if objective is not met.

5.4 REPRESENTATIVENESS

Representativeness is a qualitative element that is related to the ability to collect a sample that reflects the characteristics of that part of the environment that is to be assessed. Sample representativeness is dependent on the sampling techniques used and is considered individually for each project. It is specifically addressed in the work plan.

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the sample. For this project, sampling will be performed by Woodward-Clyde Consultants. Sample handling protocols (e.g., storage, preservation and transportation) have been developed to preserve the representativeness of the samples. Proper documentation will establish that protocols have been followed and sample identification and integrity assured. Every attempt will be made to ensure that the aliquots taken for analysis are representative of the samples received.

5.5 COMPARABILITY

Comparability is also considered during preparation of the work plan. The objective of comparability is to ensure that results of similar activities conducted by different parties are comparable. PACE uses EPA-approved or other methods and procedures to ensure comparability with data from previous or following studies. PACE participates in external and interlaboratory performance evaluation (PE) studies as additional means of establishing comparability in the laboratory.

TABLE 5.1 APPENDIX IX CLASSICAL PARAMETERS QUALITY CONTROL OBJECTIVES

Parameter	Typical Precision RPD % (a)	Typical Accuracy % Recovery	Expected Completeness (%)
Total Cyanide	20	± 25	90
Total Sulfide	20	± 25	90

(a) "RPD" = relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

TABLE 5.2 APPENDIX IX METALS QUALITY CONTROL OBJECTIVES

Parameter	Typical Precision RPD %(a)	Typical Accuracy % Recovery	Expected Completeness (%)
Antimony	20	± 25	90
Arsenic	20	± 25	90
Barium	20	± 25	90
Beryllium	20	± 25	90
Cadmium	20	± 25	90
Chromium	20	± 25	90
Cobalt	20	± 25	90
Copper	20	± 25	90
Lead	20	± 25	90
Mercury	20	± 25	90
Nickel	20	± 25	90
Selenium	20	± 25	90
Silver	20	± 25	90
Thallium	20	± 25	90
Tin	20	± 25	90
Vanadium	20	± 25	90
Zinc	20	± 25	90

(a) "RPD" - relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

TABLE 5.3 APPENDIX IX ORGANICS QUALITY CONTROL OBJECTIVES *

Parameter	Matrix Spike (a) Precision RPD % (b) Water	Matrix Spike (a) Precision RPD % (b) Solids	Matrix Spike (a) Accuracy % of Recovery Water	Surrogate Spike Accuracy % of Recovery (c) Solids	Surrogate Spike Accuracy % of Recovery (c) Water	Completeness Expected Completeness Solids	Completeness Expected Completeness %
Volatiles:							
Trichloroethene	14	24	71-120	62-137	-	-	90
Benzene	11	21	76-127	66-142	-	-	90
Toluene	13	21	76-125	59-139	-	-	90
Chlorobenzene	13	21	75-130	60-133	-	-	90
1,1-Dichloroethene	14	22	61-145	59-172	-	-	90
Toluene-d8	-	-	-	-	88-110	84-138	90
4-Bromofluorobenzene	-	-	-	-	86-115	59-113	90
1,2-Dichloroethane-d4	-	-	-	-	76-114	70-121	90

* The quality control objectives listed above are highly sample matrix dependent, and will be adversely affected by sample dilutions necessitated by matrix interferences.

(a) Matrix spike precision and accuracy goals, where stated, are found in EPA CLP method references and will be used.

(b) "RPD" - relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

(c) Accuracy goals stated are from EPA CLP SOW

TABLE 5.3 APPENDIX IX ORGANICS QUALITY CONTROL OBJECTIVES * (continued)

Parameter	Matrix Spike (a)(d) Precision RPD %(b) Water	Matrix Spike (a)(d) Precision RPD %(b) Solids	Matrix Spike (a)(d) Accuracy % of Recovery Water	Matrix Spike (a)(d) Accuracy % of Recovery Solids	Surrogate Spike Accuracy % of Recovery (c) Water	Surrogate Spike Accuracy % of Recovery (c) Solids	Completeness Expected Completeness %
GC/MS Semivolatiles:							
Phenol	42	35	12-110	26-90	-	-	90
2-Chlorophenol	40	50	27-123	25-102	-	-	90
1,4-Dichlorobenzene	28	27	36-97	28-104	-	-	90
N-Nitroso-di-n-propylamine	38	38	41-116	41-126	-	-	90
1,2,4-Trichlorobenzene	28	23	39-98	38-107	-	-	90
4-Chloro-3-methylphenol	42	33	23-97	26-103	-	-	90
Acenaphthylene	31	39	46-118	31-137	-	-	90
4-Nitrophenol	50	50	10-80	11-114	-	-	90
2,4-Dinitrotoluene	38	47	24-96	28-89	-	-	90
Pentachlorophenol	50	47	9-103	17-109	-	-	90
Pyrene	31	36	26-127	35-142	-	-	90
Nitrobenzene-d5	-	-	-	-	35-114	23-120	90
2-Fluorobiphenyl	-	-	-	-	43-116	30-115	90
p-Terphenyl-d14	-	-	-	-	33-141	18-137	90
Phenol-d5	-	-	-	-	10-110	24-113	90
2-Fluorophenol	-	-	-	-	21-110	25-121	90
2,4,6-Tribromophenol	-	-	-	-	10-123	19-122	90
Propazine (d)	18	5	34-118	77-100	-	-	90
Tinuvin-327 (d)	15	6	47-123	77-107	-	-	90
Irqasan-DP-300	50	50	40-140	40-140	-	-	90
Trofranil	50	50	40-140	40-140	-	-	90
Butazolidin	50	50	40-140	40-140	-	-	90

* The quality control objectives listed above are highly sample matrix dependent, and will be adversely affected by sample dilutions necessitated by matrix interferences.

(a) Matrix spike precision and accuracy goals, where stated, are found in EPA CLP method references and will be used.

(b) "RPD" - relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

(c) Accuracy goals stated are from EPA CLP SOW.

(d) Accuracy and precision goals stated for Propazine and Tinuvin-327 were calculated by the laboratory involved in Phase I of the Cranston project. The limits are based on data collected from four reagent spike blanks and five sediment samples. PACE will derive laboratory specific goals once a statistical database is created, until such time the stated control limits will be utilized as advisory limits only.

TABLE 5.3 APPENDIX IX ORGANICS QUALITY CONTROL OBJECTIVES * (continued)

Parameter	Matrix Spike (a) Precision RPD % (b) Water	Matrix Spike (a) Precision RPD % (b) Solids	Matrix Spike (a) Accuracy % of Recovery Water	Matrix Spike (a) Accuracy % of Recovery Solids	Surrogate Spike Accuracy % of Recovery (a) Water	Surrogate Spike Accuracy % of Recovery (a) Solids	Completeness Expected Completeness %
Herbicides:							
2,4-D	13	N/A	69-159	N/A	-	-	90
2,4,5-T	50	50	40-140	40-140	-	-	90
2,4,5-TP	25	N/A	29-182	N/A	-	-	90
2,4-Dichlorophenylaceticacid -	-	-	-	50-150	50-150	90	

* The quality control objectives listed above are highly sample matrix dependent, and will be adversely affected by sample dilutions necessitated by matrix interferences.

(a) Accuracy and precision goals stated were calculated by the Phase I laboratory for the Cranston site. PACE will derive laboratory specific goals once a statistical database is created, until such time the stated limits will be utilized as advisory limits only.

(b) "RPD" - relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

N/A Not available

TABLE 5.3 APPENDIX IX ORGANICS QUALITY CONTROL OBJECTIVES * (continued)

Parameter	Matrix Spike (a) Precision RPD % (b) Water	Matrix Spike (a) Precision RPD % (b) Solids	Matrix Spike (a) Accuracy % of Recovery Water	Matrix Spike (a) Accuracy % of Recovery Solids	Surrogate Spike Accuracy % of Recovery (c) Water	Surrogate Spike Accuracy % of Recovery (c) Solids	Completeness Expected Completeness %
Pesticides/Polychlorinated Biphenyls:							
gamma-BHC	15	50	56-123	46-127	-	-	90
Heptachlor	20	31	40-131	35-130	-	-	90
Aldrin	22	43	40-120	34-132	-	-	90
Dieldrin	18	38	52-126	31-134	-	-	90
Endrin	21	45	56-121	42-139	-	-	90
4,4'-DDT	27	50	38-127	23-134	-	-	90
Decachlorobiphenyl	-	-	-	-	60-150	60-150	90
Tetrachloro-m-xylene	-	-	-	-	60-150	60-150	90
Dibutylchlorendate	-	-	-	-	24-154	20-150	90

* The quality control objectives listed above are highly sample matrix dependent, and will be adversely affected by sample dilutions necessitated by matrix interferences.

(a) Matrix spike precision and accuracy goals, where stated, are found in EPA CLP SOW.

(b) "RPD" - relative percent difference. Precision is expressed according to the type of measurement (i.e., for field duplicates precision is expressed as the RPD between duplicate results).

(c) Accuracy goals stated are from EPA CLP SOW and are advisory limits only.

TABLE 5.4 APPENDIX IX ORGANOPHOSPHORUS PESTICIDE QUALITY CONTROL OBJECTIVES *

Parameter	Matrix Spike (a) Precision RPD % (b) Water	Matrix Spike (a) Precision RPD % (b) Solids	Matrix Spike (a) Accuracy % of Recovery Water	Matrix Spike (a) Accuracy % of Recovery Solids	Surrogate Spike Accuracy % of Recovery (a) Water	Surrogate Spike Accuracy % of Recovery (a) Solids	Completeness Expected Completeness %
Organophosphorus Pesticides:							
Ethyl Parathion	14	21	45-112	29-133	-	-	90
Disulfoton	36	39	10-180	10-129	-	-	90
Triphenylphosphate	-	-	-	-	23-176	28-174	90
Sulfotepp	50	50	20-140	20-140	-	-	90

* The quality control objectives listed above are highly sample matrix dependent, and will be adversely affected by sample dilutions necessitated by matrix interferences.

(a) These limits were developed by The Phase I laboratory for the Cranston site. PACE will derive laboratory specific goals once a statistical database is created, until such time the stated control limits will be utilized as advisory limits only.

TABLE 5.5 QUALITY CONTROL MEASURES AND FREQUENCY

EPA Method 8240	Volatile Organics by GC/MS
Audit	Frequency
Method Blank	One per 12 hours of analysis *
Holding Blank	One per week
Continuing Calibration Standard	One per 12 hours of analysis
Surrogate Standard	Added to each sample, blank and standard
Matrix Spike/Matrix Spike Duplicate (precision audit)	As dictated by CIBA-GEIGY Sampling and Analysis Plan, typically one set per sampling lot (1 per 20)
GC/MS Tune (BFB Tuning Compound)	Once every 12 hours of analysis

* The method blank must not exhibit any targeted compound > MDL. The exception will be for up to 5 x the MDL for common laboratory solvents (e.g., acetone, methylene chloride, and 2-butanone).

TABLE 5.6 QUALITY CONTROL MEASURES AND FREQUENCY

EPA Method 8270	Semivolatile Organics by GC/MS
Audit	Frequency
Method Blank	One per 20 samples per matrix or per extraction date, which ever is more frequent. *
Solvent Blank	One per lot of solvent reagent. (Evaluation and documentation performed by vendor and/or laboratory.)
Continuing Calibration Standard	Once per 12 hours of analysis.
Surrogate Standard	Added to each sample, blank and standard
Matrix Spike/Matrix Spike Duplicate (precision audit)	As dictated by the CIGA-GEIGY Sampling and Analysis Plan, typically one set per sampling lot (1 per 20).
GC/MS Tune (DFTPP Tuning Compound)	Once per 12 hours of analysis

* The method blank must not exhibit any targeted compound > MDL. The exception will be for up to 5 x the MDL for phthalate esters.

TABLE 5.7 QUALITY CONTROL MEASURES AND FREQUENCY

EPA Method 8080 EPA Method 8150	Organochlorine Pesticides/PCBs by GC/ECD Herbicides by GC/ECD
Audit	Frequency
Method Blank	One per 20 samples per matrix or per extraction date, which ever is more frequent.
Solvent Blank	One per lot of solvent reagent. (Evaluation and documentation performed by vendor and/or laboratory.)
Continuing Calibration Standard	Individual mixtures analyzed according to established run sequences (individual mix A & B every 10 samples).
Surrogate Standard	Added to each sample, blank and standard.
Matrix Spike/Matrix Spike Duplicate (precision audit)	As dictated by the CIBA-GEIGY Sampling and Analysis Plan, typically one set per sampling lot (1 per 20).

TABLE 5.8 QUALITY CONTROL MEASURES AND FREQUENCY

Metals

Audit and Control Limits	Frequency
Preparation Blank (< MDL - all metals)	One per group of 20 or fewer samples.
Matrix Spike (75-125% recovery for all metals)	As dictated by CIBA-GEIGY in the Sampling and Analysis Plan, typically one per sample lot (1 per 20).
Sample Duplicate (precision audit - see Table 5.3)	As dictated by CIGA-GEIGY in the Sampling and Analysis Plan, typically one per sample lot (1 per 20).
Initial Calibration Verification (ICV - 80-120% recovery for all metals)	Run immediately following instrument calibration.
Initial Calibration Blank (ICB - < MDL for all metals)	Run immediately following each ICV.
Continuing Calibration Verification (CCV - 90-110% recovery for all metals except Hg; 80-120% recovery for Hg)	One per every 10 analyses and after last sample analyzed.
Continuing Calibration Blank (CCB - < MDL for all metals)	One per every 10 analyses and after last sample; placed immediately following each CCV.

9.0 ANALYTICAL PROCEDURES

EPA approved methods will be used for all analyses for which EPA approved methods are available. Soil and water samples for Appendix IX parameters will be prepared and analyzed using SW-846 3rd Edition methods. A list of parameters, methods, and practical quantitation limits (PQLs) are included in Tables 9.1 through 9.8.

Analyses will be performed in accordance with the methods stated herein unless specific project requirement or needs dictate adoption of an alternate method or modification of the cited method. If analysis is performed in an alternate manner, the method used and/or modifications shall be documented in the project records with prior approval from Woodward-Clyde Consultants, Mark Houlday.

EPA is currently considering a proposal to correct analytical data for matrix spike recovery(s). The analytical data and matrix spike recovery(s) will be provided so corrections may be made if and when the EPA proposal is promulgated.

9.1 APPENDIX IX ORGANIC COMPOUNDS

Proven instruments and techniques will be used to identify and quantify volatile and semivolatile Appendix IX organic compounds. Methods from SW-846 3rd Edition will be used for these analyses. The methods, compounds and practical quantitation limits for Appendix IX organic compounds are listed in Tables 9.1 through 9.5. The actual detection limits obtained for a particular sample depend upon the amount and nature of matrix interferences present in the sample If the listed practical quantitation limits are unachievable for a specific sample, an explanation of the problem and supporting evidence will be provided with the analytical report.

If matrix interferences causing elevated detection limits are encountered, the sample extract may be subjected to optional cleanup procedures recommended in SW-846, 3rd Edition.

A. Volatiles

Analysis for Appendix IX volatiles will be conducted using SW-846 Method 8240. The matrix spiking compounds will be 1,1-dichloroethene; trichloroethene; chlorobenzene; toluene; and benzene. The surrogate spikes will be toluene-d8; bromofluorobenzene; 1,2-dichloroethane-d4. The internal standard compounds will be bromochloromethane; 1,4-difluorobenzene; and chlorobenzene-d5. The criteria for acceptable calibration will be that the SPCC and CCC list compounds meet the stated method criteria.

Efforts will be made to achieve the SPCC and CCC method criteria for all Appendix IX compounds not listed under the 8240 methodology. Based on PACE's experience with these compounds and their known characteristics, judgements will be made as to when restandardization is necessary, if these objectives are not met.

In addition to analysis for the compounds listed in Table 9-1, a mass spectral library search will be conducted to determine tentative compound identifications for up to ten (10) nonsurrogate/nontarget compounds of greatest concentration. Substances (peaks) with responses less than 10 percent of the nearest internal standard will not be searched. The National Bureau of Standards mass spectral library will be used. For estimating the concentration of any Tentatively Identified Compound (TIC), a response factor of one (1) will be used. The concentration will then be estimated by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interference on the reconstructed ion chromatogram. Criteria for TIC identification will be that listed in the SW-846 method.

B. GC/MS Semivolatiles

The Appendix IX semivolatile compounds, and di and tri-chlorinated dioxins/furans listed in Table 9.2 will be analyzed for according to SW-846 Method 8270. The GC/MS semivolatiles scan range will be extended from 35-500 amu to 35-550 amu in order to allow detection of di- and tri-chlorinated dioxins/furans. The following isomers will be used for quantitation of the di- and tri-chlorinated dioxins/furans:

2,7-Dichlorodibenzo-p-dioxin
1,2,4-Trichlorodibenzo-p-dioxin
2,8-Dichlorodibenzofuran
2,3,8-Trichlorodibenzofuran

If a non target peak response is observed, a reverse library search will be performed to confirm the presence or absence of these compounds. Should the library search confirm the presence of di- or tri-chlorinated dioxins or furans, a single point calibration standard will be analyzed and quantitation will be performed relative to this standard (50 ug/mL). If di- and tri-chlorinated dioxins/furans are not detected by the reverse library search, ND will be reported with no definite Practical Quantitation Limit (PQL). PACE will perform a reverse library search against the National Institute of Standards Technology (NIST) library.

The following site specific compounds will be added to the semi-volatile calibration mixture and identified and quantitated as targeted compounds: 1,1-biphenyl; n-Octane; Oxy-bis (ethanol); Dimethoxyacetophenone; Methylbenzenesulfonamide; x-Cyclohexene-1-01; 2-Cyclohexene-1-one; 2,5-cyclohexadiene-1,4-dione. No MDL study will be performed for these compounds, rather their IDLs (instrument detection limits) will be used to set reporting limits. The spiking

compounds will be phenol; 2-chlorophenol; 1,4-dichlorobenzene; N-nitroso-di-n-propylamine; 1,2,4-trichlorobenzene; 4-chloro-3-methylphenol; acenaphtene; 4-nitrophenol; 2,4-dinitrotoluene; pentachlorophenol; pyrene; propazine; and tinuvin 327. Six surrogates will be used: nitrobenzene-d5; 2-fluorobiphenyl; terphenyl-d14; phenol-d6; 2-fluorophenol; and 2,4,6-tribromophenol. The internal standards will be 14,-dichlorobenzene-d4; naphthalene-d8; acenaphthene-d10; phenanthrene-d10; chrysene-d12; and perylene-d12. The criteria for acceptable calibration will be that the SPCC and CCC list compounds meet the stated method criteria.

Efforts will be made to achieve the SPCC and CCC method criteria for all Appendix IX compounds not listed under the 8270 methodology. Based on PACE's experience with these compounds and their known characteristics, judgement will be made as to when restandardization is necessary, if these objectives are not met. Determination of organic compounds on the Appendix IX list is not necessarily a straightforward proposition. EPA studies have documented low or no recoveries for the following compounds: hexachlorophene; pentachloroethane; hexachlorocyclopentadiene; p-naphthaoquionone; aramite; N-nitrosodimethylamine; and 1-naphthylamine.

C. Organochlorine Pesticides/PCBs

The list of Appendix IX chlorinated pesticides and PCBs in Table 9.3 will be analyzed for using SW-846 3rd Edition Method 8080. Dibutylchlorendate, Tetrachloro-m-xylene, and Decachlorobiphenyl will be used as the surrogates. The surrogate recovery limits will be considered to be advisory, and surrogate recoveries outside of the limits will not require reanalysis of samples.

The spiking compounds for matrix spike/matrix spike duplicates (MS/MSD) will be lindane, heptachlor, aldrin, dieldrin, endrin, and 4,4'-DDT. Goals for percent recovery and relative percent deviation will be those listed in Section 5.0, Table 5.3. The limits are advisory only and do not reflect criteria necessitating sample reanalysis. An evaluation standard containing endrin and 4,4'-DDT will be analyzed routinely to check for endrin and DDT breakdown.

D. Additional Appendix IX Organics

The herbicides listed in Table 9.4 will be analyzed for using SW-846 3rd Edition Method 8150. Two representative compounds of this class, 2,4-D and 2,4,5-TP (Silvex), will be used to spike the matrix spike/matrix spike duplicate (MS/MSD) samples. PACE will use 2,4-dichlorophenylacetic acid as the surrogate.

The organophosphorus compounds listed in Table 9.5 will be analyzed for using SW-846 3rd Edition Method 8140. Representative compounds of this class, Disulfoton and Ethyl Parathion, will be used for MS/MSD spiking. PACE will use triphenylphosphate as the surrogate.

E. Appendix IX Inorganics

Proven instruments and techniques will be used to identify and quantify Appendix IX inorganic parameters. Soil and water samples will be analyzed for metals according to SW-846, 3rd Edition inductively coupled plasma emission (ICP) Method 6010 and/or graphite furnace and flame AA methods. Samples requiring dissolved metals analysis will be filtered in the field. For specific methods, see Tables 9.7 through 9.8.

The ICP method will be used as the preferred method with flame AA to be used as a backup. In cases where ICP instrument detection limits do not meet project requirements, alternative graphite furnace methods will be used. Matrix modifiers as stipulated by the methods for graphite furnace analyses will be used. Calibration for graphite furnace metals will be performed daily with a calibration check analyzed after every 10 samples. Any modifications employed for this project will be documented and reported to the client.

The SW-846 cold vapor techniques will be used for mercury analyses. Determinations of total cyanide will be made using SW-846 Methods 9010 and 9012. Sulfide will be determined using SW-846 Method 9030.

Tables 9.6 through 9.8 list the inorganic parameters, analytical methods, and PQLs.

TABLE 9.1 Appendix IX Volatile Organic Compounds

	Practical Quantitation Limits[A]			
	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep[C] Method	Analytical[C] Method
Acrolein	75	75	8240	8240
Acetone	100	100	8240	8240
Acrylonitrile	50	50	8240	8240
Acetonitrile	20	20	8240	8240
Bromomethane	10	10	8240	8240
Bromodichloromethane	5.0	5.0	8240	8240
Benzene	5.0	5.0	8240	8240
Chloroethane	10	10	8240	8240
Chloromethane	10	10	8240	8240
Carbon disulfide	5.0	5.0	8240	8240
3-Chloropropene	5.0	5.0	8240	8240
Chloroform	5.0	5.0	8240	8240
Carbon tetrachloride	5.0	5.0	8240	8240
Chlorobenzene	5.0	5.0	8240	8240
2-Chloro-1,3-butadiene	25	25	8240	8240
1,4-Dioxane	500	500	8240	8240
Dichlorodifluoromethane	20	20	8240	8240
1,1-Dichloroethene	5.0	5.0	8240	8240
1,1-Dichloroethane	5.0	5.0	8240	8240
trans-1,2-Dichloroethene	5.0	5.0	8240	8240
1,2-Dichloroethane	5.0	5.0	8240	8240
Dibromomethane	5.0	5.0	8240	8240
Dibromochloromethane	5.0	5.0	8240	8240
1,2-Dichloropropane	5.0	5.0	8240	8240
cis-1,3-Dichloropropene	5.0	5.0	8240	8240
trans-1,3-Dichloropropene	5.0	5.0	8240	8240
1,2-Dibromoethane	5.0	5.0	8240	8240
trans-1,4-Dichloro-2-butene	10	10	8240	8240
1,2-Dibromo-3-chloropropane	20	20	8240	8240
Ethyl methacrylate	10	10	8240	8240
Ethylbenzene	5.0	5.0	8240	8240
2-Hexanone	50	50	8240	8240

TABLE 9.1 Appendix IX Volatile Organic Compounds (Continued)

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep[C] Method	Analytical[C] Method
Iodomethane	5.0	5.0	8240	8240
Isobutanol	100	100	8240	8240
Methylene chloride	10	10	8240	8240
2-Butanone	100	100	8240	8240
Methyl methacrylate	10	10	8240	8240
4-Methyl-2-pentanone	50	50	8240	8240
Methacrylonitrile	100	100	8240	8240
Propanenitrile	100	100	8240	8240
Styrene	5.0	5.0	8240	8240
Trichlorofluoromethane	10	10	8240	8240
1,1,1-Trichloroethane	5.0	5.0	8240	8240
Trichloroethene	5.0	5.0	8240	8240
1,1,2-Trichloroethane	5.0	5.0	8240	8240
Bromoform	5.0	5.0	8240	8240
1,1,1,2-Tetrachloroethane	5.0	5.0	8240	8240
1,2,3-Trichloropropane	5.0	5.0	8240	8240
Tetrachloroethene	5.0	5.0	8240	8240
1,1,2,2-Tetrachloroethane	5.0	5.0	8240	8240
Toluene	5.0	5.0	8240	8240
Vinyl chloride	10	10	8240	8240
Vinyl acetate	5.0	5.0	8240	8240
o-Xylene	5.0	5.0	8240	8240
m-and p-Xylenes	10	10	8240	8240

A Sample PQLs are highly matrix-dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

B PQLs listed for soil/sediment are based on wet weight. If data are reported on a dry weight basis, PQLs will be higher, based on the % moisture in each sample.

C USEPA SW-846 3rd edition.

TABLE 9.2 Appendix IX Semivolatile Organic Compounds

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
Acetophenone	10	330	3520	3550/3540	8270
Aniline	50	1700	3520	3550/3540	8270
Acenaphthylene	10	330	3520	3550/3540	8270
Acenaphthene	10	330	3520	3550/3540	8270
4-Aminobiphenyl	50	1700	3520	3550/3540	8270
2-Acetylaminofluorene	50	1700	3520	3550/3540	8270
Aramite	100	3000	3520	3550/3540	8270
Anthracene	10	330	3520	3550/3540	8270
Benzyl alcohol	10	330	3520	3550/3540	8270
4-Bromophenyl phenylether	10	330	3520	3550/3540	8270
Butylbenzylphthalate	10	330	3520	3550/3540	8270
Benzo(b)fluoranthene	10	330	3520	3550/3540	8270
Benzo(k)fluoranthene	10	330	3520	3550/3540	8270
Benzo(a)pyrene	10	330	3520	3550/3540	8270
Benzo(g,h,i)perylene	10	1000	3520	3550/3540	8270
Benzo(a)anthracene	10	330	3520	3550/3540	8270
bis(2-Chloroethyl)ether	10	330	3520	3550/3540	8270
2-Chlorophenol	10	330	3520	3550/3540	8270
bis(2-Chloroethoxy)methane	10	330	3520	3550/3540	8270
4-Chloroaniline	10	330	3520	3550/3540	8270
4-Chloro-3-methylphenol	10	330	3520	3550/3540	8270
4-Chlorophenylphenylether	10	330	3520	3550/3540	8270
2-Chloronaphthalene	10	330	3520	3550/3540	8270
Chlorobenzilate	10	330	3520	3550/3540	8270
Chrysene	10	330	3520	3550/3540	8270
1,3-Dichlorobenzene	10	330	3520	3550/3540	8270
1,4-Dichlorobenzene	10	330	3520	3550/3540	8270
1,2-Dichlorobenzene	10	330	3520	3550/3540	8270
2,4-Dimethylphenol	10	330	3520	3550/3540	8270
2,4-Dichlorophenol	10	330	3520	3550/3540	8270
Dimethylphenethylamine	10	330	3520	3550/3540	8270
2,6-Dichlorophenol	10	330	3520	3550/3540	8270
Dimethylphthalate	10	330	3520	3550/3540	8270

TABLE 9.2 Appendix IX Semivolatile Organic Comounds (Continued)

	Practical Quantitation Limits[A]				
	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
1,3-Dinitrobenzene	10	330	3520	3550/3540	8270
2,6-Dinitrotoluene	10	330	3520	3550/3540	8270
Dibenzofuran	10	330	3520	3550/3540	8270
2,4-Dinitrotoluene	10	330	3520	3550/3540	8270
2,4-Dinitrophenol	50	1700	3520	3550/3540	8270
Diethylphthalate	10	330	3520	3550/3540	8270
4,6-Dinitro-2-methylphenol	50	1700	3520	3550/3540	8270
Diphenylamine	10	330	3520	3550/3540	8270
Di-n-butylphthalate	10	330	3520	3550/3540	8270
p-Dimethylaminoazobenzene	30	1000	3520	3550/3540	8270
3,3'-Dimethylbenzidine	80	2700	3520	3550/3540	8270
3,3'-Dichlorobenzidine	20	660	3520	3550/3540	8270
7,12-Dimethylbenz(a)anthracene	50	1700	3520	3550/3540	8270
Di-n-octylphthalate	10	330	3520	3550/3540	8270
Dibenz(a,h)anthracene	10	330	3520	3550/3540	8270
Diallate	10	330	3520	3550/3540	8270
Ethyl methanesulfonate	10	330	3520	3550/3540	8270
bis(2-Ethylhexyl)phthalate	10	330	3520	3550/3540	8270
Fluorene	10	330	3520	3550/3540	8270
Fluoranthene	10	330	3520	3550/3540	8270
Hexachloroethane	10	330	3520	3550/3540	8270
Hexachloropropene	50	1700	3520	3550/3540	8270
Hexachlorobutadiene	10	330	3520	3550/3540	8270
Hexachlorocyclopentadiene	10	330	3520	3550/3540	8270
Hexachlorobenzene	10	330	3520	3550/3540	8270
Hexachlorophene	50	1700	3520	3550/3540	8270
Indeno(1,2,3-cd)pyrene	10	330	3520	3550/3540	8270
Isophorone	10	330	3520	3550/3540	8270
Isosafrole	10	330	3520	3550/3540	8270
Methyl methanesulfonate	50	1700	3520	3550/3540	8270
2-Methylphenol	10	330	3520	3550/3540	8270
3-Methylphenol	10	330	3520	3550/3540	8270
4-Methylphenol	10	330	3520	3550/3540	8270

TABLE 9.2 Appendix IX Semivolatile Organic Compounds (Continued)

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
Methapyrlene	40	1300	3520	3550/3540	8270
3-Methylcholanthrene	30	1000	3520	3550/3540	8270
2-Methylnaphthalene	10	330	3520	3550/3540	8270
N-Nitrosodimethylamine	10	330	3520	3550/3540	8270
N-Nitrosomethylethylamine	10	330	3520	3550/3540	8270
N-Nitrosodiethylamine	10	330	3520	3550/3540	8270
N-Nitrosodipropylamine	10	330	3520	3550/3540	8270
Nitrobenzene	10	330	3520	3550/3540	8270
N-Nitrosopyrrolidine	10	330	3520	3550/3540	8270
N-Nitrosomorpholine	10	330	3520	3550/3540	8270
N-Nitrosopiperidine	10	330	3520	3550/3540	8270
2-Nitrophenol	10	330	3520	3550/3540	8270
Naphthalene	10	330	3520	3550/3540	8270
N-Nitroso-di-n-butylamine	20	660	3520	3550/3540	8270
1,4-Napthoquinone	10	330	3520	3550/3540	8270
2-Nitroaniline	50	1700	3520	3550/3540	8270
3-Nitroaniline	50	1700	3520	3550/3540	8270
1-Naphthylamine	20	660	3520	3550/3540	8270
4-Nitrophenol	50	1700	3520	3550/3540	8270
2-Naphthylamine	20	660	3520	3550/3540	8270
5-Nitro-o-toluidine	20	660	3520	3550/3540	8270
4-Nitroaniline	50	1700	3520	3550/3540	8270
N-Nitrosodiphenylamine	10	330	3520	3550/3540	8270
4-Nitroquinoline-n-oxide	100	3000	3520	3550/3540	8270
2,2-Oxybis(1-Chloropropane	10	330	3520	3550/3540	8270
Pyridine	20	660	3520	3550/3540	8270
2-Picoline	70	2300	3520	3550/3540	8270
Phenol	10	330	3520	3550/3540	8270
Pentachloroethane	20	330	3520	3550/3540	8270
Pentachlorobenzene	20	660	3520	3550/3540	8270
Phenacetin	10	330	3520	3550/3540	8270
Pentachlorophenol	50	1700	3520	3550/3540	8270
Pentachloronitrobenzene	20	660	3520	3550/3540	8270
Pronamide	30	1000	3520	3550/3540	8270
Phenanthrene	10	330	3520	3550/3540	8270

TABLE 9.2 Appendix IX Semivolatile Organic Compounds (Continued)

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
Pyrene	10	330	3520	3550/3540	8270
p-Phenylenediamine	50	1700	3520	3550/3540	8270
Safrole	10	330	3520	3550/3540	8270
o-Toluidine	10	330	3520	3550/3540	8270
1,2,4-Trichlorobenzene	10	330	3520	3550/3540	8270
2,4,6-Trichlorophenol	10	330	3520	3550/3540	8270
2,4,5-Trichlorophenol	50	1700	3520	3550/3540	8270
1,2,4,5-Tetrachlorobenzene	10	330	3520	3550/3540	8270
2,3,4,6-Tetrachlorophenol	20	660	3520	3550/3540	8270
Tinuvin 327	N/A	N/A	3520	3550/3540	8270
Irgasan DP-300	N/A	N/A	3520	3550/3540	8270
Propazine	N/A	N/A	3520	3550/3540	8270
Butazolidin	N/A	N/A	3520	3550/3540	8270
Tofranil	N/A	N/A	3520	3550/3540	8270
DCDD	N/A	N/A	3520	3550/3540	8270
TrCDD	N/A	N/A	3520	3550/3540	8270
DCDF	N/A	N/A	3520	3550/3540	8270
TrCDF	N/A	N/A	3520	3550/3540	8270
1,3,5-Trinitrobenzene (D)	N/A	N/A	3520	3550/3540	8270

A Sample PQLs are highly matrix dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

B PQLs listed for soil/sediment are based on wet weight. If data are reported on a dry weight basis, PQLs will be higher, based on the % moisture in each sample.

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D 1,3,5-Trinitrobenzene will be analyzed as a tentatively identified compound due to unavailability of standards.

TABLE 9.3 Appendix IX Organochlorine Pesticides and PCBs

	Practical Quantitation Limits[A]				
	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
Aldrin	0.05	8	3520	3550/3540	8080
alpha-BHC	0.05	8	3520	3550/3540	8080
beta-BHC	0.05	8	3520	3550/3540	8080
delta-BHC	0.05	8	3500	3550/3540	8080
gamma-BHC	0.05	8	3500	3550/3540	8080
alpha-Chlordane	0.1	16	3500	3550/3540	8080
gamma-Chlordane	0.1	16	3500	3550/3540	8080
4,4'-DDD	0.1	16	3500	3550/3540	8080
4,4'-DDE	0.1	16	3500	3550/3540	8080
4,4'-DDT	0.1	16	3500	3550/3540	8080
Dieldrin	0.1	16	3500	3550/3540	8080
Endosulfan I	0.05	8	3500	3550/3540	8080
Endosulfan II	0.1	16	3500	3550/3540	8080
Endosulfan Sulfate	0.1	16	3500	3550/3540	8080
Endrin	0.1	16	3500	3550/3540	8080
Endrin Aldehyde	0.1	16	3500	3550/3540	8080
Heptachlor	0.05	8	3500	3550/3540	8080
Heptachlor epoxide	0.05	8	3500	3550/3540	8080
Isodrin	10	1600	3500	3550/3540	8080
Kepone	10	1600	3500	3550/3540	8080
Methoxychlor	0.5	80	3500	3550/3540	8080
PCB-1016	0.5	80	3500	3550/3540	8080
PCB-1221	0.5	80	3500	3550/3540	8080
PCB-1232	0.5	80	3500	3550/3540	8080
PCB-1242	0.5	80	3500	3550/3540	8080
PCB-1248	0.5	80	3500	3550/3540	8080
PCB-1254	1.0	160	3500	3550/3540	8080
PCB-1260	1.0	160	3500	3550/3540	8080
Toxaphene	1.0	160	3500	3550/3540	8080

A Sample PQLs are highly matrix dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

B PQLs listed for soil/sediment are based on wet weight. If data are reported on a dry weight basis, PQLs will be higher, based on the % moisture in each sample.

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TABLE 9.4 Appendix IX Chlorinated Herbicides

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep[C] Method	Analytical[C] Method
2,4-D	10	670	8150	8150
2,4,5-TP (Silvex)	2	270	8150	8150
2,4,5-T	2	270	8150	8150
Dinoseb	1	D	8150	8150

A Sample PQLs are highly matrix dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

B PQLs listed for soil/sediment are based on wet weight. If data are reported on a dry weight basis, PQLs will be higher, based on the % moisture in each sample.

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D Dinoseb is not recovered from soil.

TABLE 9.5 Appendix IX Organophosphorous Pesticides

Practical Quantitation Limits[A]

	Groundwater ug/L	Low Soil/Sediment[B] ug/kg	Prep Method[C] Water	Prep Method[C] Soil	Analytical[C] Method
Sulfotepp	5	165	3520	3550/3540	8140
Phorate	3	100	3520	3550/3540	8140
Dimethoate	5	165	3520	3550/3540	8140
Disulfoton	3	100	3520	3550/3540	8140
Methyl parathion	3	100	3520	3550/3540	8140
Ethyl parathion	3	100	3520	3550/3540	8140
Famphur	5	165	3520	3550/3540	8140
Thionazin	5	165	3520	3550/3540	8140
o,o,o-Triethylphosphorothioate	3	100	3520	3550/3540	8140

A Sample PQLs are highly matrix dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

B PQLs listed for soil/sediment are based on wet weight. If data are reported on a dry weight basis, PQLs will be higher, based on the % moisture in each sample.

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TABLE 9.6 APPENDIX IX CLASSICAL PARAMETERS

Practical Quantitation Limits(b)

Compound	Method(a)	Water	Soil
Cyanide	9012	0.01 mg/liter	0.5 mg/kg
Sulfide	9030	1.0 mg/liter	N/A

(a) USEPA SW-846 3rd Edition.

(b) Sample PQLs are highly matrix-dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

N/A Not Applicable

TABLE 9.7 APPENDIX IX METALS (DISSOLVED)

Metal	Prep Method(a)	Analytical Method(b)	Practical Quantitation Limits Groundwater(c) (ug/L)
Antimony	3020	7041	7
Arsenic	3020	7060	4
Barium	3005 6010		10
Beryllium	3005	6010	2
Cadmium	3005	6010	5
Chromium	3005	6010	10
Cobalt	3005 6010		20
Copper	3005 6010		20
Lead	3020	7421	3
Mercury	7470	7470	0.2
Nickel	3005 6010		20
Selenium	3020	7740	5
Silver	3005 6010		10
Thallium	3020	7871	5
Tin	3005	6010	100
Vanadium	3005	6010	20
Zinc	3005	6010	20

(a) USEPA SW-846 3rd Edition.

(b) USEPA SW-846 3rd Edition. Where listed, Method 6010 is the primary method. The alternative SW-846 method(s) will be used only as necessary.

(c) Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in groundwater than can be reliably determined by the indicated methods under routine laboratory conditions. The PQLs are highly matrix-dependent and may not always be achievable.

TABLE 9.8 APPENDIX IX METALS (TOTAL)

	Analytical Methods(b)		Practical Quantitation Limits		
	Primary	Prep Method(a)	Groundwater	Soil(d)	
	Method	Water	Soil	ug/liter	mg/kg	
Antimony	7041	3020	3050	30	3
Arsenic	7060	3020	3050	2	0.2
Barium	6010	3005	3050	10	1.0
Beryllium	6010	3005	3050	2	0.2
Cadmium	6010	3005	3050	5	0.5
Chromium	6010	3005	3050	10	1
Cobalt	6010	3005	3050	20	2
Copper	6010	3005	3050	20	2
Lead	7421	3020	3050	2	0.2
Mercury	7470 (Water) 7471 (Soil)	7470	7471	0.2	0.2
Nickel	6010	3005	3050	20	2
Selenium	7740	3020	3050	2	0.2
Silver	6010	3005	3050	10	1.0
Thallium	7841	3020	3050	2	0.2
Tin	6010	3005	3050	100 10	
Vanadium	6010	3005	3050	20	2
Zinc	6010	3005	3050	20	2

(a) USEPA SW-846 3rd Edition.

(b) USEPA SW-846 3rd Edition. Where listed, Method 6010 is the primary method. The alternate SW-846 method(s) will be used only as necessary

(c) Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in groundwater that can be reliably determined by the indicated methods under routine laboratory conditions. The PQLs are highly-matrix dependent and may not always be achievable.

(d) PQL in soil using 1g of soil and a final extract volume of 100 ml.

Tracking Forms 13 & 14
(main document)

CRANSTON QAPjP TRACKING FORM

No. 13
Date: 12/17/92

PERSON REQUESTING REVISION: Diane Leber, Diana Baldi

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
Diane Leber: CIBA-GEIGY Project Coordinator for the Cranston Site
Diana Baldi: CIBA-GEIGY National Services Contract Administrator

NATURE OF CHANGE TO QAPjP:
Type: 1. Major X Minor____ (check one)
2. Informational____ Technical X (check one)

Section(s): Sections 4.0 and 5.0
of Document of the Cranston Quality Assurance Documents: Supplement #1

REVISION: (see attachment for list)

REASON FOR CHANGE: Each reason is listed with each change in the attachment.

EFFECTS OF CHANGE: Net effect of each change is listed in the attachment.

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of Sections 4.0 and 5.0 of the Cranston Quality Assurance Documents: Supplement #1.

[These changes are being made concurrently with the changes in Tracking Form #14, wherein the above sections will be distributed.]

Diana Baldi 12/17/92
Project Manager Date
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M. Leber 12/18/92
CIBA-GEIGY Project Coordinator Date

APPROVED (if technical change):

USEPA Project Manager Date

MAJOR TECHNICAL CHANGES TO CRANSTON QUALITY ASSURANCE DOCUMENT: SUPPLEMENT #1

1. Section 4, page 7 and Section 5, page 17: The compound Dimethylphenethylamine has been changed to a,a-Dimethylphenethylamine.

   REASON FOR CHANGE: Isomer specification

   EFFECT OF CHANGE: The isomer analyzed is clarified.

2. Section 4, page 7: The compound Hexachlorophene has been deleted from Table 4-1.

   REASON FOR CHANGE: The compound is unstable and cannot be reliably quantitated.

   EFFECT OF CHANGE: Hexachlorophene will continue to not be reported.

3. Section 4, page 9: The analysis for "oxy-bis(ethanol)" has been footnoted to indicate that it will be performed only for samples from areas of the site where it was previously detected.

   REASON FOR CHANGE: The compound was tentatively identified by GC/MS in a limited area of the site. The purpose of adding it as a target compound is to confirm or refute the original tentative identifications.

   EFFECT OF CHANGE: Analysis for oxy-bis(ethanol) will be limited to areas of the site where it was tentatively identified in Phase I.

4. Section 4, page 9 and Section 5, page 5: The compound Tinuvin 327 listed in the Cranston site-specific compound list has been changed to Tinuvin 328 with CAS number 25973-55-1. The spike compound, accuracy and precision limits for Tinuvin 327 have been changed to Tinuvin 328.

   REASON FOR CHANGE: Revision of project scope was requested by EPA

   EFFECT OF CHANGE: Tinuvin data from Phase I and Phase II will not be comparable.

5. Section 4, page 9: Two constituents referenced in the "Cranston Site-Specific Compounds added for Phase II after Review of Phase I TICs" have been changed:

   (a) Dimethoxyacetophenone changed to 3,4'-Dimethoxyacetophenone
   (b) Methylbenzene sulfonamide changed to 2&4-Methylbenzenesulfonamide

REASON FOR CHANGE: Clarification of isomer identifications and elimination of extra space in compound name

EFFECT OF CHANGE: (a) To report the available standard (b) To report both isomers and correctly enter compound name into EDMS

6. Section 5, page 5: (a) For Method 8140/8141, the precision limits (water & soil) for methyl parathion and for thionazin have been added. The accuracy and precision limits for sulfotepp have been deleted. (b) Footnotes have been added to this section to indicate the spike compound applicable to the laboratory.

   REASON FOR CHANGE: To incorporate changes in Savannah Laboratories QAPjP (see Tracking Form #4) into the main document

   EFFECTS OF CHANGE: (a) Matrix effects will be able to be distinguished from method variability (b) Matrix spike compounds will be associated with the appropriate laboratories.

7. Section 5, pages 6 & 8: Footnote #3 regarding Savannah Lab's use of tin in their matrix spike samples has been removed. Footnote #4 applicable to antimony has been changed to #3.

   REASON FOR CHANGE: Savannah Labs <u>will</u> add tin to their matrix spike samples to provide quality control information for tin.

   EFFECT OF CHANGE: Additional information will be available to verify tin results.

8. Section 5, page 10: The non-CLP surrogate compound Ronnel has been deleted from this table, along with the associated % recovery limits and footnotes.

   REASON FOR CHANGE: Savannah Labs will now use triphenylphosphate as their non-CLP surrogate compound for method 8141 since Ronnel is a target compound for the 8141 list.

   EFFECT OF CHANGE: Allows consistency in the spiking of organophosphate pesticides within Savannah Laboratories for multiple projects

9. Section 5, page 16: The PQLs in soil for PACE, Inc., for acetonitrile, 1,4-dioxane, and isobutanol have been changed, as follows:

COMPOUND	OLD VALUE	REVISED VALUE
Acetonitrile	400	20
1,4-dioxane	2000	500
Isobutanol	10000	100

REASON FOR CHANGE: Updated PQLs from PACE, Inc. (see Tracking Form #12) were incorporated into the table.

EFFECT OF CHANGE: Lower reporting limits will be obtained from PACE, Inc.

10. Section 5, page 17: The PQL for dinoseb in water for Savannah Laboratories has been lowered from 50 ppb to 10 ppb.

REASON FOR CHANGE: Updated PQL from Savannah Laboratories (see Tracking Form #3) has been incorporated into the table.

EFFECTS OF CHANGE: Lower reporting limits will be obtained from Savannah Laboratories.

11. Section 5, page 17: The analyte 1-naphthylamine and its corresponding identifications have been deleted.

REASON FOR CHANGE: Updated PQL from Savannah Laboratories is not higher than either Appendix IX recommended PQL or historical PWL from Radian, so the compound can be deleted from the table.

EFFECT OF CHANGE: Better comparability of results from Savannah Laboratories with the historical data from Radian.

12. Section 5, page 18: The following PQLs for PACE, Inc., for the applicable compounds have been lowered:

Compounds	Water PQL		Soil PQL	
	Old Value	New Value	Old Value	New Value
Acetonitrile	no change		400	20
1,4-Dioxane	no change		2000	500
Isobutanol	1000	100	10000	100

REASON FOR CHANGE: Updated PQLs from PACE, Inc., (see Tracking Form #12) were incorporated into the table.

EFFECTS OF CHANGE: Better comparability between PACE, Inc., results and other laboratories for volatiles.

CRANSTON QAPjP TRACKING FORM

No. 14
Date: 12/17/92

PERSON REQUESTING REVISION: Diane Leber, Diana Baldi

RESPONSIBILITY OF REQUESTOR IN CRANSTON PROJECT:
Diane Leber: CIBA-GEIGY Project Coordinator for the Cranston Site
Diana Baldi: CIBA-GEIGY National Services Contract Administrator

NATURE OF CHANGE TO QAPjP:
Type: 1. Major___ Minor X (check one)
2. Informational X Technical____ (check one)

Section(s) of Document: Sections 2.0, 4.0, 5.0, 9.0, 13.0, 14.0, 17.0 and 18.0 of the Cranston Quality Assurance Documents: Supplement #1

REVISION: (see attachment for list)

REASON FOR CHANGE: Each reason is listed with each change in the attachment.

EFFECTS OF CHANGE: Net effect of each change is listed in the attachment.

NECESSARY CORRECTIVE ACTION(S): Project-wide distribution of Sections 2.0, 4.0, 5.0, 9.0, 13.0, 14.0, and 17.0 of the Cranston Quality Assurance Documents: Supplement #1. Also, project-wide distribution of Tracking Forms 3 - 14 for insertion in Section 18.0 of said document.
[These changes are being issued concurrently with those in Tracking Form #13, which includes some of the same sections for distribution.]

Diana Baldi — 12/17/92
Project Manager — Date
Responsibility: CIBA-GEIGY National Service Contract Administrator

Diane M. Leber — 12/18/92
CIBA-GEIGY Project Coordinator — Date

APPROVED (if technical change):

NOT REQUIRED

USEPA Project Manager — Date

MINOR INFORMATIONAL CHANGES TO CRANSTON QUALITY ASSURANCE DOCUMENTS: SUPPLEMENT #1

1. Section 2, pp. 1 - 3: Revision numbers have been changed for pertinent section of the document

   REASON FOR CHANGE: Revisions to the document were required

   EFFECT OF CHANGE: None

2. Section 2, page 7 and Section 17, page 2: The address/telephone/FAX for Bill Davis, PACE, Inc. has been changed to the following: 100 Marshall Drive, Warrendale, PA 15086; Voice: (412) 772-0610; FAX: (412) 772-4020.

   REASON FOR CHANGE: Relocation

   EFFECT OF CHANGE: None

3. Section 2, page 8: John Rissel (Environmental Testing Laboratory) has been changed to Denis Mitchell.

   REASON FOR CHANGE: Personnel change

   EFFECT OF CHANGE: None

4. Section 4, page 3: In Section 4.3, line 4, the word "health" has been corrected.

   REASON FOR CHANGE: Typographical error

   EFFECT OF CHANGE: None

5. Section 4, page 8: The CAS numbers have been added for sulfide, tin and o-oxylene.

   REASON FOR CHANGE: To identify CAS numbers for these constituents.

   EFFECT OF CHANGE: CAS numbers are now listed for these compounds.

6. Section 4, page 9: The tests "Biological Oxygen Demand - 5" and "Langlier Index" have been moved from "Major/Minor Ions" and "Miscellaneous Tests" to "POTW/NPDES" and "Corrosion/Encrustation," respectively.

   REASON FOR CHANGE: Incorrect placement in original document

   EFFECT OF CHANGE: None

7. Section 4, page 10: CIBA-GEIGY Environmental Testing Laboratory

has replaced Savannah Laboratories as the primary laboratory for performing the analysis of corrosion/encrustation in the water parameters, while Savannah Laboratories has been indicated as a back-up laboratory.

REASON FOR CHANGE: To accurately reflect where future analyses will be completed

EFFECT OF CHANGE: Analysis work for corrosion/encrustation in the water parameters will now be performed at CIBA-GEIGY Environmental Testing Laboratory.

8. Section 4, page 10: PACE, Inc., has been added to the list of back-up laboratories for the "Miscellaneous Pawtuxet River Work."

REASON FOR CHANGE: To accurately reflect PACE, Inc.'s involvement with analyses to support the river monitoring work.

EFFECT OF CHANGE: None

9. Section 4, page 10 and page 11: R.I. Analytical Laboratories, Inc., Northeast Analytical, Inc., and Savannah Analytical Services have been added to Table 4-2 and to the Organizational Chart for Cranston Project (titles only), Figure 4-1.

REASON FOR CHANGE: R.I. Analytical Laboratories, Inc., were used due to their capabilities and their proximity to the site and for work requiring Rhodes Island certification. Northeast Analytical, Inc., was selected to obtain required detection limits for mono through deca PCBs in the Pawtuxet River work. Savannah Analytical Services was selected for particulate organic carbon determination.

EFFECT OF CHANGE: Convenient sample delivery, rapid turn around time capabilities and accurate results to satisfy low detection limit requirements.

10. Section 5, page 12: The abbreviation for Savannah Labs has been corrected from SLI to SL.

REASON FOR CHANGE: Incorrect original reference

EFFECT OF CHANGE: None

MINOR INFORMATIONAL CHANGES TO CRANSTON QUALITY ASSURANCE DOCUMENTS: SUPPLEMENT #1

11. Section 9, page 1: The following compounds or analytes, laboratory names, and appropriate appendix references are added to the list:

Compounds or Analytes	QA Project Plan	Appendix
Metals, volatiles, semi-volatiles, & TSS	R.I. Analytical, Inc.	L
Particulate Organic Carbon	Savannah Analytical Services	K
PCB homolog (mono through deca)	Northeast Analytical, Inc.	M

REASON FOR CHANGE: Additional laboratories were added

EFFECT OF CHANGE: None

12. Section 13, page 1: Section 13.2 is completed and added.

REASON FOR CHANGE: Not complete at time of original issuance of document

EFFECT OF CHANGE: None

13. Section 14, page 1: The last sentence is changed to correct verb tense from "satisfies" to "satisfy."

REASON FOR CHANGE: Grammatical correction

EFFECT OF CHANGE: None

14. Section 17, page 1: The CIBA-GEIGY Corporation Lab Manager position has been changed from John Rissel to Denis Mitchell.

REASON FOR CHANGE: Personnel reassignments

EFFECT OF CHANGE: None

MINOR INFORMATIONAL CHANGES TO CRANSTON QUALITY ASSURANCE DOCUMENTS: SUPPLEMENT #1

15. Section 17, page 4: Figure 17-1 is added.

    REASON FOR CHANGE: Not complete at issuance of Revision 1 to Section 17.

    EFFECT OF CHANGE: None

16. Section 18: Insert Cranston QAPjP Tracking Forms Number 3 - 14 (with attached pages that detail revisions)

    REASON FOR CHANGE: See each tracking form [and each revision listed] for details

    EFFECT OF CHANGE: See each tracking form [and each revision listed] for rationale

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I. IT Corporation QAPjP for Biological Fieldwork and TIE
J. IT Corporation QAPjP for Geotechnical Analyses
K. Savannah Analytical Services Quality Assurance Document
L. R.I. Analytical Laboratories, Inc., Quality Assurance Document
M. Northeast Analytical, Inc., Quality Assurance Document

2.4 DISTRIBUTION LIST

ENTIRE DOCUMENT:

Frank Battaglia, USEPA Region I (6 copies)
Waste Management Building
90 Canal Street
Boston, MA 02114
Voice: (617) 573-9643
FAX: (617) 573-9662

Diane Leber, CIBA-GEIGY (x2159); FAX: (914) 479-2332
Corporate Environmental Protection

Patty Culver, CIBA-GEIGY (x4365); FAX: (914) 479-2290
Corporate Information Services
CIBA-GEIGY Corporation
444 Saw Mill River Road
Ardsley, NY 10502
Voice: (914) 479-5000

ENTIRE DOCUMENT (cont.):

Diana Baldi, CIBA-GEIGY
CIBA-GEIGY Corporation
Environmental Technology Center
P. O. Box 18300 (27419), 410 Swing Road (27409)
Greensboro, NC
Voice: (919) 632-7506
FAX: (919) 632-2048

Frank Saksa, CIBA-GEIGY (x2789)
CIBA-GEIGY Corporation
Environmental Testing Laboratory
P. O. Box 71, Route 37 West
Toms River, NJ 08754
Voice: (908) 349-5200
FAX: (908) 505-9195

Mark Houlday, Woodward-Clyde Consultants
201 Willowbrook Boulevard
P. O. Box 290
Wayne, NJ 07470
Voice: (201) 785-0700
FAX: (201) 785-0023

Tom C. Marshall, IT Corporation
312 Director's Drive
Knoxville, TN 37923
Voice: (615) 690-3211
FAX: (615) 690-3626

John Connolly, HydroQual, Inc.
1 Lethbridge Plaza
Mahwah, NJ 07430
Voice: (201) 529-5151
FAX: (201) 529-5728

MAIN DOCUMENT WITH APPENDICES A AND B:

Linda Wolfe, Savannah Laboratories, Inc.
5102 La Roche Avenue (31404)
P. O. Box 13548 (31416-0548)
Savannah, GA
Voice: (912) 354-7858
FAX: (912) 352-0165

Bill Davis, PACE, Inc.
100 Marshall Drive
Warrendale, PA 15086
Voice: (412) 772-0610
FAX: (412) 772-4020

Rod Miller, PACE, Inc.
1710 Douglas Drive North
Minneapolis, MN 55422
Voice: (612) 544-5543
FAX: (612) 525-3377

Ed Stuber, PACE, Inc.
Robinson Lane, RD6
Wappingers Falls, NY 12590
Voice: (914) 227-2811
FAX: (914) 227-6134

Diane Waldschmidt, PACE, Inc.
100 Marshall Drive
Warrendale, PA 15086
Voice: (412) 772-0610
FAX: (412) 772-4020

Shelly Eyraud, Enseco-CAL
2544 Industrial Boulevard
West Sacramento, CA 95691
Voice: (916) 372-1393
FAX: (916) 372-1059

Steve Missler, Triangle Labs of Houston
12823 Park One Drive
Sugarland, TX 77478
Voice: (713) 240-5330
FAX: (713) 240-5341

MAIN DOCUMENT WITH APPENDICES A AND B:(cont.)

Denis Mitchell, CIBA-GEIGY (x2283)
Environmental Testing Laboratory
P. O. Box 71, Route 37 West
Toms River, NJ 08754
Voice: (908) 349-5200
FAX: (908) 505-9195

Tom Barber, CIBA-GEIGY
Environmental Technology Center
P. O. Box 18300 (27419), 410 Swing Road (27409)
Greensboro, NC
Voice: (919) 632-7297
FAX: (919) 632-2048

Dan Duh, IT Corporation
165 Fieldcrest Avenue
Edison, NJ 08837
Voice: (908) 225-2000
FAX: (908) 225-1691

Tom Geisler, IT Corporation
Non-U.S. Mail: 1570 Bear Creek Road
Oakridge, TN 37830
U.S. Mail: 1570 Bear Creek Road
Kingston, TN 37763
Voice: (615) 482-6497
FAX: (615) 482-1890

Steve Bishop, Savannah Analytical Services
Suite "I"
42 West Montgomery Crossroads
Savannah, GA 31406
Voice: (912) 920-4725
FAX: (912) 927-2076

Jerry Zschau, R.I. Analytical Laboratories, Inc.
41 Illinois Avenue
Warwick, RI 02888
Voice: (401) 737-8500
FAX: (401) 738-1970

Robert E. Wagner, Northeast Analytical, Inc.
301 Nott Street
Schenectady, NY 12305
Voice: (518) 346-4592
FAX: (518) 381-6055

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

4.1 Rationale for Project Organization

CIBA-GEIGY has carefully selected laboratories and technical consultants who will participate in the RCRA Corrective Action Study. In making its selections, CIBA-GEIGY applied the criteria that each laboratory and technical consultant must have demonstrated (1) expertise in its designated area of responsibility, and (2) the capacity to handle the work in the time frame specified in the order. In addition, because the laboratories and technical consultants must interact with each other, they must be able to function as members of the team. Finally, in the case of analytical laboratories, turn-around-time and contingency back-up was an additional consideration.

4.2 Project Organization

The project organization, shown on Figure 4-1, identifies the key positions at CIBA-GEIGY, the technical consultants and the laboratories. More detailed organizational charts are provided in the appendices for each laboratory and technical consultant. Figure 4-1 highlights the main communication channels for the Cranston Project.

Within CIBA-GEIGY, there are several individuals contributing to this project from the Corporate Environmental Technology Center (ETC) to support the CIBA-GEIGY project coordinator. ETC is an internal consulting resource available to provide high quality, timely, and cost-effective environmental engineering and analytical services to clients within the CIBA-GEIGY Corporation. The ETC staff and resources are organized into the following technical groups:

- Air Pollution Control
- Water and Wastewater Treatment Technology
- Hazardous Waste Treatment/Geohydrology
- Analytical Technology

The Analytical Technology Group provides high quality,

responsive and cost-effective technical support in three distinct areas of environmental analysis:

- **Environmental Testing Laboratory (ETL)** is a high throughput, certified, compliance laboratory capable of routine to moderately sophisticated analytical support. This laboratory utilizes standard procedures accepted by regulatory agencies and is accredited in multiple states. The lab is capable of implementing and producing EPA Contract Laboratory Program (CLP) deliverables.
- **Analytical Chemistry Group** is a high-technology, non-routine analytical function dedicated to generating engineering quality data in support of characterization and treatability studies. This Group is also the focus for all analytical methods development work.
- **National Service Contract Administration** is a technical and administrative function to select, oversee and manage qualified external environmental laboratories.

In addition to these groups, a Quality Assurance Officer (QAO) ensures that all work meets the stated data quality objectives. This structure positions ETC to be responsive to the diverse technical needs found within CIBA-GEIGY. For the Cranston project, the ETC Analytical Technology Group and the Quality Assurance Officer have assigned responsibilities for the analytical data.

Other internal support to the CIBA-GEIGY project coordinator related to Quality Assurance of the data includes a computer programmer from Corporate Information Services (CIS) for management of the database.

External support for the CIBA-GEIGY project coordinator include the following:

- Woodward-Clyde Consultants for overall project management, including fieldwork, data analysis and report writing;
- HydroQual, Inc., for modeling of the Pawtuxet River;
- International Technology (IT) Corporation for Public Health and Environmental Risk Evaluation of on-site and off-site areas; propose Media Protection Standards; Toxicity Identification Evaluation; and
- Project laboratories for chemical analyses and other analyses, as needed.

4.3 Responsibilities

Project Coordinator - The project coordinator has overall responsibility for meeting the objectives of the study. The project coordinator ensures that appropriate quality assurance plans, health and safety plans, and work plans (including schedules) are written to meet the objectives, and also ensures adherence to the plans through close communications and audits. When a deviation from an approved plan or schedule becomes necessary, it is the responsibility of the project coordinator to discuss the deviation with the USEPA remedial project manager.

Database Manager - The database manager is part of the Corporate Information Services (CIS) Group and is responsible for maintaining all hardware and software associated with the database system used to manage data from the project. In addition, the database manager ensures that the data integrity is maintained upon loading, validation and finalization. Once the data is loaded into the system it is the responsibility of the database manager to structure queries appropriately for accurate results and to confirm that the results are reflected accurately in customized reports.

National Service Contract Administrator (NSCA) - The NSCA is responsible for selecting laboratories to perform the required analyses, providing technical direction and oversight of the

laboratories. For the Cranston project, both internal and external laboratories will be managed to meet the project objectives. The oversight responsibilities include systems audits of the laboratories (in conjunction with the ETC Quality Assurance Officer) and systems audits of the data validators for compliance to the project-specific Data Validation Worksheets (Appendix B - Attachment #1).

Quality Assurance Officer - The QAO is part of the Corporate ETC and is primarily responsible for ensuring that the data quality objectives are met for analyses completed at ETL and ETC Analytical Chemistry. The QAO is also responsible for assisting the NSCA in oversight of the external laboratories performing work for CIBA-GEIGY Corporation. For the Cranston project, the QAO will perform systems audits of the internal and external laboratories as specified in Section 14 in conjunction with the NSCA.

The laboratories selected jointly by the project coordinator and the NSCA utilize a combination of external, contract laboratories, and CIBA-GEIGY's internal laboratories in the ETC Analytical Technology group. For the Cranston project, there are several distinct requirements for analytical data. The main categories of analysis are:

- Appendix IX
  - a) except dioxins/furans
  - b) dioxins/furans[1]
- Site-Specific Compounds
- Treatability Parameters[2]
  - a) POTW/NPDES
  - b) Nutrients
  - c) Major/Minor Ions
  - d) Corrosion/Encrustation

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[1]includes the Appendix IX specified congeners (tetra through hexa-chlorinated dioxins and furans and 2, 3, 7, 8 - TCDD) and additional 2, 3, 7, 8 - chlorinated isomers recommended by CIBA-GEIGY

[2]listed according to terminology presented in the Work Plan

- Geotechnical Parameters
- Bioassay
- Toxicity Identification Evaluation (TIE)
- PCB Screening

The constituents (compounds, analytes, and parameters) related to this project are listed in Table 4.1 and are grouped by the above categories of analysis. Since the PCB screening, TIE, and bioassay test results are not stored in the project database, these categories are not listed in Table 4-1. The nomenclature and CAS numbers in the table are consistent with the database for this project.

Due to the significant amount of analytical data to be collected in a relatively short time frame, a two-tiered management approach is presented for the Appendix IX plus site-specific compounds, the treatability parameters, and the miscellaneous parameters. The approach is to identify two vendors capable of performing the specified analysis while meeting stated data quality objectives of the project equally well. The vendors are identified in Table 4.2 as either the primary lab or the back-up lab for the specified analysis.

TABLE 4-1 Constituents Analyzed for Cranston Project Listed by Category of Analysis.

CATEGORY OF ANALYSIS: APPENDIX IX

CONSTITUENT NAME	CAS NUMBER	CONSTITUENT NAME	CAS NUMBER
ACENAPHTHENE	83-32-9	CHLOROBENZILATE	510-15-6
ACENAPHTHYLENE	208-96-8	2-CHLORO-1,3-BUTADIENE	126-99-8
ACETONE	67-64-1	ALPHA-CHLORDANE	5103-71-9
ACETONITRILE	75-05-8	GAMMA-CHLORDANE	5103-74-2
ACETOPHENONE	98-86-2	CHLOROETHANE	75-00-3
2-ACETYLAMINOFLUORENE	53-96-3	CHLOROFORM	67-66-3
ACROLEIN	107-02-8	CHLOROMETHANE	74-87-3
ACRYLONITRILE	107-13-1	4-CHLORO-3-METHYLPHENOL	59-50-7
ALDRIN	309-00-02	2-CHLORONAPHTHALENE	91-58-7
4-AMINOBIPHENYL	92-67-1	2-CHLOROPHENOL	95-57-8
ANILINE	62-53-3	4-CHLOROPHENYL-PHENYLETHER	7005-72-3
ANTHRACENE	120-12-7	3-CHLOROPROPENE	107-05-1
ANTIMONY	7440-36-0	CHROMIUM	7440-47-3
ARAMITE	140-57-8	CHRYSENE	218-01-9
ARSENIC	7440-38-2	COBALT	7440-48-4
BARIUM	7440-39-3	COPPER	7440-50-8
BENZENE	71-43-2	CYANIDE	57-12-5
BENZO(A)ANTHRACENE	56-55-3	2,4-D	94-75-7
BENZO(A)PYRENE	50-32-8	4,4'-DDD	72-54-8
BENZO(B)FLUORANTHENE	205-99-2	4,4'-DDE	72-55-9
BENZO(G,H,I)PERYLENE	191-24-2	4,4'-DDT	50-29-3
BENZO(K)FLUORANTHENE	207-08-9	DIALLATE	2303-16-4
BENZYL ALCOHOL	100-51-6	DIBENZ(A,H)ANTHRACENE	53-70-3
BERYLLIUM	7440-41-7	DIBENZOFURAN	132-64-9
ALPHA-BHC	319-84-6	DIBROMOCHLOROMETHANE	124-48-1
BETA-BHC	319-85-7	1,2-DIBROMO-3-CHLOROPROPANE	96-12-8
DELTA-BHC	319-86-8	DIBROMOMETHANE	74-95-3
GAMMA-BHC	58-89-9	1,2-DIBROMOETHANE	106-93-4
BIS(2-CHLOROETHYL)ETHER	111-44-4	DI-N-BUTYLPHTHALATE	84-74-2
BIS(2-CHLOROETHOXY)METHANE	111-91-1	1,2-DICHLOROBENZENE	95-50-1
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	1,3-DICHLOROBENZENE	541-73-1
BROMODICHLOROMETHANE	75-27-4	1,4-DICHLOROBENZENE	106-46-7
BROMOFORM	75-25-2	3,3'-DICHLOROBENZIDINE	91-94-1
BROMOMETHANE	74-83-9	TRANS-1,4-DICHLORO-2-BUTENE	110-57-6
4-BROMOPHENYL-PHENYLETHER	101-55-3	DICHLORODIFLUOROMETHANE	75-71-8
2-BUTANONE	78-93-3	1,1-DICHLOROETHANE	75-34-3
BUTYLBENZYLPHTHALATE	85-68-7	1,2-DICHLOROETHANE	107-06-2
CADMIUM	7440-43-9	1,1-DICHLOROETHENE	75-35-4
CARBON DISULFIDE	75-15-0	TRANS-1,2-DICHLOROETHENE	156-60-5
CARBON TETRACHLORIDE	56-23-5	2,4-DICHLOROPHENOL	120-83-2
4-CHLOROANILINE	106-47-8	2,6-DICHLOROPHENOL	87-65-0
CHLOROBENZENE	108-90-7	1,2-DICHLOROPROPANE	78-87-5

CATEGORY OF ANALYSIS: APPENDIX IX (cont.)

CONSTITUENT NAME	CAS NUMBER
CIS-1,3-DICHLOROPROPENE	10061-01-5
TRANS-1,3-DICHLOROPROPENE	10061-02-6
DIELDRIN	60-57-1
DIETHYLPHTHALATE	84-66-2
DIMETHOATE	60-51-5
P-DIMETHYLAMINOAZOBENZENE	60-11-7
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6
3,3'-DIMETHYLBENZIDINE	119-93-7
a,a-DIMETHYLPHENETHYLAMINE	122-09-8
2,4-DIMETHYLPHENOL	105-67-9
DIMETHYLPHTHALATE	131-11-3
1,3-DINITROBENZENE	99-65-0
4,6-DINITRO-2-METHYLPHENOL	534-52-1
2,4-DINITROPHENOL	51-28-5
2,4-DINITROTOLUENE	121-14-2
2,6-DINITROTOLUENE	606-20-2
DINOSEB	88-85-7
DI-N-OCTYLPHTHALATE	117-84-0
1,4-DIOXANE	123-91-1
DIPHENYLAMINE	122-39-4
DISULFOTON	298-04-4
ENDOSULFAN I	959-98-8
ENDOSULFAN II	33213-65-9
ENDOSULFAN SULFATE	1031-07-8
ENDRIN	72-20-8
ENDRIN ALDEHYDE	7421-93-4
ETHYLBENZENE	100-41-4
ETHYL METHACRYLATE	97-63-2
ETHYL METHANESULFONATE	62-50-0
ETHYL PARATHION	56-38-2
FAMPHUR	52-85-7
FLUORANTHENE	206-44-0
FLUORENE	86-73-7
HEPTACHLOR	76-44-8
HEPTACHLOR EPOXIDE	1024-57-3
HEXACHLOROBENZENE	118-74-1
HEXACHLOROBUTADIENE	87-68-3
HEXACHLOROCYCLOPENTADIENE	77-47-4
HEXACHLOROETHANE	67-72-1
HEXACHLOROPROPENE	1888-71-7
2-HEXANONE	591-78-6
HXCDD	
HXCDF	
INDENO(1,2,3-CD)PYRENE	193-39-5

CONSTITUENT NAME	CAS NUMBER
IODOMETHANE	74-88-4
ISOBUTANOL	78-83-1
ISODRIN	465-73-6
ISOPHORONE	78-59-1
ISOSAFROLE	120-58-1
KEPONE	143-50-0
LEAD	7439-92-1
MERCURY	7439-97-6
METHACRYLONITRILE	126-98-7
METHAPYRILENE	91-80-5
METHOXYCHLOR	72-43-5
3-METHYLCHOLANTHRENE	56-49-5
METHYLENE CHLORIDE	75-09-2
METHYL METHACRYLATE	80-62-6
METHYL METHANESULFONATE	66-27-3
2-METHYLNAPHTHALENE	91-57-6
METHYL PARATHION	298-00-0
4-METHYL-2-PENTANONE	108-10-1
2-METHYLPHENOL	95-48-7
3-METHYLPHENOL	108-39-4
4-METHYLPHENOL	106-44-5
NAPHTHALENE	91-20-3
1,4-NAPHTHOQUINONE	130-15-4
1-NAPHTHYLAMINE	134-32-7
2-NAPHTHYLAMINE	91-59-8
NICKEL	7440-02-0
2-NITROANILINE	88-74-4
3-NITROANILINE	99-09-2
4-NITROANILINE	100-01-6
NITROBENZENE	98-95-3
2-NITROPHENOL	88-75-5
4-NITROPHENOL	100-02-7
4-NITROQUINOLINE-N-OXIDE	56-57-5
N-NITROSO-DI-N-BUTYLAMINE	924-16-3
N-NITROSODIETHYLAMINE	55-18-5
N-NITROSODIMETHYLAMINE	62-75-9
N-NITROSODIPHENYLAMINE	86-30-6
N-NITROSO-DI-N-PROPYLAMINE	621-64-7
N-NITROSOMETHYLETHYLAMINE	10595-95-6
N-NITROSOMORPHOLINE	59-89-2
N-NITROSOPIPERIDINE	100-75-4
N-NITROSOPYRROLIDINE	930-55-2
5-NITRO-O-TOLUIDINE	99-55-8

CONSTITUENT NAME	CAS NUMBER
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1
PCB-1016	12674-11-2
PCB-1221	11104-28-2
PCB-1232	11141-16-5
PCB-1242	53469-21-9
PCB-1248	12672-29-6
PCB-1254	11097-69-1
PCB-1260	11096-82-5
PECDD	
PECDF	
PENTACHLOROBENZENE	608-93-5
PENTACHLOROETHANE	76-01-7
PENTACHLORONITROBENZENE	82-68-8
PENTACHLOROPHENOL	87-86-5
PHENACETIN	62-44-2
PHENANTHRENE	85-01-8
PHENOL	108-95-2
P-PHENYLENEDIAMINE	106-50-3
PHORATE	298-02-2
2-PICOLINE	109-06-8
PRONAMIDE	23950-58-5
PROPANENITRILE	107-12-0
PYRENE	129-00-0
PYRIDINE	110-86-1
SAFROLE	94-59-7
SELENIUM	7782-49-2
SILVER	7440-22-4
STYRENE	100-42-5
SULFIDE	18496-25-8
SULFOTEPP	3689-24-5
2,4,5-T	93-76-5
2,3,7,8-TCDD	1746-01-6
TCDD	
TCDF	
1,2,4,5-TETRACHLOROBENZENE	95-94-3
1,1,1,2-TETRACHLOROETHANE	630-20-6
1,1,2,2-TETRACHLOROETHANE	79-34-5
TETRACHLOROETHENE	127-18-4
2,3,4,6-TETRACHLOROPHENOL	58-90-2
THALLIUM	7440-28-0
THIONAZIN	297-97-2
TIN	7440-31-5
TOLUENE	108-88-3
O-TOLUIDINE	95-53-4
TOXAPHENE	8001-35-2

CONSTITUENT NAME	CAS NUMBER
2,4,5-TP (SILVEX)	93-72-1
1,2,4-TRICHLOROBENZENE	120-82-1
1,1,1-TRICHLOROETHANE	71-55-6
1,1,2-TRICHLOROETHANE	79-00-5
TRICHLOROETHENE	79-01-6
TRICHLOROFLUOROMETHANE	75-69-4
2,4,5-TRICHLOROPHENOL	95-95-4
2,4,6-TRICHLOROPHENOL	88-06-2
1,2,3-TRICHLOROPROPANE	96-18-4
O,O,O-TRIETHYLPHOSPHOROTHIOATE	126-68-1
1,3,5-TRINITROBENZENE	99-35-4
VANADIUM	7440-62-2
VINYL ACETATE	108-05-4
VINYL CHLORIDE	75-01-4
O-XYLENE	95-47-6
M&P-XYLENE	
ZINC	7440-66-6

CATEGORY OF ANALYSIS: ISOMERS OF DIOXINS AND FURANS THAT ARE NOT SPECIFIED IN THE APPENDIX IX LIST

2,3,7,8-TCDF	51207-31-9
1,2,3,7,8-PECDD	40321-76-4
1,2,3,7,8-PECDF	57117-41-6
2,3,4,7,8-PECDF	57117-31-4
1,2,3,4,7,8-HXCDD	39227-28-6
1,2,3,6,7,8-HXCDD	57653-85-7
1,2,3,7,8,9-HXCDD	19408-74-3
1,2,3,4,7,8-HXCDF	70648-26-9
1,2,3,6,7,8-HXCDF	57117-44-9
1,2,3,7,8,9-HXCDF	72918-21-9
2,3,4,6,7,8-HXCDF	60851-34-5

CATEGORY OF ANALYSIS: CRANSTON SITE-SPECIFIC

CONSTITUENT NAME	CAS NUMBER
BUTAZOLIDIN	50-33-9
DCDD	DCDD
DCDF	DCDF
IRGASAN DP-300	3380-34-5
PROPAZINE	139-40-2
TINUVIN 328	25973-55-1
TOFRANIL	113-52-0
TRCDD	TRCDD
TRCDF	TRCDF

CATEGORY OF ANALYSIS: CRANSTON SITE-SPECIFIC COMPOUNDS ADDED FOR PHASE II AFTER REVIEW OF PHASE I TENTATIVELY IDENTIFIED COMPOUNDS (TIC)

1,1-BIPHENYL
2-CYCLOHEXENE-1-OL
2-CYCLOHEXENE-1-ONE
2,5-CYCLOHEXADIENE-1,4-DIONE
3,4'-DIMETHOXYACETOPHENONE
2&4-METHYLBENZENESULFONAMIDE
n-OCTANE
OXY-BIS(ETHANOL)[1]

CATEGORY OF ANALYSIS: POTW/NPDES

BIOLOGICAL OXYGEN DEMAND - 5
CHEMICAL OXYGEN DEMAND
HYDROCARBONS
OIL AND GREASE
TKN
TOTAL DISSOLVED SOLIDS
TOTAL ORGANIC CARBON
TOTAL ORGANIC HALIDES
TOTAL SUSPENDED SOLIDS

CATEGORY OF ANALYSIS: NUTRIENTS

AMMONIA AS N
NITRATE-NITRITE AS N
ORTHOPHOSPHATE

CATEGORY OF ANALYSIS: MAJOR/MINOR IONS

CALCIUM	7440-70-2
CHLORIDE	
IRON	7439-89-6
MAGNESIUM	7439-95-4
MANGANESE	7439-96-5
POTASSIUM	7440-09-7
SODIUM	7440-23-5
SULFATE	

CATEGORY OF ANALYSIS: CORROSION/ENCRUSTATION

BICARBONATE ALKALINITY
CARBONATE ALKALINITY
LANGLIER INDEX
SILICA,DISSOLVED
TOTAL ALKALINITY

CATEGORY OF ANALYSIS: GEOTECHNICAL PARAMETERS

BULK DENSITY
COMBUSTIBILITY (BTU VALUE)
PARTICLE SIZE
PERCENT MOISTURE
TOTAL ORGANIC CARBON (TOC)

CATEGORY OF ANALYSIS: MISCELLANEOUS TESTS

CATION EXCHANGE CAPACITY (CEC)

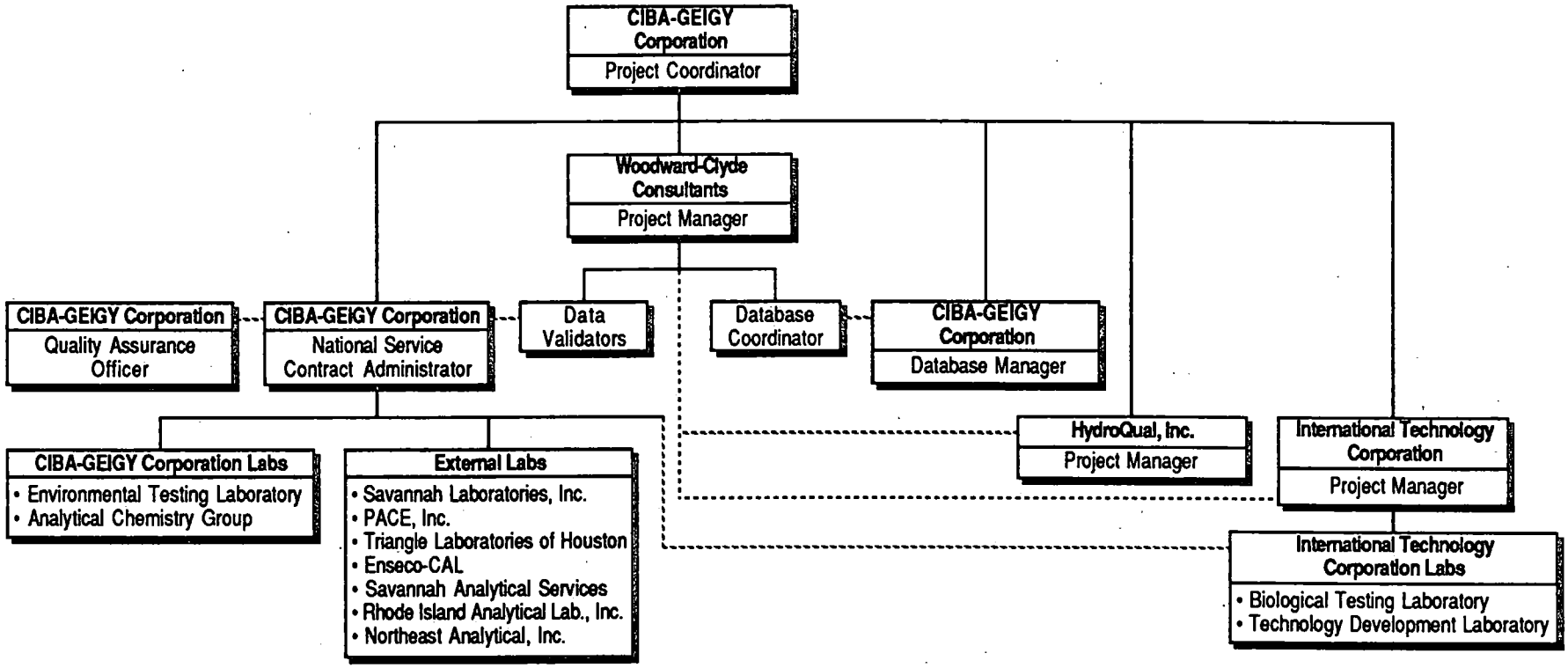
[1]will be requested by CIBA-GEIGY only for those areas of the site where it was previously detected as a TIC

TABLE 4-2 Identification and Status of Selected Vendors for Laboratory Analysis.

DATA TYPE	PRIMARY LABORATORY	BACK-UP LABORATORY
Appendix IX (non-dioxin) plus the site-specific compounds	Savannah Laboratories	PACE, Inc.
Appendix IX dioxins & furans	to be determined[1]	to be determined[1]
Water Quality Parameters:		
POTW/NPDES	CIBA-GEIGY Environmental Testing Lab[2]	Savannah Laboratories
Nutrients	CIBA-GEIGY Environmental Testing Lab	Savannah Laboratories
Major/Minor Ions	CIBA-GEIGY Environmental Testing Lab	Savannah Laboratories
Corrosion/Encrustation	CIBA-GEIGY Environmental Testing Lab	Savannah Laboratories
Bioassay and TIE	IT Corporation (Edison, NJ)	none
Geotechnical	IT Corporation (Oakridge, TN)	none
PCB Screening	CIBA-GEIGY Analytical Chemistry Group	none
Miscellaneous tests (CEC, Langlier Index)	Savannah Laboratories	none
Particulate Organic Carbon	Savannah Analytical Services	none
PCB Homolog (mono through deca)	Northeast Analytical, Inc.	none
Work requiring Rhode Island Certification	R. I. Analytical Laboratories, Inc.	none
Miscellaneous Pawtuxet River Work	R. I. Analytical Laboratories, Inc.	PACE, Inc.

[1]Enseco-CAL and Triangle Labs of Houston are the two laboratories selected. The main responsibility for analyses is dependent upon timing of the fieldwork.

[2]Savannah Laboratories, Inc., analyzes Total Organic Halides (TOX)



PROJECT ORGANIZATION
CIBA-GEIGY FACILITY, CRANSTON, RHODE ISLAND

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY: DWS	SCALE: NONE	PROJ. NO.: 87X4660
CK'D BY: MH	DATE: 1 DEC 1992	FIG. NO.: 4-1

5.0 QUALITY ASSURANCE OBJECTIVES

5.1 Overview

The quality assurance objectives for the project are that data be sufficiently complete, representative, comparable, accurate, precise, and sensitive enough (detection limits appropriate) to characterize the site, assess public health and environmental impacts, and evaluate remedial alternatives.

Quality Assurance elements which are addressed for all field and laboratory analysis include precision, accuracy, representativeness, completeness and comparability (PARCC parameters). Blank contamination, instrument calibration, sample holding times, sample preservation, and sample transport are other quality assurance elements that are important to the project. Each of these parameters are addressed from the perspective of the laboratory or technical consultant in their individual QA project plans contained in the appendices.

5.2 PARCC Parameters

The PARCC parameters needed to fulfill the objectives of the Consent Order may be more stringent or less restrictive than what is presented by each of the laboratories or technical consultants. In most cases, the objectives presented by the external vendors are what are *achievable* by the methods cited. In many cases, these achievable objectives are adopted by the project as a best case objective. It is likely that the normally achievable objectives cannot be obtained on the site-specific samples due to matrix interferences. During data validation, the normally achievable objectives are used as guidance and data falling outside the criteria specified in the Cranston-specific Data Validation Worksheets are qualified. Under most circumstances, it is not outliers from a single criterium that cause problems in data interpretation. Rather, it is the *combination* of non-attained objectives that form the difficulty in data interpreta-

tion. Therefore, it is the evaluation of the data by the external technical consultants that determines if the objectives of the Consent Order have been met. From a project perspective, the target objectives for the PARCC parameters are listed below.

5.2.1 **Precision** is an estimate of how reproducible a reported result is. It will be expressed in terms of Relative Percent Difference (RPD) which is the difference between two results that ideally would be identical. The field duplicates will be sent as single blind duplicates to the laboratories. The laboratories will know they are field duplicates, but they will not know which sample is being duplicated. The purpose of the field duplicates is to measure the *combined variability* for the field procedures and laboratory analysis. The *laboratory variability* will be evaluated using the RPD pairs from matrix spikes (MS/MSD) and laboratory control samples (LCS), (e.g., blank water spiked with compounds/analytes targeted for analysis). Table 5-1 lists the compounds/analytes that will be spiked into the MS/MSD and LCS that have acceptance limits specified in a USEPA Contract Lab Program (CLP) Statement of Work (SOW). The acceptance limits from the 3/90 SOW are the limits presented in Table 5-1, Table 5-3, and Table 5-4. For non-CLP compounds, the target project acceptance limits are presented in Table 5-2. These limits differ from the limits specified by Savannah Laboratories, Inc., and PACE, Inc., and are intended to present a reasonable compromise from a project perspective. The acceptance limits presented by the labs in their individual QA project plans for non-CLP compounds are based on control charts generated within each lab. The RPDs listed in Table 5-2 reflect the target limits for the *combined variability* from field procedures and laboratory analysis.

TABLE 5-1 Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples and Laboratory Control Samples for Organic Methods.

	ACCURACY WATER % RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 8240				
Benzene	76-127	11	66-142	21
Chlorobenzene	75-130	13	60-133	21
1,1-Dichloroethene	61-145	14	59-172	22
Toluene	76-125	13	59-139	21
Trichloroethene	71-120	14	62-137	24
METHOD 8270				
Acenaphthylene	46-118	31	31-137	39
4-Chloro-3-methylphenol	23-97	42	26-103	33
2-Chlorophenol	27-123	40	25-102	50
1,4-Dichlorobenzene	36-97	28	28-104	27
2,4-Dinitrotoluene	24-96	38	28-89	47
4-Nitrophenol	10-80	50	11-114	50
N-Nitroso-di-n-propylamine	41-116	38	41-126	38
Pentachlorophenol	9-103	50	17-109	47
Phenol	12-110	42	26-90	35
Pyrene	26-127	31	35-142	36
1,2,4-Trichlorobenzene	39-98	28	38-107	23
METHOD 8080				
Aldrin	40-120	22	34-132	43

[1]Since these compounds/analytes are listed in an EPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

TABLE 5-1 (cont.) Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples and Laboratory Control Samples for Organic Methods.

	ACCURACY	PRECISION	ACCURACY	PRECISION
	WATER %RECOVERY	WATER % RPD	SOIL % RECOVERY	SOIL % RPD
METHOD 8080 (cont.)				
Dieldrin	52-126	18	31-134	38
4-4'-DDT	38-127	27	23-134	50
Endrin	56-121	21	42-139	45
gamma-BHC	56-123	15	46-127	50
Heptachlor	40-131	20	35-130	31

[1]Since these compounds/analytes are listed in an EPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

TABLE 5-2 Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits for Matrix Spike Samples and Laboratory Control Samples for non-CLP Compounds and Analytes.

	ACCURACY WATER %RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 8140/8141				
Methyl parathion[1]	40-140	40	40-140	40
Ethyl parathion[2]	20-140	50	20-140	50
Thionazin[1]	25-160	60	25-160	60
Disulfoton[3]	20-140	50	24-140	50
METHOD 8150/8151				
2,4-D	40-140	50	40-140	50
2,4,5-T	40-140	50	40-140	50
2,4,5-TP	40-140	50	40-140	50
METHOD 8270: SITE-SPECIFIC FINGERPRINT COMPOUNDS				
Irgasan-DP-300	40-140	50	40-140	50
Tinuvin-328	40-140	50	40-140	50
Propazine	40-140	50	40-140	50
Tofranil	40-140	50	40-140	50
Butazolidin	40-140	50	40-140	50
METHOD 9030				
Total sulfide	50-150	50		

[1]Matrix spike compounds used by Savannah Laboratories
[2]Matrix spike compound used by both Savannah Laboratories and PACE, Inc.
[3]Matrix spike compound used by PACE, Inc., and Radian

TABLE 5-3 Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples for Inorganic Parameters.

	ACCURACY WATER %RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 6010				
Antimony[2]	75-125	20	75-125	20
Barium	75-125	20	75-125	20
Beryllium	75-125	20	75-125	20
Cadmium	75-125	20	75-125	20
Chromium	75-125	20	75-125	20
Cobalt	75-125	20	75-125	20
Copper	75-125	20	75-125	20
Nickel	75-125	20	75-125	20
Silver	75-125	20	75-125	20
Tin	75-125	20	75-125	20
Vanadium	75-125	20	75-125	20
Zinc	75-125	20	75-125	20
METHOD 7041				
Antimony[3]	75-125	20	75-125	20
METHOD 7060				
Arsenic	75-125	20	75-125	20
METHOD 7421				
Lead	75-125	20	75-125	20

[1]Since these compounds/analytes are listed in an USEPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

[2]Analyzed by Method 6010 by Savannah Labs

[3]Analyzed by Method 7041 by PACE

TABLE 5-3 (cont.) Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples for Inorganic Parameters.

	ACCURACY WATER %RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 7470/7471				
Mercury	75-125	20	75-125	20
METHOD 7740				
Selenium	75-125	20	75-125	20
METHOD 7841				
Thallium	75-125	20	75-125	20
METHOD 9012				
Total cyanide	75-125	20		

[1]Since these compounds/analytes are listed in an USEPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

TABLE 5-4 Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples for Laboratory Control Samples (LCS) for Inorganic Parameters.

	ACCURACY WATER %RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 6010				
Antimony[2]	80-120	20	80-120	20
Barium	80-120	20	80-120	20
Beryllium	80-120	20	80-120	20
Cadmium	80-120	20	80-120	20
Chromium	80-120	20	80-120	20
Cobalt	80-120	20	80-120	20
Copper	80-120	20	80-120	20
Nickel	80-120	20	80-120	20
Silver	80-120	20	80-120	20
Tin	80-120	20	80-120	20
Vanadium	80-120	20	80-120	20
Zinc	80-120	20	80-120	20
METHOD 7041				
Antimony[3]	80-120	20	80-120	20
METHOD 7060				
Arsenic	80-120	20	80-120	20
METHOD 7421				
Lead	80-120	20	80-120	20

[1]Since these compounds/analytes are listed in an USEPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

[2]Analyzed by Method 6010 by Savannah Labs

[3]Analyzed by Method 7041 by PACE

TABLE 5-4 (cont.) Target Percent Recovery (%R) and Relative Percent Difference (RPD) Limits[1] for Matrix Spike Samples for Laboratory Control Samples (LCS) for Inorganic Parameters.

	ACCURACY WATER %RECOVERY	PRECISION WATER % RPD	ACCURACY SOIL % RECOVERY	PRECISION SOIL % RPD
METHOD 7470				
Mercury[2]	80-120	20	80-120	20
METHOD 7740				
Selenium	80-120	20	80-120	20
METHOD 7841				
Thallium	80-120	20	80-120	20
METHOD 9012				
Total cyanide	80-120	20		

[1]Since these compounds/analytes are listed in an USEPA Contract Laboratory Program (CLP) Statement of Work (SOW), the CLP (3/90) SOW limits have been adopted.

[2]For soils, PACE uses Method 7471.

TABLE 5-5 Target Accuracy Acceptance Limits for Percent Recovery of Surrogate Compounds.

	WATER % RECOVERY	SOIL % RECOVERY
CLP SURROGATE COMPOUNDS:		
METHOD 8080		
Dibutylchlorendate	24-154	20-150
METHOD 8240		
4-Bromofluorobenzene	86-115	59-113
1,2-Dichloroethane-d4	76-114	70-121
Toluene-d8	88-110	84-138
METHOD 8270		
2-Fluorobiphenyl	43-116	30-115
2-Fluorophenol	21-110	25-121
Nitrobenzene-d5	35-114	23-120
Phenol-d5	10-110	24-113
p-Terphenol-d14	33-141	18-137
2,4,6-Tribromophenol	10-123	19-122
NON-CLP SURROGATE COMPOUNDS:		
METHOD 8140/8141		
Triphenylphosphate	23-176	28-174
METHOD 8150/8151		
2,4-Dichlorophenyl-acetic acid	50-150	50-150

5.2.2 Accuracy is an estimate of how closely a result matches the "true value." For this project, accuracy will be measured in terms of 1) laboratory Performance Evaluation (PE) samples which have statistically determined true values and acceptance limits; 2) surrogate recoveries in the methods for organic compounds, and 3) matrix spike (MS) samples. The specific types and frequencies of PE samples implemented by the labs are defined in each of their individual QA project plans (see Section 12 in their documents). The additional project PE samples for dioxin-furan analyses are dependent upon availability from USEPA Region I. Table 5-5 lists the target accuracy limits for the surrogate compounds for each of the methods for organic compounds.

5.2.3 Representativeness is a measure of how well the subsample characterizes the whole. In the field, the samplers will take precautions to obtain samples that represent the area being sampled (e.g., monitoring wells will be purged, and sampling equipment will be decontaminated prior to sampling). In the laboratories, the analysts are required to obtain a representative subsample from the sample container.

5.2.4 Comparability is a measure of how one data set compares to another. In general, standardized methods, reporting formats, and units of measure set the framework for comparability. For this project, the discussion of comparability of data requires several viewpoints. For the non-Appendix IX compounds/analytes, the discussion is straightforward since the methods and reporting units are standard. (For full discussion of these parameters, see the laboratory QA project plans which discuss the non-Appendix IX compounds/analytes.)

For the Appendix IX compounds, the following points are discussed:

- Comparison of Appendix IX list to list of analytes/compounds actually reported

- Comparison of Appendix IX recommended methods and Practical Quantitation Limits (PQL) to the historical data from Radian and to Savannah Laboratories (SL), and PACE, Inc.

5.2.4.1 DIFFERENCES FROM THE APPENDIX IX LIST

(1) Radian, SL, and PACE have all demonstrated that Hexachlorophene cannot be reliably quantitated since it is not stable. Hexachlorophene will not be reported.

(2) The Appendix IX list contains "Total Xylenes." Radian, SL, and PACE quantitate and report data as o-xylene and m + p xylene. This partial separation is useful to the risk assessors.

(3) 1,3,5-Trinitrobenzene was analyzed as a Tentatively Identified Compound (TIC) by Radian but SL has documented it is feasible to quantitate this compound. PACE has not completed their method validation for this compound to determine if it will be reported as a TIC or a target compound.

(4) The Appendix IX list only requires one dioxin isomer (2,3,7,8-TCDD) to be quantitated and reported separately from the "total" concentration of tetra through hexa congeners. Both Radian and Enseco-CAL analyzed samples during Phase IB using modified versions of Method 8280 to allow for quantitation of the other 2,3,7,8-chlorinated isomers. Due to the number and types of modifications to 8280 by both labs, comparability was not easily determined. To address this issue, the method proposed and accepted by USEPA Region I (beginning with the 9/91 groundwater sampling) is the CLP SOW (12/90) for Polychlorinated dibenzo-p-dioxins (PCDD) and Polychlorinated dibenzofurans (PCDF). This SOW specifies quantitation of all the 2,3,7,8-chlorinated isomers of dioxins and furans. The change in methods accomplishes two

goals: 1) to facilitate generation of interlaboratory data that is comparable (fewer, if any, modifications to the SOW are needed), and 2) to provide quantitative measurements for all the 2,3,7,8-chlorinated isomers to assist in the risk assessment. This change in methods may hinder comparability of new data with the historical data generated by Radian.

(5) Dinoseb has been documented by Radian and PACE to be unrecoverable in soil. Dinoseb will be reported for water samples only.

(6) Radian and PACE report 3-methylphenol and 4-methylphenol as separate compounds. SLI reports them as a combined total for 3 + 4 methylphenol.

5.2.4.2 DIFFERENCES FROM THE APPENDIX IX RECOMMENDED METHODS AND PRACTICAL QUANTITATION LIMITS

Since SW-846 3rd edition methods allow some flexibility in associating compounds with methods, there is opportunity to generate confusion. In other words, the labs can analyze the same compound by different methods. For a limited number of compounds, there are differences in the methods selected by Radian, SLI, and Pace. In an attempt to keep the following comparisons straightforward, the recommended methods and PQLs in the Appendix IX list are used as the model. Differences from the recommended methods and PQLs are presented in Table 5-6 and Table 5-8 for SLI and in Table 5-7 and Table 5-9 for PACE. In order to maintain a sense of the historical data, the related information from Radian's QAPjP is also listed in Tables 5-6 and 5-7.

5.2.5 **Completeness** is a measure of the amount of valid data generated from a measurement system. It is usually expressed as a percentage of valid data obtained based on the total amount of data attempted. Although 100% valid data is the general goal for

this project, there are categories where the Consent Order objectives can be met with less than 100% completeness obtained. The "acceptable" amount of incompleteness depends on the amount of redundancy of samples from the area.

For samples obtained in new areas or in fringe areas, the project goal is 100%. This means that 1) resampling will be initiated if the samples from these areas arrive broken at the lab, and 2) the laboratory will attempt reanalysis immediately upon identifying any quality control criteria out of control for these samples. Due to the questionable past data for dioxins/furans, all samples for this analysis are being considered as first-time samples, so the completeness goal is 100% for dioxin/furan analysis.

For other samples 80% completeness may allow the project objectives to be met. The overall goal for these samples is to attempt >90% completeness.

TABLE 5-6 List of Compounds/Analytes Analyzed by Savannah Laboratories, Inc. (SLI) using a Method which Differs from the Recommended Method in the Appendix IX List. All Units are ppb. (Note that the Practical Quantitation Limit [PQL] achieved by SLI using the alternate method is lower than the Appendix IX recommended PQL except for the four compounds noted.)

ANALYTE	APPENDIX IX RECOMMENDATION		RADIAN			SAVANNAH		
	METHOD	PQL	METHOD	WATER PQL	SOIL PQL	METHOD	WATER PQL	SOIL PQL
ACETONITRILE[1]	8015	100	8240	20	400	8240	1000	200
ARSENIC	6010	500	7060	4	400	7060	10	1000
CHLOROBENZILATE	8270	10	8270	10	330	8080	0.50	17
CYANIDE	9010	40	9012	10	500	9012	10	1000
1,4-DIOXANE	8015	150	8240	10000	10000	8270	10	330
DISULFOTON	8270	10	8140	2	200	8141	2	66
HEXACHLOROPHENE[2]	8270	10	8270	50	1700		N/A	N/A
ISOBUTANOL[1]	8015	50	8240	10000	10000	8240	1000	1000
ISODRIN	8270	10	8080	10	1600	8080	0.05	3.3
LEAD	6010	40	7421	3	300	7421	5	500
KEPONE	8270	10	8080	10	1600	8080	0.10	17
PENTACHLOROETHANE[1]	8270	10	8270	20	330	8240	25	25
SELENIUM	6010	750	7740	5	500	7740	10	1000
THALLIUM	6010	400	7871	5	500	7841	10	1000
TIN	7870	8000	6010	100	10	6010	50	5000

N/A = Not Analyzed

NOTE: The methods, water PQLs, and soil PQLs generated by Radian for Phase I of the project are presented above to facilitate comparison with the historical data.

[1]SLI PQL is higher than the Appendix IX recommended PQL.

[2]Hexachlorophene has been shown to be unstable. Although Radian stated the above PQLs in their QAPjP, they were not able to document that they could find it at any concentration. SLI states that they also are unable to reliably analyze for hexacholorophene.

TABLE 5-7 List of Compounds/Analytes Analyzed by PACE, Inc., using a Method which Differs from the Recommended Method in the Appendix IX List. All units are ppb. Except for 1,4-Dioxane and Isobutanol, the PQLs achieved by PACE using the alternate method are lower than the Appendix IX recommended PQLs.

ANALYTE	APPENDIX IX RECOMMENDATION		RADIAN			PACE		
	METHOD	PQL	METHOD	WATER PQL	SOIL PQL	METHOD	WATER PQL	SOIL PQL
ACETONITRILE	8015	100	8240	20	400	8240	20	20
ANTIMONY	6010	300	7041	7	3000	7041	7	3000
ARSENIC	6010	500	7060	4	400	7060	4	200
CYANIDE	9010	40	9012	10	500	9012	10	10
DINOSEB	8270	10	8150	1	N/A	8150	1	N/A
1,4-DIOXANE	8015	150	8240	10000	10000	8240	500	500
ISOBUTANOL	8015	50	8240	10000	10000	8240	1000	100
ISODRIN	8270	10	8080	10	1600	8080	10	1600
KEPONE	8270	10	8080	10	1600	8080	10	1600
LEAD	6010	40	7421	3	300	7421	3	200
SELENIUM	6010	750	7740	5	500	7740	5	200
THALLIUM	6010	400	7871	5	500	7871	5	200
TIN	7870	8000	6010	100	10000	6010	100	10000

N/A = not analyzed

NOTE: The methods, water PQLs, and soil PQLs generated by Radian for Phase I of the project are presented above to facilitate comparison with the historical data.

TABLE 5-8 List of Compounds that SLI reports a higher PQL than both the recommended Appendix IX PQL and the PQL generated historically for the project by Radian. All units are ppb.

ANALYTE	APPENDIX IX RECOMMENDATION		RADIAN			SAVANNAH LABS		
	METHOD	PQL	METHOD	WATER PQL	SOIL PQL	METHOD	WATER PQL	SOIL PQL
ACETONITRILE	8015	100	8240	20	400	8240	1000	200
ACROLEIN	8240	5	8240	75	1500	8240	100	200
ACRYLONITRILE	8240	5	8240	50	1000	8240	100	100
BERYLLIUM	6010	3	6010	2	200	6010	5	500
3,3'-DIMETHYLBENZIDINE	8270	10	8270	80	2700	8270	200	1700
a,a-DIMETHYLPHENETHYLAMINE	8270	10	8270	10	330	8270	2000	1700
DINOSEB[1]	8270	10	8150	1		8270	10	330
METHAPYRILENE	8270	10	8270	40	1300	8270	2000	3300
4-NITROQUINOLINE-N-OXIDE	8270	10	8270	100	3000	8270	100	3300
PENTACHLOROETHANE	8270	10	8270	20	330	8240	25	25
P-PHENYLENEDIAMINE	8270	10	8270	50	1700	8270	2000	1700
2-PICOLINE	8270	10	8270	70	2300	8270	200	330
PYRIDINE	8270	10	8270	20	660	8270	200	330
TOXAPHENE	8080	2	8080	1	160	8080	5	170
1,3,5-TRINITROBENZENE[2]	8270	10		N/A	N/A	8270	200	330
VINYL ACETATE	8240	5	8240	5	100	8240	10	10

N/A = Not Analyzed

NOTE: The methods, water PQLs, and soil PQLs generated by Radian for Phase I of the project are presented above to facilitate comparison with the historical data.

[1]Radian could not recover this compound from soil.

[2]Radian analyzed this compound as a Tentatively Identified Compound (TIC), but SLI has documented that they can reliably detect this compound.

TABLE 5-9 List of Compounds that PACE reports a higher PQL than both the recommended Appendix IX PQL and the PQL generated historically for the project by Radian. All units are ppb.

ANALYTE	APPENDIX IX RECOMMENDATION		RADIAN			PACE		
	METHOD	PQL	METHOD	WATER PQL	SOIL PQL	METHOD	WATER PQL	SOIL PQL
ACETONITRILE	8015	100.	8240	20.	400.	8240	20.	20.
1,4-DIOXANE	8015	150.	8240	10000.	10000.	8240	500.	500.
ISOBUTANOL	8015	50.	8240	10000.	10000.	8240	100.	100.
PENTACHLOROETHANE	8270	10.	8270	20.	330.	8270	20.	330.

9.0 ANALYTICAL PROCEDURES

Quality Assurance is the responsibility of each analytical laboratory and technical consultant. Analytical methods and practical quantitation limits associated with the field and laboratory measurements to be performed during this study are provided in the individual QA project plans as outlined below:

Compounds or Analytes	QA Project Plan	Appendix
General field sampling and field methods	Woodward-Clyde Consultants	B
Appendix IX (non-dioxin) and CIBA-GEIGY Site-Specific Compounds	Savannah Laboratories; PACE, Inc.	C, D
Appendix IX Dioxins/Furans	Triangle Labs of Houston, Enseco-CAL	E, F
POTW/NPDES[1]	CIBA-GEIGY ETL; Savannah Laboratories, Inc.	G, C
Nutrients	CIBA-GEIGY ETL; Savannah Laboratories, Inc.	G, C
Major/Minor Ions	CIBA-GEIGY ETL; Savannah Laboratories, Inc.	G, C
Corrosion/Encrustation	Savannah Laboratories, Inc.	C
PCB Screening	CIBA-GEIGY ETC Analytical Chemistry	H
Geotechnical Parameters	IT Corporation	J
Bioassay, TIE, and Biological Fieldwork	IT Corporation	I
Metals, Volatiles, semi-volatiles & TSS	R. I. Analytical, Inc.	L
Particulate Organic Carbon	Savannah Analytical Servces	K
PCB Homolog (mono through deca)	Northeast Analytical, Inc.	M

[1]Total Organic Halides is discussed only in the Savannah Laboratories, Inc. QA project plan.

13.0 PREVENTIVE MAINTENANCE

13.1 Overview

Preventive maintenance tasks that will be performed to minimize down time of field instruments, sampling devices, and laboratory instrument, as well as schedules of major preventive maintenance tasks are provided in the individual QA project plans contained in the appendices.

13.2 Data Base Preventive Maintenance

See Section 11.4 for data base preventive maintenance.

14.0 SPECIFIC PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, REPRESENTATIVENESS AND COMPLETENESS

Woodward-Clyde Consultants, IT Corporation, and the analytical laboratories have provided the equations necessary to calculate precision, accuracy, representativeness, comparability, and completeness (PARCC parameters) for each major measurement parameter in their respective QA project plans. These individual QA documents also describe procedures to determine whether their stated quality assurance and quality control objectives have been met.

From a project perspective, the procedures to access whether the project objectives have been met are implemented by the consultants performing the data interpretation. Woodward-Clyde Consultants will evaluate if the extent and nature of contamination have been sufficiently defined. IT Corporation will perform the PHERE and, in doing so, will evaluate if the data are sufficient for the public health and environmental risk evaluation. In support of these consultants, the data for the Appendix IX and site-specific compounds will be validated according to the Revised Data Validation Worksheets (included in Appendix B). The data qualifiers added during validation (see Section 10 for discussion) will assist the consultants by identifying potentially unreliable data.

In the reports submitted to USEPA, the consultants will discuss the rationale for identifying data gaps, if present. In contrast, if the data are determined to be sufficient, then the discussion of how the data satisfy the project Consent Order will be presented.

17.0 CURRENT PERSONNEL FOR KEY POSITIONS

Table 17-1 lists the current personnel for key positions, and Figure 17-1 shows the organizational structure for the Cranston Project.

TABLE 17-1 List of Current Personnel for Key Positions

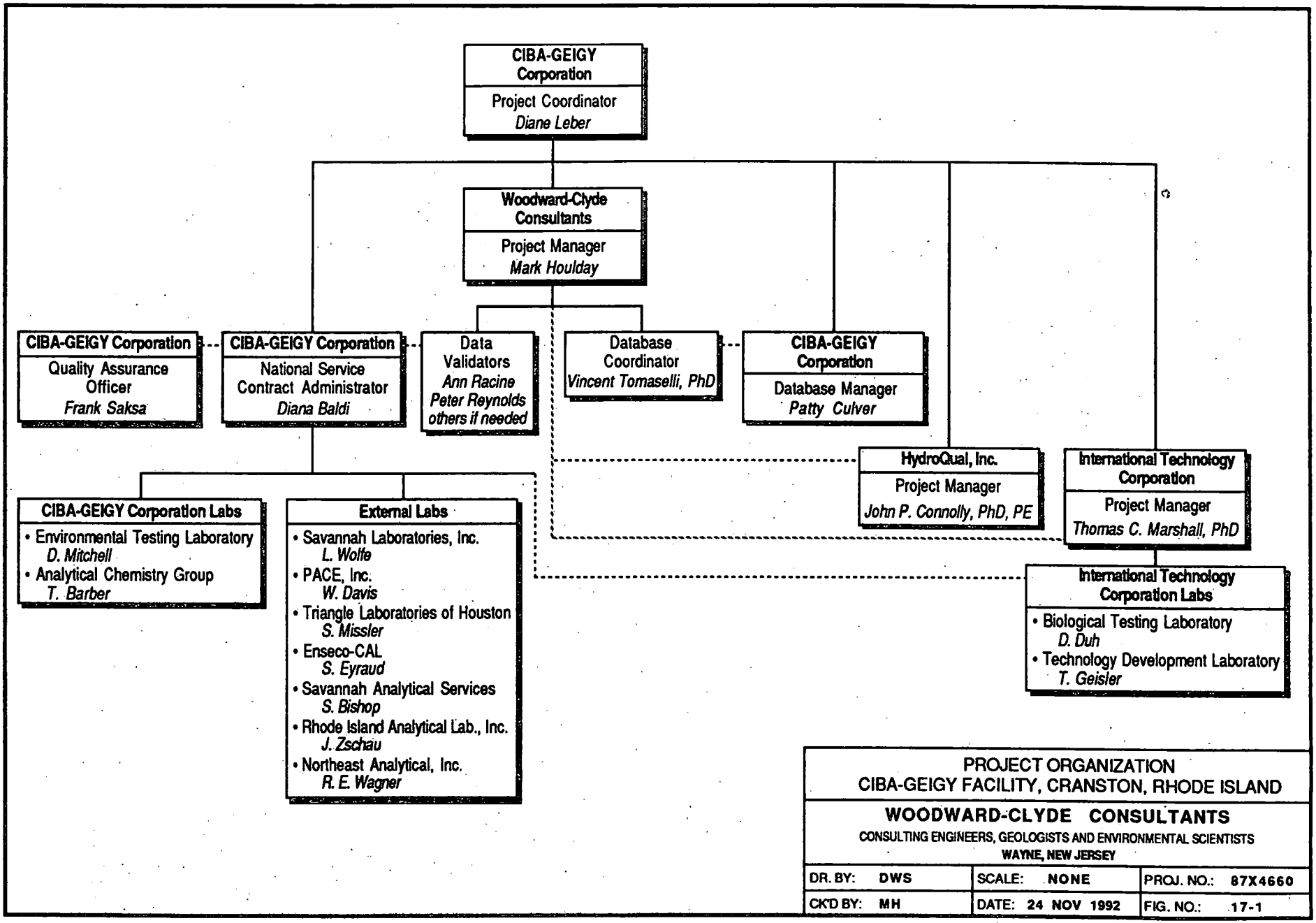
AFFILIATION	TITLE	NAME	ADDRESS	TELEPHONE & FAX NO.
CIBA-GEIGY Corporation	Project Manager	Diane Leber	444 Saw Mill River Road Ardsley, NY 10502	(914)479-2159 FAX:(914)479-2332
CIBA-GEIGY Corporation	National Service Contract Administrator	Diana Baldi	410 Swing Road Greensboro, NC 27419	(919)632-7506 FAX:(919)632-2048
CIBA-GEIGY Corporation	Database Manager	Patty Culver	444 Saw Mill River Road Ardsley, NY 10502	(914)479-4365 FAX:(914)479-2290
CIBA-GEIGY Corporation	Quality Assurance Officer	Frank Saksa	Route 37 West Toms River, NJ 08754	(908)349-2789 FAX:(908)505-9195
CIBA-GEIGY Corporation	Lab Manager	Denis Mitchell	Route 37 West Toms River, NJ 08754	(908)349-2283 FAX:(908)505-9195
CIBA-GEIGY Corporation	Group Leader	Tom Barber	410 Swing Road Greensboro, NC 27419	(919)632-7297 FAX:(919)632-2048

TABLE 17-1 (cont.) List of Current Personnel for Key Positions

AFFILIATION	TITLE	NAME	ADDRESS	TELEPHONE & FAX NO.
Woodward-Clyde Consultants	Project Manager	Mark Houlday	201 Willowbrook Blvd. Wayne, NJ 07470	(201)785-0700 FAX:(201)785-0023
HydroQual, Inc.		John Connolly	1 Lethbridge Plaza Mahwah, NJ 07430	(201)529-5151 FAX:(201)529-5728
IT Corporation	Project Manager	Thomas Marshall	312 Directors Drive Knoxville, TN 37923	(615)690-3211 FAX:(615)690-3626
IT Corporation	Lab Manager	Tom Geisler	1570 Bear Creek Road Kingston, TN 37763	(615)482-6497 FAX:(615)482-1890
IT Corporation	Lab Manager	Dan Duh	165 Fieldcrest Avenue Edison, NJ 08837	(908)225-2000 FAX:(908)225-1691
Savannah Laboratories, Inc.	Project Manager	Linda Wolfe	5102 La Roche Avenue Savannah, GA 31404	(912)354-7858 FAX:(912)352-0165
PACE, Inc.	Project Manager	Bill Davis	100 Marshell Drive Warrendale, PA 15086	(412)772-0610 FAX:(412)772-4020
Enseco-CAL	Project Manager	Shelly Eyraud	2544 Industrial Blvd. West Sacramento, CA 95691	(916)372-1393 FAX:(916)372-1059
Triangle Labs of Houston	Project Manager	Steve Missler	12823 Park One Drive Sugarland, TX 77478	(713)240-5330 FAX:(713)240-5341

TABLE 17-1 (cont.) List of Current Personnel for Key Positions

AFFILIATION	TITLE	NAME	ADDRESS	TELEPHONE & FAX NO.
Savannah Analytical Serv.	Project Manager	Steve Bishop	Suite "I" 42 West Montgomery Crossroads Savannah, GA 31406	(912) 920-4725 FAX:(912) 927-2076
R.I. Analytical Laboratories, Inc.	Project Manager	Jerry Zschau	41 Illinois Avenue Warwick, RI 02888	(401) 737-8500 FAX:(401) 738-1970
Northeast Analytical, Inc.	Project Manager	Robert E. Wagner	301 Nott Street Schenectady, NY 12305	(518) 346-4592 FAX:(518) 381-6055



PROJECT ORGANIZATION
CIBA-GEIGY FACILITY, CRANSTON, RHODE ISLAND

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY: DWS	SCALE: NONE	PROJ. NO.: 87X4660
CK'D BY: MH	DATE: 24 NOV 1992	FIG. NO.: 17-1