→ Tom Jansch - WR/2
Comments?
Lewis, Gary E

Roy F. Weston, Inc.
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Vernon Hills, Illinois 60061-1450
708-918-4000 • Fax 708-918-4055

23 February 1994

Ms. Betty G. Lavis (HSRW-6J)
U.S. Environmental Protection Agency
Region V
77 W. Jackson Blvd.
Chicago, IL 60604-3590

Re: Response to Second Round of Comments on
Predesign Phase Quality Assurance Plan
Moss-American Superfund Site, Milwaukee, Wisconsin

Dear Ms. Lavis:

Roy F. Weston, Inc. (WESTON®) has prepared this transmittal on behalf of Kerr-McGee Chemical Corporation (KMCC). This transmittal is in response to U.S. EPA's letter dated 18 November 1993 and provides responses to outstanding review comments on the Predesign Phase Quality Assurance Project Plan (QAPP). Revised, highlighted pages are included where applicable.

By this letter, WESTON is also transmitting a laboratory QAPP for Lancaster Laboratories, Inc. This QAPP provides an addendum to the above-referenced QAPP. Lancaster Laboratories, Inc. has been selected by KMCC to provide analytical services during the 1994 predesign investigation tasks.

Please also note that WESTON has included a figure depicting the proposed temporary equipment decontamination pad for the site, as requested by WDNR. This is presented as Figure 5-1.

WESTON and KMCC look forward to U.S. EPA's timely review of these document revisions and addendum. QAPP approval will be essential to implementing the predesign investigative and extent of contamination studies planned for the spring and summer of 1994.

If we can provide any clarifications to this transmittal, please contact the undersigned at (708) 918-4000.

Very truly yours,

ROY F. WESTON, INC.

Gary J. Deigan
Principal Project Manager

Kurt S. Stimpson /slr

Kurt S. Stimpson
Project Director

GJD:KSS/slr
Enclosures (2)

(1) Response to Comments/Revised Pages
(2) Lancaster Laboratories, Inc. QAPP

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RESPONSE TO 18 NOVEMBER 1993 U.S. EPA COMMENTS
DRAFT PREDESIGN PHASE QUALITY ASSURANCE PROJECT PLAN

U.S. EPA Comment

A-1 is acceptable.

U.S. EPA Comment

A-2 *Generally acceptable response. However, it may be necessary for SMO to review existing documentation at WESTON's internal laboratory, Gulf Coast Laboratories, to determine if an audit is necessary. I should know for sure by 11/22. The possibility of audit could also apply to other laboratories, so QAPP information should be submitted as soon as possible for each laboratory.*

Response/Clarification

Lancaster Laboratories, Inc. of Lancaster, Pennsylvania, has been selected by KMCC for the performance of laboratory analyses. Lancaster Laboratories' Laboratory Quality Assurance Plan is provided for U.S. EPA review as an addendum to the original draft QAPP.

U.S. EPA Comment

A-3 and A-4 are acceptable.

U.S. EPA Comment

B-1 *Include field parameters in Level 1.*

Response/Clarification

The text (Subsection 2.5.3) has been modified to indicate that field parameters are Level I analyses, as requested. The field parameters have also been added to Table 2-2.

U.S. EPA Comment

B-2 *There should be a footnote that specifies the analysis included in "Analysis N." There is not footnote referring to Appendix A. Correct the table number references.*

Response/Clarification

As requested, the footnotes in Table 2-3 have been clarified to indicate the specific analytes (i.e., temperature, specific conductance, and pH) included in "Analysis N" and to indicate that the standard operating procedures (SOPs) for these analyses are provided in Appendix A. In addition, Analysis P "Atterberg Limits" was not included in the QAPP table and this oversight has been corrected.

U.S. EPA Comment

B-3, B-4, B-5, B-6, B-7, and B-8 are acceptable.

U.S. EPA Comment

B-9 Summarize activities that will use composite samples.

Response/Clarification

Activities that will use composite samples have been summarized in Section 5.1, as requested. These activities include sediment sampling in the river, soil borings on the former wood preserving property, and soil sampling in the floodplain. This information had been provided in Table 2-1 which presents an overview of sampling procedures (i.e., grab, composite, and discrete) for each predesign task.

U.S. EPA Comment

B-10 is acceptable.

U.S. EPA Comment

B-11 Provide supporting evidence.

Response/Clarification

The U.S. EPA-approved Predesign Work Plan dated October 1992 provided a description of the rationale and supporting evidence used in the selection of the location of the pilot-scale river diversion (Section 5.3.3.2). In brief, the location immediately downstream of the former plant was selected based on RI reports of "high" oily response, and cross-sectional characteristics suitable for construction of the proposed cofferdam.

U.S. EPA Comment

B-12, B-13, B-14, B-15, B-16, and B-17 are acceptable.

U.S. EPA Comment

B-18 *Acceptable for the purposes of the QAPP. The Agency reserve the right to review the analytical method selection rationale when this decision is made.*

Response/Clarification

The Agency may review the analytical method(s) selection rationale.

ADDITIONAL AGENCY COMMENTS

U.S. EPA Comment

1. Predesign Task 1 requires that a new field screening method and/or laboratory procedure be developed. The method should be described more fully.

Response/Clarification

The goal of Predesign Task 1, as presented in the Statement of Work, is to refine and/or develop a field screening procedure for quantifying the concentration of CPAHs with accuracy and detection limits that correlate to the cleanup standards. If, based on continued predesign work and site investigations, a new field screening procedure is deemed useful and/or necessary for subsequent remedial action (RA) phases, the procedure will be identified, evaluated, and tested as outlined in the U.S. EPA-approved Predesign Work Plan (October 1992). To date, useful field screening methods for CPAHs have not been widely accepted nor determined to be feasible for the Moss-American site. Therefore, at this time we do not propose to include additional discussion or description of field screening methods in the context of this QAPP.

However, as part of our continuing evaluation of appropriate analytical methods, we are currently examining automated extraction systems that can be coupled with an on-site GC or HPLC analyzer. If our examination appears promising, we may propose a field evaluation to be coordinated with sampling activities that are currently scheduled for 1994. We are also considering a field evaluation of the EnSys field screening method for PAHs. Any field evaluations to meet the goals of Predesign Task 1 would include split samples collected and analyzed using U.S. EPA-approved methods contained in the QAPP.

U.S. EPA Comment

2. Predesign Task 3 indicates the evaluation of alternative methods for determining or predicting the distribution of free-product residues. Please discuss alternative methods.

Response/Clarification

Please reference the U.S. EPA-approved Predesign Work Plan dated October 1992 for a description of the work to be conducted under Predesign Task 3.

U.S. EPA Comment

3. Predesign Task 12 indicates the evaluation of visual observation methods for location of sediment contaminants. There is no discussion of the visual observation method.

Response/Clarification

The visual observation methods for location of sediment contamination are described in detail in Section 5.4 of the U.S. EPA-approved Predesign Work Plan. Visual documentation (e.g., field notes, logs, photographs) will be compared to laboratory-determined CPAH concentrations to determine if a correlation can be made between visible observation and cleanup standards. If a reliable correlation exists, a protocol for using visual observations to identify sediments requiring removal and treatment will be documented in a Technical Memorandum.

U.S. EPA Comment

4. Table 4-1. Provide the accuracy, precision, and sensitivity goals for the field CPAH methodology.

Response/Clarification

The accuracy, precision, and sensitivity goals for the field screening CPAH methodology cannot be provided at this time since a methodology has not yet been identified. If a field screening methodology is deemed necessary, this information will be included in a Technical Memorandum prepared for Predesign Task 1 (also see response to Comment 1).

U.S. EPA Comment

5. Table 4-2 references using decafluorobiphenyl as a surrogate for CPAHs. This is OK if the Method 8310 is used, but Method 8270 does not use this constituent as a surrogate. Add the Method 8270 surrogate to the table.

Response/Clarification

The surrogate reference for CPAHs using Method 8270 has been added to Table 4-2. Lancaster Laboratories, Inc. utilizes nitrobenzene as a surrogate for CPAHs when conducting Method 8310 analyses and nitrobenzene-d5, 2-fluorobiphenyl, terphenyl-d14, phenol-d6, 2-fluorophenol, and 2,4,6-tribromophenol when conducting Method 8270 analyses.

U.S. EPA Comment

6. The method references for nitrite in Table 4-1, Table 2-3 (footnote), and Section 8.1 are not the same. Which is correct?

Response/Clarification

The method references for nitrite in Table 4-1, Table 2-3, Section 8.1, and Table 5.3 have been changed, as appropriate, to consistently indicate that the method used for nitrite analysis is Method 354.1 and the method used for nitrate-nitrogen analysis Method 353.2. The QAPP addendum for Lancaster Laboratories, Inc. indicates that nitrogen-nitrate analysis will be conducted by Method 300.0.

U.S. EPA Comment

7. Include SOPs for BOD and the ASTM method for grain size.

Response/Clarification

The ASTM method for grain size was provided in the QAPP; however, it may have been overlooked. Colored breaker pages will be used to eliminate this problem in the future. The SOP for BOD has changed due to the change in the laboratory, and the SOP is presented in the Lancaster Laboratories, Inc.'s Quality Assurance Plan addendum.

Revised/Highlighted Pages
of Predesign Phase QAPP

- LEVEL III - This level provides an intermediate level of data quality and is used for site characterization and in support of engineering studies using standard U.S. EPA-approved procedures. Engineering analyses may include mobile laboratory generated data and some analytical laboratory methods (e.g., laboratory data with quick turnaround used for screening purposes but without full quality control documentation).

- LEVEL IV - This level provides the highest level of data quality and is characterized by rigorous QA/QC protocols and documentation and provides qualitative and quantitative analytical data. Some regions have obtained similar support via their own regional laboratories, university laboratories, or other commercial laboratories.

- LEVEL V - Non-standard methods. Analyses which may require method modification and/or development.

Analytical Level I will apply to readings generated during health and safety monitoring and to field parameters (i.e., temperature, specific conductance, and pH) generated during groundwater sampling. Analytical Level II will apply to data generated by the field analytical method developed for rapid turnaround analysis (Predesign Task 1). Analytical Level III will apply to all analytical data generated from sample analyses by off-site laboratories. The data quality objectives for all associated data collection activities, data types, data uses, and other data quality control factors are summarized in Table ~~2-1~~ 2-3. Table 8-1 presents contaminants of concern and associated method detection limits for the Moss-American Site Predesign activities. All health and safety issues associated with the field program for the Site will be addressed in the Site Health and Safety Plan.

2.6 SAMPLE NETWORK AND RATIONALE

The sampling network and rationale is addressed in the Predesign Work Plan and the sampling procedures are described in the Section 5 of this QAPP.

Table 2-2

Target Compounds for Moss-American Site Media

Target Compound	Groundwater	Surface Water	Soils/Sediment
Benzene	X	X	
Ethylbenzene	X	X	
Toluene	X	X	
Xylene	X	X	
Naphthalene	X	X	
Acenaphthylene	X	X	
Acenaphthene	X	X	
Fluorene	X	X	
Phenanthrene	X	X	
Anthracene	X	X	
Fluoranthene	X	X	
Pyrene	X	X	
Benzo(a)anthracene	X	X	X
Chrysene	X	X	X
Benzo(b)fluoranthene	X	X	X
Benzo(k)fluoranthene	X	X	X
Benzo(a)pyrene	X	X	X
Indeno(1,2,3-cd)pyrene	X	X	X
Dibenz(a,h)anthracene	X	X	X
Benzo(g,h,i)perylene	X	X	X
BOD_5	X		
COD	X		
Oil and Grease	X		
Nitrogen	X		
Phosphorous	X		
Total Suspended Solids	X		
pH	X		
Specific Conductance	X		
Temperature	X		

Table 2-3

Data Quality Objective Summary
Moss-American Site

Activity	Matrix	Analytical Parameter	Data Use	Analytical Level
Soil Sampling	Soil	A	SC, EE	II, III
		B	EE	III
		C	EE	II, III
		D	EE	III
		O	SC, EE	II
		P	EE	III
Sediment Sampling	Sediment	A	SC, EE	III
Surface Water Sampling	Water	E	EC	III
		F	EC	III
Groundwater Sampling	Water	E, G	SC, EE	III
		H	SC, EE	III
		I	SC, EE	III
		J	SC, EE	III
		K	SC, EE	III
		L	SC, EE	III
		M	SC, EE	III
		N	SP	I

Analysis A: CPAHs analysis by Method 8270 or 8310, and field rapid turnaround method (Appendix B).
Analysis B: Permeability testing by U.S. Army Corps of Engineers Method EM1110-2-1906 (Appendix C).
Analysis C: Grain size distribution by ASTM D22216-80 (Appendix C).
Analysis D: Moisture content by ASTM D423-63 (Appendix C).
Analysis E: PAHs by EPA Method 8270 or 8310 (Appendix B).
Analysis F: TSS by EPA Method 160.2 (Appendix B).
Analysis G: BETX by EPA Method 8020 (Appendix B).
Analysis H: COD by Method 508C, 410.4 and HACH 8000 (Appendix B).
Analysis I: BOD_5 by Method 405.1 (Appendix B).
Analysis J: TOC by Method 415.1 (Appendix B).
Analysis K: Nitrate/nitrogen by Method 353.2, nitrite by Method 354.1 (Appendix B).
Analysis L: Phosphorous by Method 365.2 (Appendix B).
Analysis M: Oil and grease by Method 413.1 (Appendix B).
Analysis N: Field parameters (i.e., temperature, specific conductance, and pH) for groundwater sampling. ~~See~~ Appendix A ~~for SOPs.~~
Analysis O: Geophysical analysis.
Analysis P: Atterberg Limits testing by ASTM D4318-84.

Data usage symbols:
SC - Site characterization.
EE - Engineering evaluation.
EC - Environmental control.
SP - Sampling protocols.

Analytical levels:
I - Qualitative screening with field equipment.
II - Field analysis with sophisticated equipment.
III - Off-site analysis by analytical laboratory.
IV - Analysis by CLP laboratory.
V - Analysis by laboratory using nonstandard method.

SECTION 5
SAMPLING PROCEDURES

The rationale for sampling is provided in the 28 April 1992 Draft Predesign Work Plan; hence, it is not discussed herein.

5.1 SAMPLING PROCEDURES

The following subsections outline the protocols of sample collection that will be implemented under this Predesign QAPP. In this section where composite sample collection is designated in lieu of grab samples, this determination is based on the fact that the associated data will be used for engineering design (i.e., the design of treatment systems and in the generalized determination of extent of contamination and contaminated media volume estimates).

Sampling activities that will use composite samples include sediment sampling in the Little Menomonee River, soil borings on the former wood preserving facility property, and soil sampling in the floodplain along the new river alignment. Table 2-1 presents an overview of sampling procedures (i.e., composite, grab, or discrete) used for each predesign task.

With respect to actual sampling procedures, the following sequence will be followed when filling sample containers from each matrix: first, the VOC sample containers will be filled, secondly, the PAH containers, and finally the nonorganic analyses containers (e.g., oil and grease, TOC/phosphorous/COD/nitrate, TSS, nitrite, BOD, pH), respectively. Only those analyses applicable to each sample matrix will be collected. All wastes and residues generated during field sampling will be managed in accordance with Section 5.1.9.

Table 4-2

Quality Assurance Objective for Accuracy For Organic Surrogate Analysis

Fraction	Surrogate Compound	% Recovery
~~CPAH~~	~~Decafluorobiphenyl~~	~~40 - 120~~
BTEX	a,a,a-Trifluorotoluene	55 - 135
CPAH Method 8310	Nitrobenzene	50 - 120
CPAH Method 8270	Nitrobenzene-d5	23 - 120
	2-Fluorobiphenyl	30 - 115
	Terphenyl-d14	18 - 137
	Phenol-d6	24 - 113
	2-Fluorophenol	25 - 121
	2,4,6-Tribromophenol	19 - 122

Table 5–3

Summary of Sampling Effort
Moss–American Site

Sample Matrix	Laboratory Parameters	Investigative			Field Duplicate			Field Blank			Matrix Spike/Matrix Spike Duplicate			Matrix Total
		No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	No.	Freq	Total	
SOILS	CPAHs – U.S. EPA Method 8270 or Method 8310	70	1	70	7	1	7	0	0	0	4	1	4	77
SEDIMENTS	CPAHs – U.S. EPA Method 8270 or Method 8310	136	1	136	14	1	14	0	0	0	7	1	7	150
GROUNDWATER	BETX – U.S. EPA Method 8020	17	1	17	2	1	2	2	1	2	1	1	1	21
	COD – HACH 8000 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	BOD(5) – Method – 405.1 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	TOC – Method 415.1 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	Nitrate – Method 353.2 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	Nitrite – Method 354.1 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	Phosphorous – Method 365.2 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	Oil & Grease – Method 413.1 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	pH – Method 150.1 (4)	17	1	17	2	1	2	2	1	2	--	--	--	21
	Conductivity – Field Instrument	17	1	17	2	1	2	2	1	2	--	--	--	21
	Temperature – Field Instrument	17	1	17	2	1	2	2	1	2	--	--	--	21
	PAHs – U.S. EPA Method 8270 or 8310	17	1	17	2	1	2	2	1	2	1	1	1	21
SURFACE WATER	PAHs – U.S. EPA Method 8270 or 8310	10	1	10	1	1	1	1	1	1	1	1	1	12
	TSS – Method 160.2 (4)	10	1	10	1	1	1	1	1	1	--	--	--	12
SOIL AND SEDIMENT	Geotechnical Property Testing													
	Moisture Content – ASTM D22216–80	12	1	12	--	--	--	--	--	--	--	--	--	12
	Particle Size Distribution – ASTM D422–63	12	1	12	--	--	--	--	--	--	--	--	--	12
	Permeabiltity – EM1110–2–1906	12	1	12	--	--	--	--	--	--	--	--	--	12
	Atterberg Limits – ASTM D4318–84	12	1	12	--	--	--	--	--	--	--	--	--	12

Notes:

1. Matrix total does not include trip blank samples, or matrix spike/matrix spike duplicate (MS/MSD) samples.
2. Although not shown in this table, trip blank samples will be shipped at a frequency of one per shipping container of aqueous VOA samples.
3. MS/MSD are not additional samples, but are instead investigative samples with extra volume collected for organic analysis.
4. Laboratory duplicates and spikes will be analyzed for on all nonorganic compounds (excluding geotechnical compounds). Frequency of analysis will be on 1 per 20 investigative samples or less basis.

investigation at the Moss-American site. The protocols for drilling, well installation, sample collection, and field testing are herein specified.

Soil Boring Drilling Procedures

The following procedures will be used during the drilling of all soil borings:

- The working end of the drill rig and all drilling equipment, tools, and materials will be decontaminated prior to drilling at each location in accordance with protocol presented in Table 5-1. A diagram of the temporary decontamination pad is presented in Figure 5-1. Provisions will be made to keep equipment, tools, and materials from coming into contact with surface soils during drilling and well installation.

- The soil borings will be advanced to a maximum depth up to the water table.

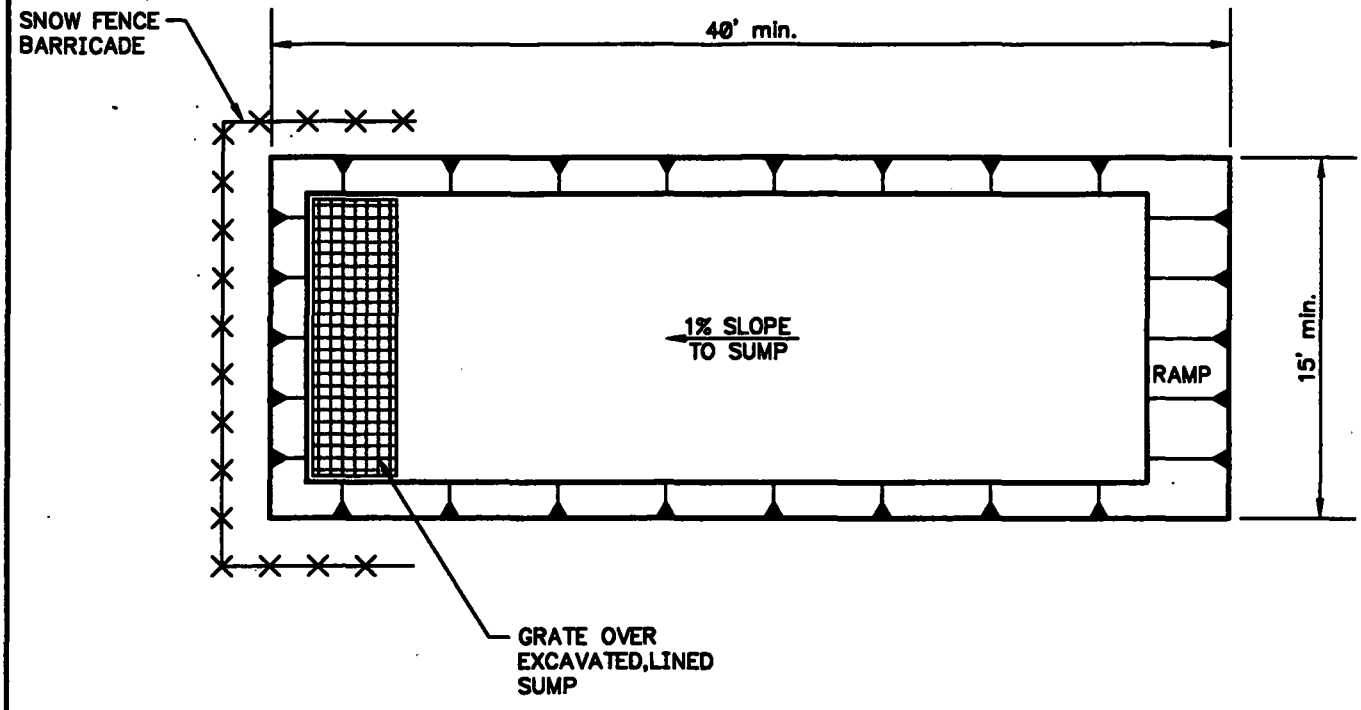
- Continuous sampling will be conducted at each boring location using standard split-spoon sampling techniques. Split-spoon samplers will be advanced ahead of the lead auger for a continuous, undisturbed soil profile.

- Samples will be collected for analyses immediately upon opening the split spoon.

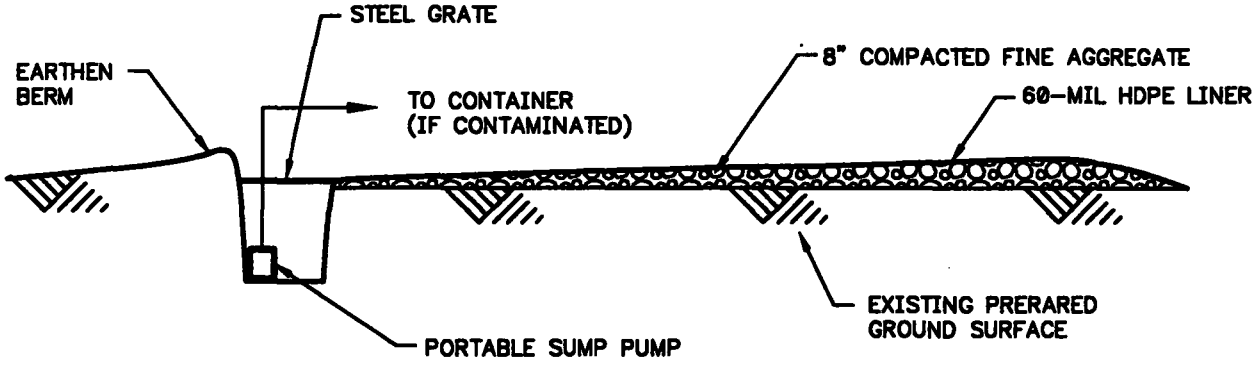
- Following sample collection, each split-spoon soil core will be logged by a qualified WESTON geologist, using a combination of the United States Department of Agriculture (USDA) textural classification system and the unified soil classification system (USCS). Sample grain size will be determined using the modified Wentworth grain-size scale. Sample color will be determined using the Munsell Soil Color Charts. Use of these systems will reduce subjectivity of soil descriptions. Samples will be retained from each sample interval for future reference. All soil descriptions will be recorded on a WESTON boring log.

- Each split spoon will be decontaminated in accordance with the standard decontamination protocol for sampling equipment outlined in Table 5-2.

- Upon completion of sample collection, each soil boring will be backfilled with cement bentonite grout to the surface to seal the borings. All drill cuttings will be collected and placed in 55-gallon drums which will be stored at the site



PLAN VIEW



SECTIONAL VIEW

TAD-02/22/94-07:38-CAD93\000\04794

FIGURE 5-1

WESTON MANAGERS DESIGNERS/CONSULTANTS

Three Hawthorn Parkway
Vernon Hills, Illinois
60061

PROPOSED DESIGN FOR TEMPORARY EQUIPMENT DECONTAMINATION PAD
MOSS-AMERICAN SITE
Milwaukee, Wisconsin

LABORATORY QUALITY ASSURANCE PLAN

Kerr-McGee Chemical Corp.
Móss-American Site
Milwaukee, Wisconsin

August 26, 1993

Revised: February 1994

WARNING: The information contained herein is of a highly confidential and proprietary nature. Lancaster Laboratories, Inc. specifically prohibits the dissemination or transfer of this information to any person or organization not directly affiliated with the project for which it was prepared.

Lancaster Laboratories

1. Laboratory Quality Assurance Plan

This document provides the laboratory portion of the response to EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" QAMS-005/80, Sections 5.1 - 5.16 as revised December 29, 1980, and EPA-600/4-83-004, February 1983. Guidance was also obtained from "Preparation Aids for the Development of Category 1 Quality Assurance Project Plans," Office of Research and Development, USEPA, EPA/600/8-91/003, February 1991.

As much as possible, the procedures in this document have been standardized to make them applicable to all types of environmental monitoring and measurement projects. However, under certain site-specific conditions, all of the procedures discussed in this document may not be appropriate. In such cases it will be necessary to adapt the procedures to the specific conditions of the investigation.

Director of Quality Assurance: H. Louise Hess KMK

3. Project Description

This quality assurance project plan provides specific quality assurance and quality control procedures involved in the generation of data of acceptable quality and completeness. Tests will be performed according to the analytical methodology set forth in the USEPA SW-846 3rd Edition, 1986*. SW-846 provides specific analytical procedures to be used and defines the specific application of these procedures. Proven instruments and techniques will be used to identify and measure the concentrations of volatiles and PAH compounds. The laboratory will employ state-of-the-art GC/MS, HPLC, and/or GC procedures to perform all organic analyses, including all necessary preparation for analysis. Wet Chemical analyses will be performed according to Methods for the Chemical Analysis of Water and Wastes, USEPA 600/4-79-020 and will use appropriate instrumentation. The client is responsible for providing specifics on the project site.

* Test Methods for Evaluating Solid Waste - Physical/Chemical Methods. SW-846 (3rd Edition, 1986).

4. Project Organization

The objectives of the laboratory Quality Assurance Program are to establish procedures which will ensure that data generated in the laboratory are within acceptable limits of accuracy and precision, to ensure that quality control measures are being carried out, and to ensure accountability of the data through sample and data management procedures. To this end, a Quality Assurance Department has been established. The Director of Quality Assurance reports directly to the Executive Vice President of Laboratory Operations and has no direct responsibilities for data production, thus avoiding any conflict of interest.

The attached organizational charts show the key personnel in both Corporate Services and Environmental Sciences. Resumes of key individuals may be found in the enclosed Qualification Manual.

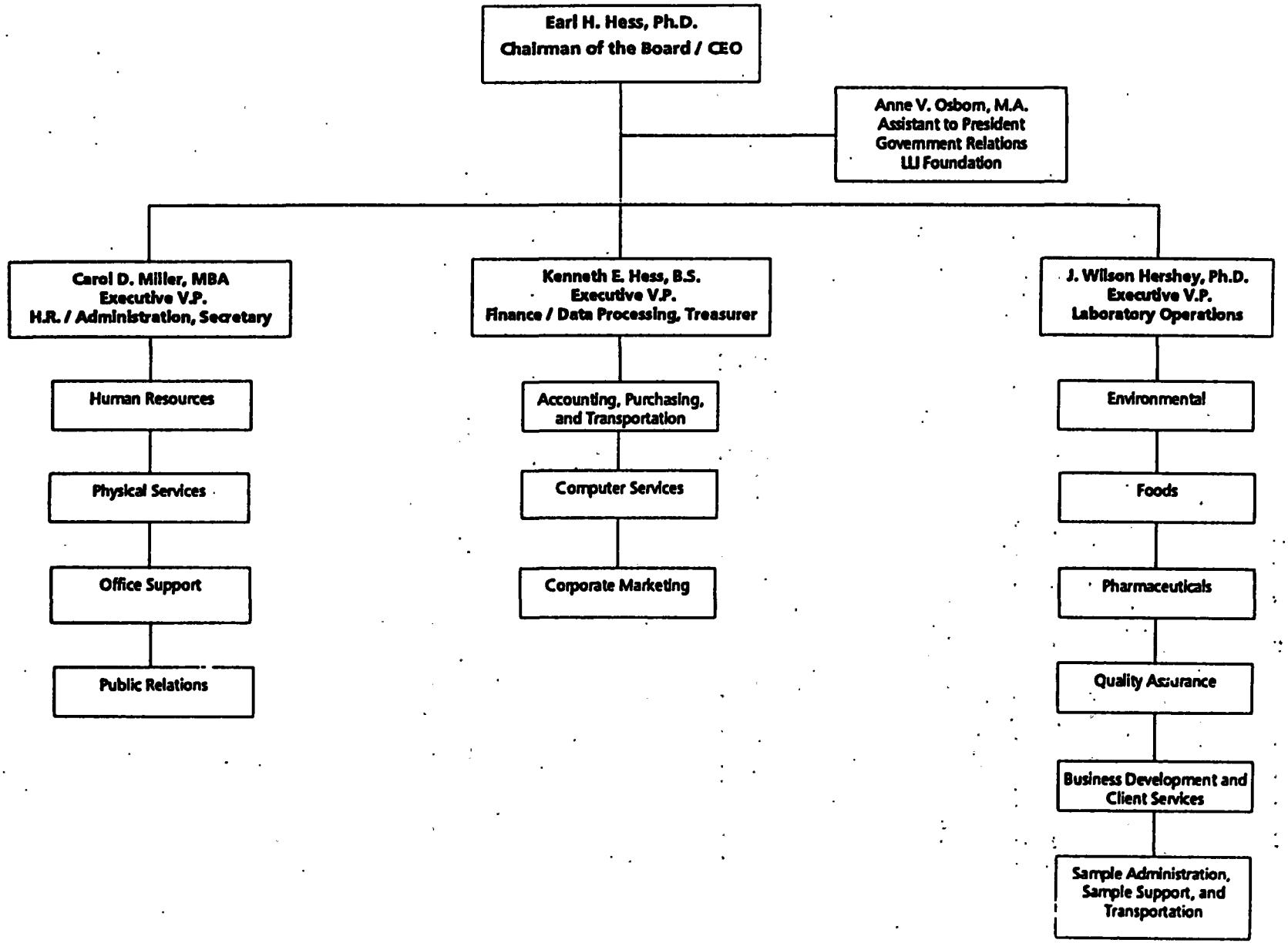
The Sample Administration Group will be responsible for receiving samples, signing the external chain-of-custody, checking sample condition, assigning unique laboratory sample identification numbers, and initiating internal chain-of-custody forms. Sample Support personnel will be responsible for assigning storage locations, checking and adjusting preservation, homogenizing the sample as needed, and sample discard.

Group Leaders listed in each technical area are responsible for performing laboratory analyses, quality control as specified in the methods, instrument calibration, and technical data review. Data is reported using a computerized sample management system, which tracks sample progress through the laboratory and generates client reports

when all analyses are complete. Quality control data is entered onto the same system for purposes of charting and monitoring data quality.

The Quality Assurance Department is responsible for reviewing quality control data, conducting audits in the laboratory and reporting findings to management, maintaining current copies of all analytical methods, maintaining copies of computer code used to calculate and report results, submitting blind samples to the laboratory, and ensuring that appropriate corrective action is taken when quality problems are observed.

Data package deliverables are available upon request. The Quality Assurance Department reviews the contents of the deliverables for completeness and to be sure that all quality control checks were performed and met specifications. This step includes review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the narrative. The laboratory will not validate data with regard to useability since this generally requires specific knowledge about the site.


Earl H. Hess, Ph.D.
Chairman of the Board / CEO
Anne V. Osborn, M.A.
Assistant to President
Government Relations
LLI Foundation
Carol D. Miller, MBA
Executive V.P.
H.R. / Administration, Secretary
Kenneth E. Hess, B.S.
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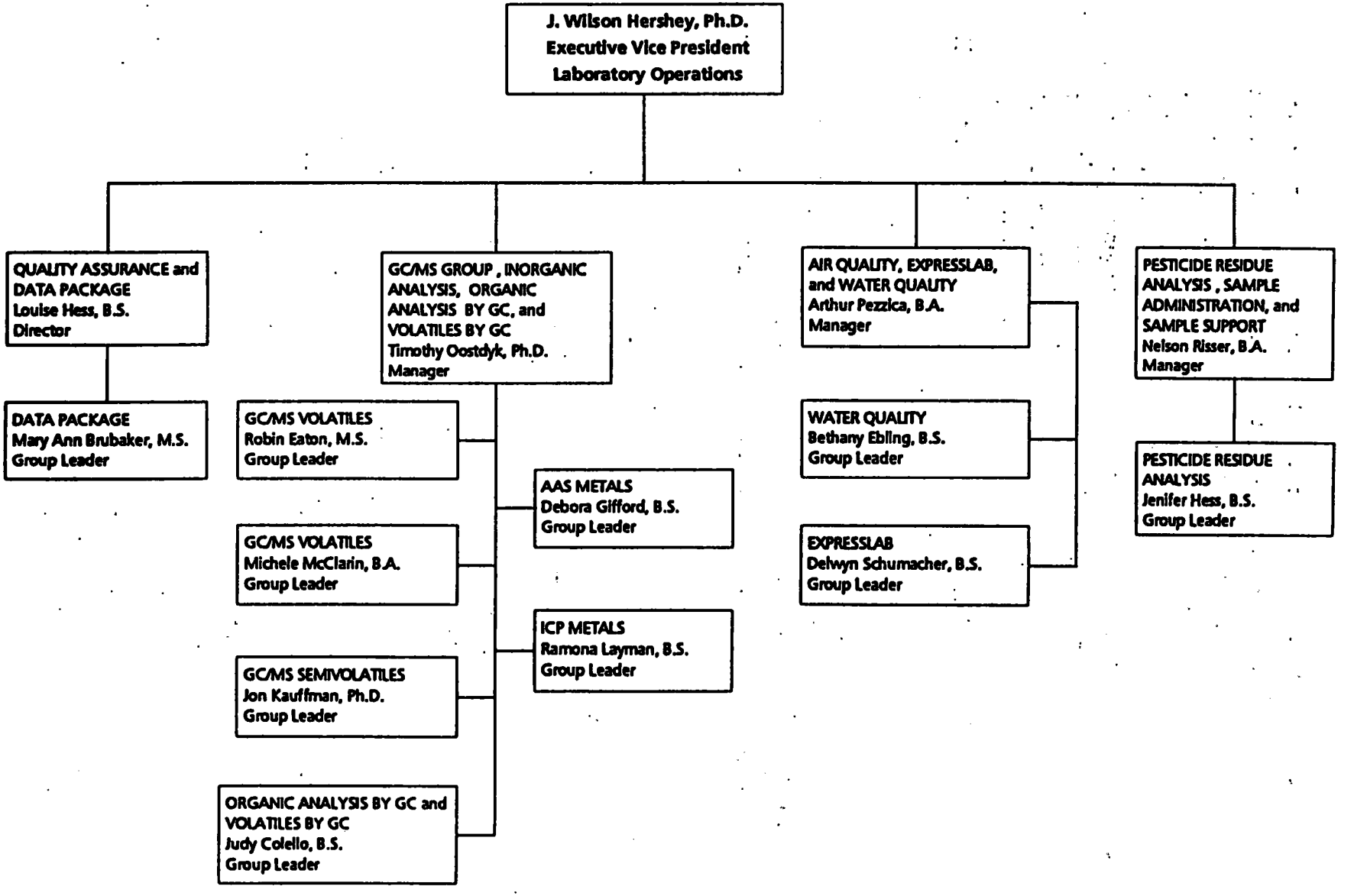
J. Wilson Hershey, Ph.D.
Executive V.P.
Laboratory Operations
Human Resources
Physical Services
Office Support
Public Relations
Accounting, Purchasing, and Transportation
Computer Services
Corporate Marketing
Environmental
Foods
Pharmaceuticals
Quality Assurance
Business Development and Client Services
Sample Administration, Sample Support, and Transportation

05/27/93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06/04/93

5. QA Objectives For Measurement Data

Quality Assurance is the overall program for assuring reliability of monitoring and measurement data. Quality control is the routine application of procedures for obtaining set standards of performance in the monitoring and measurement process. Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. The quality of all data generated and processed during this investigation will be assessed for Precision, Accuracy, Representativeness, Comparability, and Completeness. These specifications will be met through precision and accuracy criteria as specified in Section 11. Detection limits are presented in Section 9.

Precision - Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The laboratory objective is to equal or exceed the precision demonstrated for the applied analytical method on comparable samples. The degree of agreement is expressed as the relative percent difference (RPD%). Evaluation of the RPD% is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses. External evaluation of precision is accomplished by analysis of Standard Reference Material and interlaboratory performance data.

Accuracy - Accuracy is a measure of the closeness of an individual measurement to the true or expected value. Analyzing a reference material of known concentration or reanalyzing a sample which has been spiked with a known concentration/amount is a way to determine accuracy. Accuracy is expressed as a percent recovery (%R). Evaluation of the %R is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses.

Representativeness - Representativeness expresses the degree to which data accurately represents the media and conditions being measured. The representativeness of the data from the sampling site will depend on the sampling procedure. Sample collection is the responsibility of the client. Samples will be homogenized, if required, as part of the laboratory sample preparation. By comparing the quality control data for the samples against other data for similar samples analyzed at the same time, representativeness can be determined for this objective.

Comparability - Comparability conveys the confidence with which one set of data can be compared to another. The analytical results can be compared to other laboratories by using traceable standards and standard methodology and consistent reporting units. The Laboratory Quality Assurance Program documents internal performance, and the interlaboratory studies document performance compared to other laboratories.

Completeness - Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount that was expected to be acquired under the measurement conditions. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. Additional information will be stored in the laboratories archives, both hard copy and magnetic tape. Quality Assurance Standard Operating Procedures (SOPs) are in place to provide traceability of all reported results.

To ensure attainment of the quality assurance objectives, Standard Operating Procedures (SOPs) are in place detailing the requirements for the correct performance of laboratory procedures. The laboratory SOPs fall under five general categories:

1. Corporate Policy
2. Quality Assurance
3. Sample Administration
4. General Laboratory Procedures
5. Analytical (i.e., methods, standard preps., instrumentation)

All SOPs are approved by the QA Department prior to implementation. The distribution of current SOPs and archiving of outdated ones are controlled through a master file. Table 5-1 provides an index of QA SOPs in place in support of the Quality Assurance Objectives. These requirements are supplemented by the procedures in the laboratory and analytical SOPs.

Table 5-1

Document #	Document Title
QA-101	Sample Collection
QA-102	Sample Log-in
QA-103	Sample Storage and Disposal
QA-104	Chain-of-Custody Documentation
QA-105	Analytical Methods Manual
QA-106	Validation and Authorization of Analytical Methods
QA-107	Analytical Methods for Nonstandard Analyses
QA-108	Subcontracting to Other Laboratories
QA-109	Laboratory Notebooks and Documentation
QA-110	Reagents
QA-111	Instrument and Equipment Calibration
QA-112	Instrument and Equipment Maintenance
QA-113	Data Entry and Verification
QA-114	Data Storage and Security
QA-115	Quality Control Records
QA-116	Investigation and Corrective Action of Unacceptable Quality Control Data
QA-117	Personnel Training Records
QA-118	Quality Assurance Audits
QA-119	Proficiency Samples
QA-120	Documentation of Programming for the Sample Management System
QA-121	Guidelines for the Development, Validation, Implementation, and Maintenance of Computer Systems Used with CLP, GLP, and GMP Data

6. Sampling Procedures

In order for meaningful analytical data to be produced, the samples analyzed must be representative of the system from which they are drawn. It is the responsibility of the client to ensure that the samples are collected according to accepted or standard sampling methods.

The laboratory will provide the appropriate sample containers, required preservative, chain-of-custody forms, shipping containers, labels, and seals. The majority of sample containers are purchased precleaned by the supplier. Any reused bottles are cleaned in-house following laboratory Standard Operating Procedures. Special containers with traceability documentation are available upon request. Because the laboratory does not stock this type of container, one month prior notice is required.

Each lot of preservative will be documented and checked for contaminants before use. The appropriate bottle will be preserved with the new preservative and filled with deionized water to represent a sample. A similar container (that does not contain preservative) will be filled with deionized water to be used as a blank check. Analysis results are documented for each preservative lot number.

Trip blanks will be prepared by the laboratory and accompany sample containers at the project required frequency. Analyte-free water will also be provided for field blanks.

A list of containers, preservatives, and holding times follows in Table 6-1.

Table 6-1

Sample Containers, Preservatives, and Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req. (ml) / Wt. Req. (g)	Container P=Plastic G=Glass	Preservation[a]	Holding Time[c] From Date of Collection Water	Soil
Volatiles BTEX	2 x 40 ml / 100 g	G	Cool, 4°C[b] pH <2 w/HCl	14 Days	14
PAHs (8310)	2 x 1000 ml / 100 g	G (amber)	Cool, 4°C[b] $Na_2S_2O_3$	7 Days to extraction[d]	14
PAHs (8270)	3 x 1000 ml / 100 g	G	Cool, 4°C[b] $Na_2S_2O_3$	7 Days to extraction[d]	14
pH	50 ml / 50 g	G	Cool, 4°C	Immediately	14 Days
BOD	1000 ml	G	Cool, 4°C	48 Hours	NA
COD	100 ml / 100 g	G	Cool, 4°C pH <2 w/H_2SO_4	28 Days	28
Oil and Grease	2 x 1000 ml / 50 g	G	Cool, 4°C Preserved upon receipt	28 Days	28
Ammonia Nitrogen	1000 ml / 100 g	P,G	Cool, 4°C pH <2 with H_2SO_4	28 Days	28
Nitrate	50 ml / 20 g	P,G	Cool, 4°C	14 Days	14
TKN	500 ml / 10 g	G	Cool, 4°C pH <2 with H_2SO_4	28 Days	28
Phosphorus	50 ml / 10 g	P,G	Cool, 4°C pH <2 with H_2SO_4	28 Days	28
TSS	500 ml	P,G	Cool, 4°C	7 Days	NA

Table 6-1

Sample Containers, Preservatives, and Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req. (ml) / Wt. Req. (g)	Container P=Plastic G=Glass	Preservation[a]	Holding Time[c] From Date of Collection Water	Soil
TOC	125 ml / 20 g	G	Cool, 4°C pH <2 with H_2SO_4	28 Days	28

[a] pH Adjustment with acid/base is performed on water samples only.

[b] Sodium thiosulfate needed for chlorinated water samples

[c] Samples will be analyzed as soon as possible after collection. The times listed are the maximum times that samples will be held before analysis and still be considered valid.

[d] Analysis 40 days from extraction.

NOTE: For volatiles analysis, the container should be filled completely, with no headspace. **All sample containers, preservatives, and mailers will be supplied at no additional charge upon request, except for the special containers with traceability documentation. There is an additional charge for this type of container.**

7. Sample Custody

Samples are unpacked and inspected in the sample receipt area. At this time, the samples are examined for breakage and agreement with the associated client paperwork. The cooler temperatures will be checked upon receipt and recorded. As the samples are unpacked, the sample label information will be compared to the chain-of-custody record and any discrepancies or missing information will be documented. If necessary, the cooler will be closed and placed in cold storage until instructions and resolution of any discrepancies are received from the client.

A member of our Sample Administration Group will act as sample custodian for the project. To ensure accountability of our results, a unique identification number is assigned to each sample as soon as possible after receipt at the laboratory. When samples requiring preservation by either acid or base are received at the laboratory, the pH will be measured and documented, with the exception of samples designated for volatile analysis. Samples requiring refrigeration will be stored in our walk-in cooler which is maintained at 4° ± 2°C. The use of our computer system in tracking samples (by the LLI sample # assignment) will control custody of the sample from receipt until the time of its disposal. The security system on our laboratory building allows us to designate the entire facility as a secure area since all exterior doors are either locked or attended. Therefore, hand-to-hand chain of custody is not part of our routine procedure, but is available upon request. If requested, hand-to-hand chain of custody will be provided as per attached SOP-QA-104. The laboratory chain of custody will begin with the preparation of bottles. The procedures for sample log-in, storage, and

chain-of-custody documentation are detailed in the QA Standard Operating Procedures included in Section No. 7 (QA102, QA103, and QA104). Examples of sample labels and a custody seal are shown in Figure 7.1.

Figure 7.1

CLIENT

If you do not have an account with us, results will not be released until payment is received.

SAMPLE INDENTIFICATION / LOCATION CL. RES:

COLLECTION INFORMATION

☐ COMPOSITE
☐ GRAB

DATE TIME BY:

TESTING REQUIRED PRESERVATIVE(S) ADDED

Lancaster Laboratories
2425 New Holland Pike, Lancaster, PA 17601-5994

LL1#

Sample Label (Field)

LL# 1869683 DIS-000 26A 10/16/92

GRP-353016
EMP-210

00649-ABC MANUFACTURING, INC.
MW-4 GRAB WATER SAMPLE
SEMI-ANNUAL MONITORING PROJECT
COLLECTED ON 10/17/92 AT 1525 BY FRB
0219 0220 0516 1126

Sample Label (Laboratory)

Lancaster Laboratories
Where quality is a science

CUSTODY SEAL

2425 New Holland Pike, Lancaster, PA 17601-5994 (717) 656-2301

DATE:

SIGNATURE:

Laboratory Custody Seal

Lancaster Laboratories
Where quality is a science.

Initiated Date: 03/87
Effective Date: APR 14 1993

QUALITY ASSURANCE OPERATIONS MANUAL

SOP-QA-102

Title: Sample Log-in

Purpose:

In order to provide accountability of our results and to prevent sample loss or mix-up, a unique identification number is assigned to each sample.

Scope:

This SOP will cover the procedure used to log-in samples received for analysis.

Procedures:

1. All samples received by laboratory personnel shall be delivered to the Sample Administration Group immediately upon arrival at the laboratory. The only exception to this requirement will be samples which are not tracked using the computerized Sample Management System (SMS). There are only a few cases where samples will be not be tracked using the SMS. These include samples which will be stored for a long period of time prior to analysis, (e.g., stability storage) and samples for special projects that will be reported in a narrative R&D report instead of on the usual computerized analytical reports.

The procedures for sample log-in described in this SOP apply only to samples which are logged into the SMS. However, a written procedure for tracking any samples not entered into the SMS must be developed by the technical department responsible for the project or analysis of those samples.

2. All client correspondence relating to samples shall also be transferred to the Sample Administration Group. This includes purchase orders, quotes, letters and completed entry request forms.

3. Personnel of the Sample Support Group shall log the samples into the computer as soon as practical after receipt. The computer will assign a unique identification number to each sample. Samples shall be logged in on the same day they are received with the following exceptions:

   a. Samples received during a holiday or between 6 p.m. on Friday and 6 p.m. on Sunday. These samples shall be logged-in on the next normal work day.

   b. Samples submitted by clients without any indication of the tests to be performed or with unclear or incomplete information. Every effort shall be made to contact the client on the same day as sample receipt.

      If same day entry is not possible, any special storage requirements (e.g., refrigeration) should be observed.

4. Upon assignment of a sample number, the computer will generate a label which shall be attached to the sample container. The information on the label will include the LLI sample number, the client name, the storage location, a list of analyses requested (by analytical method number), a bottle code indicating container and preservative type, and a unique bar code.

5. Addition of preservatives to unpreserved samples will be the responsibility of the Sample Administration Group. Preservation should be performed immediately after log-in. A list of preservatives required for routine analyses may be found in the Fee Schedule.

6. All entries in preservation notebooks and on client paperwork shall be made in ink. The error correction procedure given in SOP-QA-109 shall be followed for any changes made in this documentation.

7. After samples are logged-in (or preserved, if required) they shall be stored in the computer-assigned location. If the computer-assigned location is inappropriate for the samples, the location code may be changed by manually overriding the computer.

8. The LLI sample number assigned to each sample shall be used to identify the sample in all records, including laboratory notebooks, instrument printouts, and

laboratory reports. The sample number shall be used to identify all additional containers of the sample which may be created during the sample preparation and analysis. This includes subsamples, extracts, and digestates.

SOPQA102.W51
SOP QA #1
032493

Prepared by: M Louise Hess Date: 4/8/93

Approved by: J William Hershey Date: 4/8/93

Read and understood by: _____ Date: _____

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Initiated Date: 3/87
Effective Date: FEB 12 1992

QUALITY ASSURANCE OPERATIONS MANUAL
STANDARD OPERATING PROCEDURE
QA-103

Title: Sample Storage and Disposal

Purpose:

Sample integrity can be compromised by improper storage conditions. The objective of these procedures is to prevent samples from deteriorating prior to analysis. The computerized sample management system (CSMS) is used to assign storage locations and to monitor the orderly storage of samples in locations from which they are easily retrieved for analysis or discard at the appropriate date.

Scope:

This SOP will outline procedures used in storing samples, retrieving and returning samples for analysis, and discarding samples when their holding time expires.

Procedures:

1. Personnel of the Sample Administration Group will designate the approximate size and type (e.g., refrigerator, freezer or room temperature) of sample storage required for each group of samples as they are logged onto the CSMS. The computer will assign the storage location and record the length of time the sample must be retained after the analysis report has been issued. Samples will be stored in the assigned location. If the location is not suitable (e.g., insufficient space), the storage location may be changed using the manual override on the computer. If refrigerated space has been requested and all the computerized refrigerator locations are occupied, the sample will be assigned a WLK000 location. Storage of samples with this designation will be assigned locations in overflow refrigerators and will be tracked using a manual system until computerized locations are available.

2. Analysts requiring the use of a sample may determine its location by referring to the daily sample status sheet. There are varying degrees of security on sample storage locations. The procedures for removal of samples from these locations are as follows:

a. Free access locations are those which are neither locked nor attended by a sample custodian. These areas are usually located within an individual group's laboratory and samples may be removed from and returned to these locations without documentation. However, if the sample must be taken out of the laboratory, documentation may be requested. Care shall be exercised in returning the sample to its appropriate location.

b. Controlled access areas are attended by a sample custodian and are usually large areas used by more than one group. Samples stored in controlled access areas can be removed only after requisitioning the sample via the CSMS. The sample custodian will retrieve the requisitioned samples from the storage locations and scan the barcode label. This process documents the sample transfer from the sample custodian to laboratory personnel. After use, the samples are returned to the sample storage center, scanned by the sample custodian and returned to the designated storage location. Only Sample Administration personnel shall be admitted to controlled access areas. The only exception to this rule will be during weekend hours when no sample custodians are on duty. During these hours, samples must be requisitioned as above, but analysts must retrieve the samples themselves, by obtaining a key to the controlled access area from the security desk. Samples must be scanned out as above. After use, samples must be scanned in and placed on the return cart inside WK. Sample custodians will return these samples to their location when they come on duty.

c. Forensic storage areas are locked and admission to these areas is only permitted to sample custodians. Most of the samples stored in these areas require strict chain-of-custody documentation as outlined in SOP QA-104, and should be requisitioned as described in (b) above. Samples may not be removed or returned to these areas without signing chain-of-custody forms.

3. To prevent unnecessary deterioration of the samples, the aliquots needed for analysis shall be removed and the sample returned to storage with a minimum of delay.

4. The Sample Administration Group will generate a discard list of samples with retention dates that have expired. The retention dates are based upon client requirements or defaulted to a given number of days past the date when the report is generated, if no client requirements were given. These samples will be removed from storage by a member of the Sample Support Group or a member of the department responsible for the given storage location. Hazardous samples shall either be returned to clients, decontaminated or disposed of at the direction of supervisory personnel. Prior to discarding each sample, the barcode will be scanned to prevent discard of the wrong sample.

5. The temperature of each refrigerator or freezer used for storing samples or reagents requiring temperature control should be checked during each normal working day by an assigned member of the group responsible for the samples stored within and recorded on a log posted on the outside of the unit. Refrigerator temperatures should be maintained at 4°C ± 2°C and freezer temperatures should be maintained at -15°C ± 5°C. If the temperature recorded does not fall within these ranges, the Maintenance Department should be contacted. Any repairs should be recorded and filed with the temperature log. All documentation of temperature checks and maintenance shall be kept in ink and any changes made shall follow the error correction procedure given in SOP-QA-109.

QA103
SOP QA #1
021092

Prepared by: M. Louise Kloo Date: 2/12/92

Approved by: S. Nelson Hendricks Date: 2/12/92

Read and understood by: _____ Date: _____

Lancaster Laboratories
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Initiated Date: 3/87
Effective Date: OCT 23 1992

QUALITY ASSURANCE OPERATIONS MANUAL

SOP-QA-104

Title: Chain-of-Custody Documentation

Purpose:

In order to demonstrate reliability of data which may be used as evidence in a legal case or required by a regulatory agency, an accurate written record tracing the possession of the sample must be maintained from the time it is entered into the computer system until the last analysis is verified.

Scope:

Procedures for initiating and maintaining chain-of-custody (COC) documentation are described in this document.

Definition:

A sample is in custody if it is in any one of the following states:

1. In actual physical possession.

2. In view after being in physical possession.

3. In physical possession and locked up so that no one can tamper with it.

4. In a secured area, restricted to authorized personnel. (e.g., any one of the individual laboratories in the building)

Procedures:

1. Chain-of-custody documentation shall be kept upon request of the client or for any samples which are known to be involved in a legal dispute. As with all analytical data, it is extremely important that documentation be filled out completely and accurately with every transfer. If changes to the form need to be made, the error correction procedure given in SOP-QA-109 shall be followed.

2. If requested by the client, the chain-of-custody documentation will begin with the preparation of bottles. A form (see Attachment 1) will be initiated by the person packing the sample bottles for shipment to the client. If the delivery of bottles is via our Transportation Department, the driver shall sign the form when relinquishing the bottles. Drivers must also sign chain-of-custody forms when picking up samples which require such documentation.

3. When samples arrive at the laboratory, a member of the Sample Administration Group will receive them and sign the chain-of-custody form, if one is provided with samples. If the sample was picked up by our Transportation Department, the driver must sign to indicate relinquishing the sample to Sample Receipt.

4. Samples will be logged into the computer as described in SOP-QA-102. Sample Administration personnel shall enter the analysis number for "laboratory chain-of-custody." A lab note to inform analysts of the need for chain of custody will be automatically added to sample labels.

5. Sample Administration personnel shall initiate an internal "Laboratory Chain-of-Custody" form (Attachment 2) for each type of container in the sample group, and relinquish the samples to a sample custodian or designated key holder, who will store the samples in the assigned locked location. This change of custody from sample entry to storage shall be documented on the chain, as well as any interim exchanges for preservation, homogenization, or temporary hold storage. The internal chain-of-custody forms will then accompany the samples throughout the lab. A master list of chains started for each sample group should also be initiated at this time.

6. At this point, the original copy of the external client chain-of-custody will be filed with Accounts Receivable, to be returned to the client with the invoice. Other copies of the external COC (pink or yellow) will stay with the client's paperwork file.

7. All signatures documenting changes of custody will use the following format: first initial, full last name, and employee number. Dates will include month/day/year, and all time will be in military time. Black ink is preferred. Pencil or red ink is not acceptable. Attachment 2 shows examples of chain-of-custody documentation.

8. Sample handling should be kept to a minimum. Analysts requiring use of a sample will requisition it through the computer requisition program. During the hours where Sample Support is manned by sample custodians, the custodian will receive the computerized requisition, and remove the sample from storage. The custodian will ensure that the bottle type listed on

the chain of custody matches the bottle type being relinquished, then sign the "released by" column to indicate the sample has been relinquished, and fill in the date and time. The analyst shall sign the "received by" column and note the reason for change of custody before taking the samples to their work area. It will be a shared responsibility of technicians and sample custodians to ensure that forms are signed with each transfer.

9. All changes of custody must be documented on the form. The following changes of custody shall be handled as follows:

   a. Signatures involving transfers from one shift to another shall be the responsibility of the technician who originally acquired the sample from Sample Support. When samples are then returned to storage, the person returning the samples shall be responsible to sign the "released by" column, and to ensure that samples were properly received by the custodian with his/her signature in the "received by" column.

   b. Occasionally a sample container will be needed for analysis by a technician in a department while it has been signed out to a technician in another department. It will be the responsibility of the first technician who received the sample to see that the second technician needing the sample signs the COC for receipt and return of the sample to the first technician.

c. In situations where a sample group must be split between departments working on different analyses, a supplemental chain of custody may be initiated by Sample Support. This supplemental chain will be used to accompany that portion of the group which is needed by a second department, when another department has part of the group and the chains of custody for the whole group. Initiating supplemental chains of custody may only be done by Sample Support and ExpressLAB, and should be used only when necessary to minimize paperwork and confusion. Sample Support will also document on a Masterlist, all chains and supplemental chains initiated for any sample group. This Masterlist of chains will be made available to Data Packages who collect all chains for packages.

d. Weekend work hours do not always have a sample custodian available. During these times the Lancaster Labs security personnel function as key holders to the storage areas. Technicians requiring use of samples over these times must requisition samples the previous day. These samples will be placed in the sample support hold walkin by a sample custodian. It will be necessary to page the security staff on weekends to acquire access to the hold walkin. Technicians will sign the COC for their own sample release by recording "SSG Storage" in the "Released By" column, and again in the "Received By" column when the sample is returned to the hold walkin.

e. Some samples are released by Sample Support and stored temporarily in other areas of the laboratory e.g. GC/MS Volatiles. During this time they may be

worked on by several people in that department. Each of these people must sign for change of custody. These samples when completed are then returned to Sample Support. It will be the responsibility of the department who held temporary storage to see that all necessary signatures are on the chain of custody form before returning samples and forms, at the same time, to Sample Support. It is also important to return these sample groups as soon as possible after verification of data, because the chains may be required for data packages.

10. Analysts in possession of samples shall remove the aliquot required for analysis and return the sample to storage, as described in #12 below, with a minimum of delay. During the time of possession, samples must remain in the analyst's view or be in a designated storage area within a secure lab restricted to authorized personnel.

11. If additional containers of the sample are created (e.g., subsamples, extracts, distillates, leachates, etc.) an additional chain-of-custody form marked with container type shall be initiated to accompany the new sample container. Each department in the lab has specifically designed chain-of-custody forms which shall be used for the new containers they create. All changes of custody involving handling of new containers within the department (e.g, analysis, storage, vials on instruments, etc.) shall be documented on the department specific chain. Any special handling or documentation requirements for department chains that are specific to any one department, should be described in a department SOP.

The only exception to the additional container form requirement will be for clients who specify chain of custody for the original sample only. In this case, no forms for sample preparation will be required.

After completion of new container sample analyses for department chains, the completed forms will be collected by the department's Data Package coordinator to be given to the Data Package department with the package data.

12. After analysis, samples shall be relinquished to a sample custodian who will return the samples to locked storage. The forms which remain in Sample Support shall be signed again to indicate storage, and the sample custodian will review the forms to ensure that all transfers are completely documented before filing the forms. Sample custodians will not return a sample to its storage location without signing an accompanying chain.

13. All completed forms for the original sample containers will be retained in files in Sample Support. The Data Package group will retrieve these forms to be copied for inclusion in the data packages. All original forms are either returned to the client or retained here, depending on the client's wishes.

14. All sample handlers in Sample Administration, Sample Support, and technical centers will make every attempt to ensure that all changes of custody are properly documented. Disciplinary action may be taken for employees who fail to comply with this important requirement.

15. In the event that a signature or other information is not recorded on the chain of custody, the Sample Support and Data Package groups shall determine what information is missing by checking computer requisition records, raw data, or Sample Support work schedules. The corrected information shall be added to the chain of custody and signed and dated with the current date of information entry.

SOPQA104.W51
SOP QA #1
102392

Prepared by: _____ Date: 10/23/92

Approved by: _____ Date: 10/23/92

Approved by: _____ Date: 10/23/92

Read and understood by: _____ Date: _____

Analysis Request/Environmental Services

Lancaster Laboratories
Where quality is a science.

Chain of Custody

Please print. Instructions on reverse side correspond with circled numbers.

(1) Client: _____ Acct. # : _____
Project Name/# : _____
Project Manager: _____ P.O. # : _____
Sampler: _____ Quote # : _____

(4) Matrix

(5) Analyses Requested

For LLI use only
FSC: _____
SCR # : _____

(2) Sample Identification	Date Collected	Time Collected	(3) No. of Containers	Container Type	Preservative Used	Soil	Water	Oil	Other	Total # of Containers	(6) Remarks

(7) Turnaround time requested (please circle): Normal Rush
(Rush TAT is subject to LLI approval and surcharge.)

Rush results requested by (please circle):
Fax Fax # : _____
Phone Phone # : _____

(8) Data package options (please circle if requested):
QC Summary
Tier I (NJ)
Tier II (NJ)
EPA CLP

Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)

Data Package Chain of Custody required?
Yes No

(9)

Relinquished by	Date	Time	Received by	Date	Time
Relinquished by	Date	Time	Received by	Date	Time
Relinquished by	Date	Time	Received by	Date	Time
Relinquished by	Date	Time	Received by	Date	Time
Relinquished by	Date	Time	Received for LLI by	Date	Time

2425 New Holland Pike, Lancaster, PA 17601-5994 (717) 656-2301 Copies: White and Yellow copies accompany samples to lab. Pink is retained by client. 4/26/91 #2102

Attachment 1

SOP-QA-104
Initiated Date: 3/87
Effective Date: OCT 23 1992
Page 9 of 10

Section No. 7
Revision No.
Date: 08/26/93
Page 19 of 20

SOP-QA-104
Initiated Date: 3/87
Effective Date: OCT 23 1992
Page 10 of 10

Lancaster Laboratories

Attachment 2
Locked Storage Chain of Custody

ORIGINAL SAMPLE

Client/Project: ABC Engineering

Preservative: none Matrix: WW

Sample # Range of Entry Group: 1716402 - 416 Bottle Type: 1/2 gallon plastic

SDG: ABC1

Sample Number(s)	Released by	Received by	Date	Time	Reason for Change of Custody
1716402 - 416	A. Hutchison 210	cabinet 266	5/21/92	1115	from entry to storage

8. Calibration Procedures

Procedures for initial calibration and continuing calibration verification are in place for all instruments within the laboratory. The calibrations generally involve checking instrument response to standards for each target compound to be analyzed. The source and accuracy of standards used for this purpose are integral to obtaining the best quality data. Standards used at Lancaster Laboratories, Inc. (LLI) are purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. The accuracy and quality of these purchased standards is verified through documentation provided by these commercial sources. Most solutions and all neat materials require subsequent dilution to an appropriate working range. All dilutions performed are documented and the resulting solution is checked by obtaining the instrument response of the new solution and comparing with the response to the solution currently in use. Any discrepancies between the responses are investigated and resolved before the new solution is used. Each standard is assigned a code which allows traceability to the original components. The standard container is marked with the code, name of solution, concentration, date prepared, expiration date, and the initials of the preparer. Shelf-life and storage conditions for standards are included in the standard operating procedures and old standards are replaced before their expiration date.

Each instrument is calibrated with a given frequency using one or more concentrations of the standard solution. As analysis proceeds, the calibration is checked for any unacceptable change in instrument response. If the calibration check verifies the initial response, the analysis proceeds. If the calibration check indicates that

a significant change in instrument response has occurred, then a new calibration is initiated. If necessary, maintenance may be performed prior to the recalibration.

Calibration records are usually kept in the form of raw data with the other instrument print-outs. In cases where no data system is used, calibration data is manually recorded in notebooks. Any maintenance or repair is also recorded in a notebook. The information recorded either in the notebooks or on the instrument print-out includes the date, instrument ID, employee name and/or identification number, and concentration or code number of standard.

The frequency of calibration and calibration verification, number of concentrations used, and acceptance criteria for each of the instruments to be used are listed on Table 8-1. In addition to checking the instrument response to target compounds, the GC/MS units are checked to ensure that standard mass spectral abundance criteria are met. Prior to each calibration, instruments being used for semivolatile analysis are tuned using decafluorotriphenylphosphine (DFTPP). The key ions and their abundance criteria are listed in Table 8-2.

Table 8-1

Initial Calibration				Continuing Calibration Verification		
Instrument	Frequency	Number of Standard Concentration	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC VOA BTEX	After C-cal fails	5	%RSD of <20% Otherwise use calibration curve	Every 8-10 hours, or every 10 samples	1	%D ± 15%
HPLC	Each new run, or After C-cal fails	5	≤ 20% RSD of RF's of initial calibration to use ave. RF, otherwise use curve fit.	Every 10 samples	1	≤ 15% difference from initial response for quantitation, ≤ 20% difference for confirmation
GC/MS PAHs	After C-cal fails	5	RF for SPCC's ≥ 0.050. Max %RSD for CCC's ≤ 30%	Every 12 hours	1	RF for SPCC's ≥ 0.050. Max %D for CCC's ≤ 30%
Technicon Autoanalyzer	Daily	5	Correlation coefficient > 0.995	Every 10 samples	1	± 10% of true value
Alpkem Autoanalyzer	Daily	6	Correlation Coefficient >0.995	Every 10 samples	1	± 10% of true value
Ion Chromatograph	Daily (Every 194 injections)	6	Correlation Coefficient >0.995 ICV ± 10%	Every 10 samples	1	± 10% of true value
Spectrophotometer (Colorimetric)	Quarterly	6	Correlation coefficient > 0.995	Daily or every 10 samples	1	± 20% of EPA std.
TOC Analyzer	Daily	5	± 10% @ STD	Every 10 samples	1	± 10% of true value
Oxygen Meter	Daily	Calibration Against Winkler Titration	NA	NA	NA	NA

Table 8-1

Initial Calibration				Continuing Calibration Verification		
Instrument	Frequency	Number of Standard Concentration	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
pH Meter	Daily	Slope 2 Buffers	Independent calibration verification ± 3%	Every 10 samples	1	± 3%
Balance	Daily	4	± .5%	NA	NA	NA

Abbreviations

Std Conc is the number of standard concentrations used.

SPCCs are system performance check compounds.

CCCs are calibration check compounds.

RF is response factor.

%RSD is percent relative standard deviation.

%D is percent difference.

C-cal is continuing calibration.

Table 8-2	
Mass	**Ion Abundance Criteria**
DTFPP Key Ions and Ion Abundance Criteria:	
51	30 to 60% of mass 198
68	less than 2% of mass 69
69	mass 69 relative abundance
70	less than 2% of mass 69
127	40 to 60% of mass 198
197	less than 1% of mass 198
198	Base peak, 100% relative abundance
199	5 to 9% of mass 198
275	10 to 30% of mass 198
365	greater than 1% of mass 198
441	Present but less than mass 443
442	greater than 40% of mass 198
443	17 to 23% of mass 442

9. Analytical Procedures

The analytical procedures to be used are those described in USEPA 600/4-79-020 and in the USEPA SW-846 3rd Edition, 1986, for the preparation and analysis of water, sediment, and soil for the client specified compounds. Copies of the analytical procedures are located in the laboratory and available for use by analysts. Copies of analytical methods are available upon request.

PAHs by GC/MS - This method determines the concentration of semivolatile organic compounds that are separated into an organic solvent and are amenable to gas chromatography. The method involves solvent extraction of the sample to isolate analytes and GC/MS analysis to determine semivolatile compounds present in the sample. Method 8270.

Volatiles by GC - This method determines the concentration of volatile (purgeable) organic compounds. The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a Photoionization and/or Electrolytic Conductivity detector. Method 5030/8010/8020.

PAHs by HPLC - The sample aliquot is extracted with methylene chloride. The extract is filtered (soils), dried, concentrated by evaporation and exchanged into acetonitrile. Silica gel cleanup is used if necessary. The extract is analyzed by reverse phase HPLC with both UV and Fluorescence detectors. Methods 3550/3630/8310.

Biochemical Oxygen Demand - A seeded sample of the waste is incubated with nutrients for five days at 20°C. The reduction of dissolved oxygen (DO) concentration during the incubation yields a measure of the BOD. The DO is used by microorganisms as they breakdown carbonaceous organic material. If nitrifying bacteria are present, nitrogenous compounds can add to the BOD. Complex organic compounds may not show a BOD if they cannot be assimilated by the seed bacteria.

Methods for the Chemical Analysis of Water and Wastes, USEPA 600/4-790-020. Method 405.1.

Chemical Oxygen Demand - This method is appropriate for midlevel water samples. Chemical oxygen demand is a measure of the total amount of oxygen required for oxidation of waste to carbon and water. The sample is heated for two hours in an acidic solution with a strong oxidizing agent, potassium dichromate. The sample is analyzed colorimetrically at 600 nm.

Methods for the Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 410.4.

Oil and Grease - This is the gravimetric method for liquid samples. Two containers should be submitted for each sample. The sample is acidified to a low pH (<2). A one liter aliquot is extracted with 3 - 30 ml portions of freon. The extracts are passed through sodium sulfate to remove any water and are combined in a tared vessel. The freon is evaporated and the residue is weighed to a constant weight.

Methods for the Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, Method 413.1.

Ammonia Nitrogen - The sample is buffered to a pH of 9.5 with borate buffer and is then distilled into a solution of boric acid. The ammonia in the distillate is titrated with standard sulfuric acid using a mixed indicator.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 350.2.

pH - The activity of hydrogen ions in the sample is measured using a glass electrode and a reference electrode.

Methods for the Chemical Analysis of Water and Wastes, USEPA 600/4-79-020, Method 150.1.

Nitrate Nitrogen - A small volume of sample is introduced into an ion chromatograph. The anions are then separated and measured by a system consisting of a guard column, separator column, suppressor, and conductivity detector. A Dionex Model 2010 Ion Chromatograph is used.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 300.0.

Kjeldahl Nitrogen - The sample is digested with sulfuric acid, potassium sulfate, and mercuric sulfate. This solution is then analyzed for the converted ammonia nitrogen using the reaction of the ammonia and sodium salicylate, sodium nitroprusside, and sodium hypochlorite in a buffered alkaline medium to form an ammonia salicylate complex. The absorbance is read at 660 nm and is compared to a standard curve. A Technicon Autoanalyzer II is used.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 351.2.

Phosphorus - All forms of phosphorus are converted to orthophosphate by an acid-persulfate digestion. The orthophosphate ion reacts with ammonium molybdate in acidic solution to form an antimony-phosphomolybdate complex. On reduction with ascorbic acid, this complex turns blue. The absorbance is read at 660 nm and is compared to a standard curve. An Alpkem Autoanalyzer is used.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 365.1.

Total Suspended Solids - A well-mixed sample is filtered through a tared gooch crucible. The residue on the filter is dried to a constant weight at 103 to 105°C. The increase in weight is the Total Suspended Solids.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 160.2.

Moisture - A known sample weight is placed in a drying oven maintained at 103 to 105° for 12 to 24 hours. The sample is reweighed after drying and this value is divided by the original weight. The result is used to calculate analytical concentration on a dry weight basis.

Methods for Chemical Analysis of Water and Wastes, USEPA 600/4-79-020. Method 160.3.

Total Organic Carbon (TOC) - Following acidification, the sample is purged with nitrogen to remove inorganic carbon. Persulfate is injected to oxidize organic carbon to carbon dioxide which is detected by IR. An OI Model 700 TOC Analyzer is used. Method 9060.

PAHs by GC/MS 8270				
Compound	Waters		Soils**	
	LOQ* (ug/l)	J-Value (ug/l)	LOQ* (ug/kg)	J-Value (ug/kg)
Naphthalene	10.	1.	330.	30.
Acenaphthylene	10.	1.	330.	30.
Acenaphthene	10.	1.	330.	30.
Fluorene	10.	1.	330.	30.
Phenanthrene	10.	1.	330.	30.
Anthracene	10.	1.	330.	30.
Fluoranthene	10.	1.	330.	30.
Pyrene	10.	1.	330.	30.
Benzo(a)anthracene	10.	1.	330.	30.
Chrysene	10.	1.	330.	30.
Benzo(b)fluoranthene	10.	1.	330.	30.
Benzo(K)fluoranthene	10.	1.	330.	30.
Benzo(a)pyrene	10.	1.	330.	30.
Indeno(1,2,3-cd)pyrene	10.	1.	330.	30.
Dibenzo(a,h)anthracene	10.	1.	330.	30.
Benzo(ghi)perylene	10.	1.	330.	30.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the "J"-Value when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

Volatiles by GC				
Compound	Waters		Soils**	
	LOQ* (ug/l)	J-Value (ug/l)	LOQ* (ug/kg)	J-Value (ug/kg)
Benzene	1.	.1	5.	1.
Toluene	1.	.1	5.	1.
Ethylbenzene	1.	.1	5.	1.
o-Xylene	1.	.1	5.	1.
m-Xylene	1.	.1	5.	1.
p-Xylene	1.	.1	5.	1.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the "J"-Value when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

PAHs by HPLC 8310				
Compound	Waters		Soils**	
	LOQ* (ug/l)	J-Value (ug/l)	LOQ* (mg/kg)	J-Value (mg/kg)
Naphthalene	10.	.9	2.	.2
Acenaphthylene	20.	.7	2.	.2
Acenaphthene	20.	2.	2.	.2
Fluorene	2.	1.	2.	.05
Phenanthrene	2.	.04	0.5	.006
Anthracene	1.	.03	0.5	.005
Fluoranthene	0.5	.02	0.2	.005
Pyrene	2.	.5	0.2	.08
Benzo(a)anthracene	0.1	.04	0.01	.004
Chrysene	1.	.2	0.1	.04
Benzo(b)fluoranthene	0.2	.03	0.02	.004
Benzo(k)fluoranthene	0.1	.01	0.02	.002
Benzo(a)pyrene	0.2	.02	0.02	.005
Dibenzo(a,h)anthracene	0.2	.04	0.02	.01
Benzo(g,h,i)perylene	0.5	.2	0.05	.03
Indeno(1,2,3-cd)pyrene	0.5	.1	0.05	.04

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the "J"-Value when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

Parameter	Waters		Soils**	
	LOQ* (mg/l)	J-Value (mg/l)	LOQ* (mg/kg)	J-Value (mg/kg)
TOC	0.5	.04	50.	1.
Ammonia-N	1.0	.3	50.	3.0
Kjeldahl-N	0.2	.2	50.	25.
Phosphorus	.05	.03	Wt. dependent	4.
pH	0.01	.01	0.01	.01
Nitrate-N	0.1	.009	1.0	.09
COD	50.	14.	50.	6.
BOD	2.0	.6	NA	NA
TSS	7.0	2.3	NA	NA
Oil and Grease	0.2	.07	60.	9.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis will be higher.

10. Data Reduction, Validation and Reporting

Raw analytical data generated in the laboratories is collected on printouts from the instruments and associated data system or manually in bound notebooks. Analysts review data as it is generated to determine that the instruments are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks described in Section No. 11. If any problems are noted during the analytical run, corrective action is taken and documented.

Each analytical run is reviewed by a chemist for completeness and accuracy prior to interpretation and data reduction. The following calculations are used to reduce raw data to reportable results.

GC/MS calculation used by the data system to determine concentration in extract for semivolatiles or in the sample itself for volatiles:

$$Q = (Ax)\ (Is)\ /\ (AIs)\ (RRF)\ (Vi)$$

Where Ax = peak area

AIs = internal standard peak area

Is = amount of internal standard injected (ng)

RRF = relative response factor

Vi = volume of extract injected (ul) or volume sample purged (ml)

The extract concentration is further reduced by considering the initial sample weight or volume and the final extract volume:

$$Concentration = (Q)\ (D)\ (F)\ (1000)\ /\ (I)$$

Where Q = concentration determined by the data system (mg/l)

D = dilution factor if needed

F = final extract volume (ml)

I = initial sample weight (grams) or volume (ml)

Results are reported in ug/l for water samples and ug/kg for solid samples. Soil samples are reported on an as received and on a dry weight basis. The results are reported on LLI Analysis Report Forms shown in Appendix A.

For Volatiles by GC, a five-point external calibration procedure is used. The resulting point-to-point calibration curve is used by the data system to calculate analyte concentrations. The equations that the data system uses for calculating analyte concentrations are shown below.

A. When analyte peak height, Hx, falls between the peak heights of two calibration points, Hn and Hn+1, the analyte concentration is calculated as follows when using a point-to-point calibration curve:

$$Concentration = ([(Hx - Hn)\ /\ S] + An)\ x\ (DF)$$

$$S = (Hn+1 - Hn)\ /\ (An+1 - An)$$

Where Hx = analyte peak height

Hn = analyte peak height in the nth calibration level

Hn+1 = analyte peak height in the n+1 calibration level

S = slope between the n and n+1 calibration points for the analyte

An = the concentration of the analyte in the nth calibration level

An+1 = the concentration of the analyte in the n+1 calibration level

DF = dilution factor

B. When the analyte peak height is below the peak height for the lowest calibration standard, the analyte concentration is calculated as follows when using a point-to-point calibration curve with extrapolation to zero:

$$Concentration = [(Hx) \times (A1 / H1)] \times (DF)$$

Where Hx = analyte peak height

A1 = concentration of analyte in the first calibration level

H1 = analyte peak height in first calibration level

DF = dilution factor

Results are reported in ug/l for water samples and in ug/kg for solid samples. Soil samples are reported on an as received and on a dry weight basis.

The results for the PAHs by HPLC analysis are calculated using the following equation:

$$\frac{Pk\ Ht \times RF \times FV \times DF \times AF}{IV\ (or\ IW)} = Concentration\ (ug/l)\ or\ mg/kg$$

Where Pk Ht = Peak height found in sample

RF = Response factor (ppm/peak height) of analyte in standard

FV = Final volume of sample extract* (ml)

DF = Dilution factor (where applicable)

IV = Initial volume of sample extracted (liters)

IW = Initial weight of the sample extracted (gm)

**AF = Additional factor

*Please note that the final volume of the extract is 3 ml for aqueous and 10 ml for solids

**Additional factor is 5 to compensate for the dilution into ACN

Results are reported as ug/l for water samples and mg/kg for solid samples. Soil samples are reported on an as received and on a dry weight basis. Results are reported on LLI Analysis Report Forms shown in Appendix A.

The results for inorganic analyses are calculated using the following equation:

$$Concentration = (A)\ (D)\ (E)\ /\ (F)$$

Where A = the concentration determined by AA, ICP, or FTIR using calibration data programmed into the instrument (mg/l)

D = dilution factor if needed

E = final extract volume (ml)

F = initial sample volume (ml) or weight (gm)

Results are usually reported in mg/l for water samples and in mg/kg for solid samples. Alternate units are available upon request. Soil samples are reported on an as received and on a dry weight basis. The results are reported on LLI Analysis Report Forms shown in Appendix A.

The principle criteria used to validate data will be the acceptance criteria described in Sections No. 8 and 11 and protocols specified in laboratory SOPs. Following review, interpretation and data reduction by the analyst, data is transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. This system stores client information, sample results, and QC results. A security system is in place to control access of laboratory personnel and to provide an audit trail for information changes. The data is again reviewed by the Group Leader or another analyst whose function is to provide an independent review and verified on the sample management system. The person performing the verification step reviews all data including quality control information prior to verifying the data. Any errors identified and corrected during the review process are

documented and addressed with appropriate personnel to ensure generation of quality data. If data package deliverables have been requested, the laboratory will complete the appropriate forms (see Appendix A) summarizing the quality control information, and transfer copies of all raw data (instrument print-outs, spectra, chromatograms, laboratory notebooks, etc.) to the Data Packages Group. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package in the client requested format. This package is reviewed by the Quality Assurance Department for conformance with SOPs and to ensure that all QC goals have been met. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

The validation of the data by the Quality Assurance Department includes spot checking raw data versus the final report, checking that all pertinent raw data is included and does refer to the samples analyzed, review of all QC results for conformance with the method, and review of the case narrative for description of any unusual occurrences during analysis. This validation is performed using techniques similar to those used by the Sample Management Office for the USEPA's Contract Laboratory Program. The validation performed by the laboratory does not address useability of the data, which usually requires some knowledge of the site. The laboratory will make every attempt to meet the requirements of this QAPP, thus reducing the need to assess useability of the data.

The laboratory sample management system is programmed to accept and track the results of quality control samples including blanks, surrogates, recoveries, duplicates, controls, and reference materials. The computer is programmed with the acceptance criteria for each type of QC sample and will display an out-of-spec message if the data is not within specifications. All data outside of specifications appears on a report to the Quality Assurance Department on the next working day. These are reviewed by the Quality Assurance Department for severity of the problems and trends in the data. The reports are then sent to the analytical groups for the purpose of documenting the corrective action taken. The sample management system also produces control charts and has searching capabilities to aid in data review. The flow of data from the time the samples enter the laboratory until the data is reported are summarized in Table 10-1.

Any data recorded manually will be collected in bound notebooks. All entries will be in ink, with no erasures or white-out being permitted. Any changes in data will be made using a single line to avoid obliteration of the original entry and will be dated and signed. Any data resulting from instrument printouts will be dated and will contain the signature and/or identification of the analyst responsible for its generation. After copies of the data are incorporated into the data package deliverables, the originals will be stored in locked archives at the laboratory for a period of ten years.

Project files will be created per client/project and will contain chain-of-custody records, analysis requirements, and laboratory acknowledgements which document samples received, laboratory sample number assignment, and analysis requested.

Raw data is filed per batch number assignment and laboratory sample number which correlates to the sample receipt documents. When the project is complete, all documentation is archived in a limited access area and retained for ten years.

Table 10-1

Sample and Data Routing at Lancaster Laboratories, Inc.

Action	Personnel Involved
Sample received at LLI	Sample Administration
Sample is entered onto sample management system (lab ID number assigned, analyses scheduled, chain of custody started, storage location assigned)	Sample Administration
Sample stored in assigned location (refrigerator, freezer, etc.)	Sample Support
Acknowledgement sent to client	Sample Administration
Removed from storage for analysis; necessary aliquot taken and sample returned to storage	Technical Personnel
Analysis is performed according to selected analytical method; raw data recorded, reviewed, and transferred to computer by chemist or technician*	Technical Personnel
Computer performs calculations as programmed according to methods	Data Processing
Chemist or supervisor verifies raw data	Technical Personnel
Data package deliverables are assembled	Data Package Group
Data packages are reviewed prior to mailing	Quality Assurance Dept. Laboratory Management

* Analyses requiring the chemist's interpretation may involve manual data reduction prior to entry onto the computer.

11. Internal Quality Control Checks

The particular types and frequencies of quality control checks analyzed with each sample are defined in the Chemical Analysis of Water and Wastes, USEPA 60014-79-020 and in USEPA SW-846 3rd Edition, 1986. The quality con'trol checks routinely performed during sample analysis include surrogates, matrix spikes, duplicates, blanks, internal standards, and laboratory control samples.

Surrogates (used for organic analysis only) - Each sample, matrix spike, matrix spike duplicate, and blank are spiked with surrogate compounds prior to purging and extraction in order to monitor preparation and analysis. Surrogates are used to evaluate analytical efficiency by measuring recovery.

Matrix Spikes - A matrix (soil or water) is spiked with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

Duplicates (matrix spike duplicate - organics and inorganic hydride generation; duplicate - inorganics) - A second aliquot of a matrix/sample is analyzed at the same time as the original sample in order to determine the precision of the method. Recovery of the original compared to the duplicate is expressed as relative percent differences (RPD).

Blanks (Method, Preparation) - Blanks are an analytical control consisting of a volume of deionized, distilled laboratory water for water samples, or a purified solid matrix for soil/sediment samples. (Metals use a digested

reagent blank with soils.) They are treated with the same reagents, internal standards, and surrogate standards and carried through the entire analytical procedure. The blank is used to define the level of laboratory background contamination.

Internal Standards (used for GC/MS analysis) - Internal standards are compounds added to every standard, blank matrix, spike, matrix spike duplicate, and sample at a known concentration, prior to analysis. Comparison of the peak areas of the internal standards are used for internal standard quantitation as well as to determine when changes in the instrument response will adversely affect quantification of target compounds.

Laboratory Control Samples - Aqueous and solid control samples of known composition are analyzed using the same sample preparation, reagents, and analytical methods employed for the sample. For inorganics, LCS recovery must fall within established control limits. For organics, an LCS is run when MS/MSD recovery falls outside established limits. The LCS recovery must fall within acceptance limits based on statistical evaluation of past lab data.

The results of all quality control samples are entered into the computer along with sample results. The computer is programmed to compare the individual values with the acceptance limits. If the results are not within the acceptance criteria, appropriate corrective action is taken where necessary. Management is kept informed by daily reports of QC outliers generated by the computerized system. Monthly reports on results of all QC analyses showing mean and standard deviation will indicate trends or method bias. Control Charts are plotted via computer and may be accessed at any time by all analysts.

The charts that follow show the types and frequency of QC performed, along with the acceptance limits and corrective action.

Table 11-1

Quality Control
GC/MS Semivolatiles

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Surrogate:			Each sample, MS, MSD, LCS, and blank	Repeat analysis if more then one surrogate out per fraction (acid/base) or any recovery <10%. If reanalysis confirms originals, document on report and/or case narrative
Nitrobenzene-d5	35-114	23-120		
2-Fluorobiphenyl	43-116	30-115		
Terphenyl-d14	33-141	18-137		
Phenol-d6	10- 94	24-113		
2-Fluorophenol	21-100	25-121		
2,4,6-Tribromophenol	10-123	19-122		
Matrix Spikes: Spike all compounds of interest	See Table 11-5 for acceptance limits		Each group (≤20) of samples per matrix/level	Run LCS for compounds outside recovery window
Laboratory Control Sample: Spike all compounds of interest	Same as for spikes		Each group (≤20) When MS/MSD falls outside established limits.	Re-extract and re-analyze LCS and associated samples for compounds outside acceptance limits
Matrix Spike Duplicates (RPD): Same as for matrix spikes	≤ 30%		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤ (5x) LOQ for the phthalate esters and benzaldehyde ≤ LOQ for all other compounds		Once per case or group (≤20) of samples, each matrix, level, instrument	Re-extract and re-analyze blank and associated samples

Table 11-1

Quality Control
GC/MS Semivolatiles

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Internal Standards: 1,4-Dichlorobenzene-d4 Naphthalene-d8 Acenaphthene-d10 Phenanthrene-d10 Chrysene-d12 Perylene-d12	-50 to +100 of internal standard area of 12 hour STD RT change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Re-analyze samples. If re-analysis confirms original, document on report and/or case narrative

Accuracy is subject to change over time.

Table 11-2

**PAHs by GC/MS Matrix Spike/
Matrix Spike Duplicate Sample Recovery**

Compound Name	Acceptance Limits (%)
Naphthalene	21.0 - 133.0
Acenaphthylene	33.0 - 145.0
Acenaphthene	47.0 - 145.0
Fluorene	59.0 - 121.0
Phenanthrene	54.0 - 120.0
Anthracene	27.0 - 133.0
Fluoranthene	26.0 - 137.0
Pyrene	52.0 - 115.0
Benzo(a)anthracene	33.0 - 143.0
Chrysene	17.0 - 168.0
Benzo(b)fluoranthene	24.0 - 159.0
Benzo(k)fluoranthene	11.0 - 163.0
Benzo(a)pyrene	17.0 - 163.0
Indeno(1,2,3-cd)pyrene	1.0 - 171.0
Dibenz(a,h)anthracene	1.0 - 227.0
Benzo(g,h,i)perylene	1.0 - 219.0

Acceptance limits are based on statistical evaluation of compiled laboratory data and are subject to change.

Table 11-3

Quality Control
PAHs by HPLC (8310)

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Surrogate:				
Nitrobenzene	60-120	50-120	Added to each sample, MS/MSD, LCS, blank, LCS/LCSD during the extraction phase	Surrogate must be in spec unless matrix-related problems are evident. If matrix-related problems are evident, report results and comment in case narrative.
Matrix Spike:				
Spike all compounds of interest	See attached Table 11-4		Each group (≤20) of samples per matrix/level	Run LCS for compounds outside acceptance window
Laboratory Control Sample:				
Spike all compounds of interest	See attached Table 11-4		Each group (≤20) When MS/MSD falls outside established limits.	Re-extract and re-analyze LCS and associated samples for compounds outside acceptance limits
Matrix Spike Duplicates (RPD):				
Spike all compounds of interest	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results

Table 11-3

Quality Control
PAHs by HPLC (8310)

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Blanks:	≤ LOQ for all compounds		Once per case or extraction group (≤20) of samples, each matrix, level, instrument	Inject a hexane or solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected if they, too, contain the analyte which was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

ance limits are based on statistical evaluation of compiled laboratory data and are subject to change.

Table 11-4

Quality Control

PAHs by HPLC Spike Acceptance Limits

Compound Name	Matrix Spike and Laboratory Control Sample Limits for Waters (%)	Laboratory Control Limits for Soils (%)	Matrix Spike Limits for Soils (%)
Napthalene	46-120	64-120	57-120
Acenaphthylene	48-120	66-120	66-120
Acenaphthene	49-120	51-131	69-120
Fluorene	51-120	73-120	71-124
Phenanthrene	58-120	80-115	62-140
Anthracene	51-120	51-120	43-140
Fluoranthene	58-121	80-120	64-137
Pyrene	59-120	74-120	65-122
Benzo(a)anthracene	61-124	78-124	51-150
Chrysene	17-122	44-125	44-139
Benzo(b)fluoranthene	63-120	77-120	62-120
Benzo(k)fluoranthene	58-122	70-120	55-124
Benzo(a)pyrene	56-120	68-115	44-123
Dibenzo(a,h)anthracene	39-120	72-121	63-120
Benzo(g,h,i)perylene	26-120	68-120	58-120
Indeno(1,2,3-CD)pyrene	54-120	64-122	42-127

Acceptance limits are based on statistical evaluation of compiled laboratory data and are subject to change.

Table 11-5

Quality Control
Volatiles by GC

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Surrogates:				
VOA by GC n-propylbenzene	75-125	70-130	Each sample, MS, MSD, and blank	Results would not be reported if the surrogate recovery is outside the limits unless matrix related problems are evident
Matrix Spikes:				
Spike all compounds of interest	75-125	70-130	Each group (≤20) of samples per matrix/level	See Flow Chart 11-6A
Matrix Spike Duplicate (RPD):				
Spike all compounds of interest	15	20	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:				
VOA by GC	≤ LOQ for all compounds		Every 8-10 hours	Re-analyze blank and associated samples if blank is outside limits.

Table 11-5

Quality Control
Volatiles by GC

Type	Acceptance Limits (%) WATERS	SOILS	Frequency	Corrective Action
Laboratory Control Sample/Check Standard: Spike all compounds of interest	85%-115%		Each group (≤20) when MS/MSD falls outside established limits	See Flow Chart 11-6B

Accuracy is subject to change over time.

Lancaster Laboratories

Batch QC Protocol Flowchart

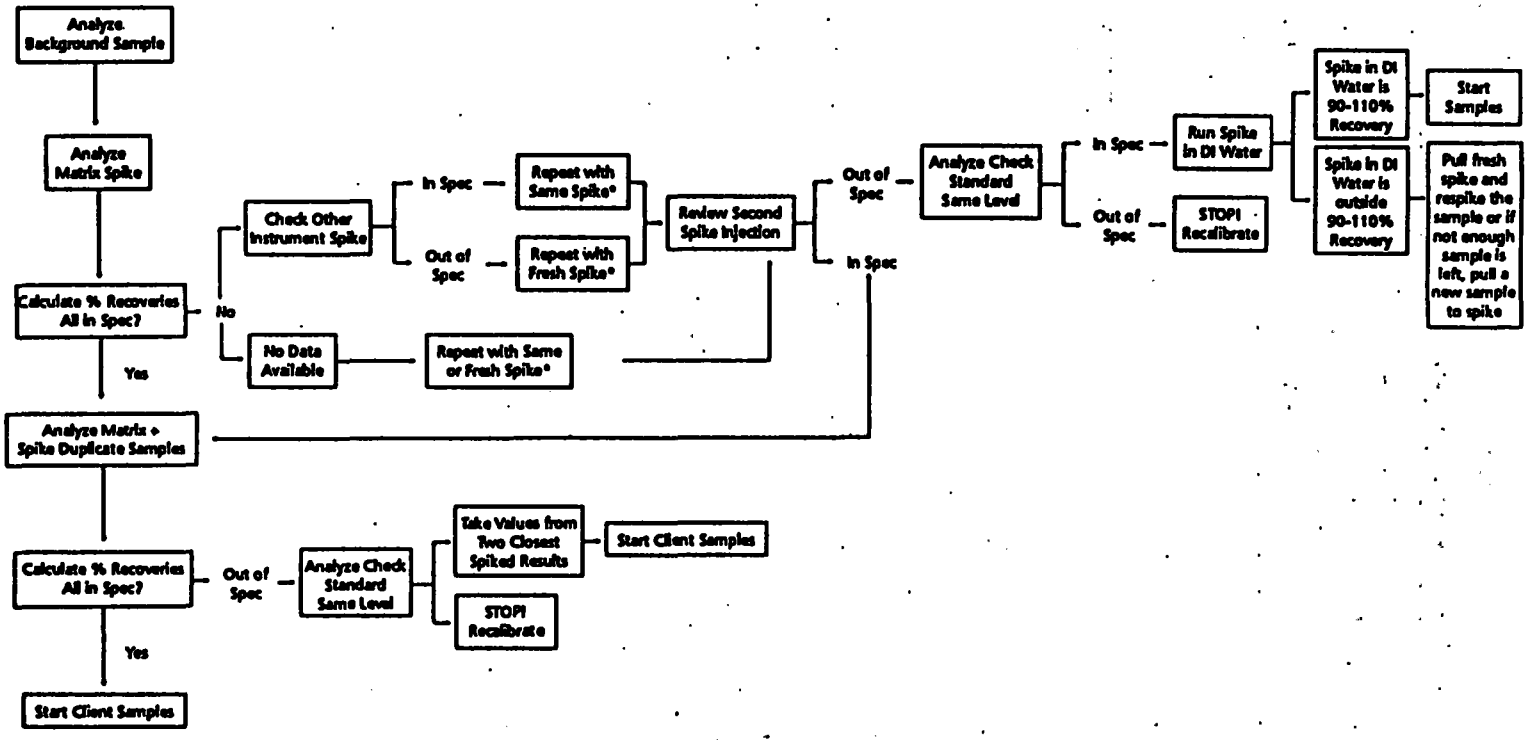


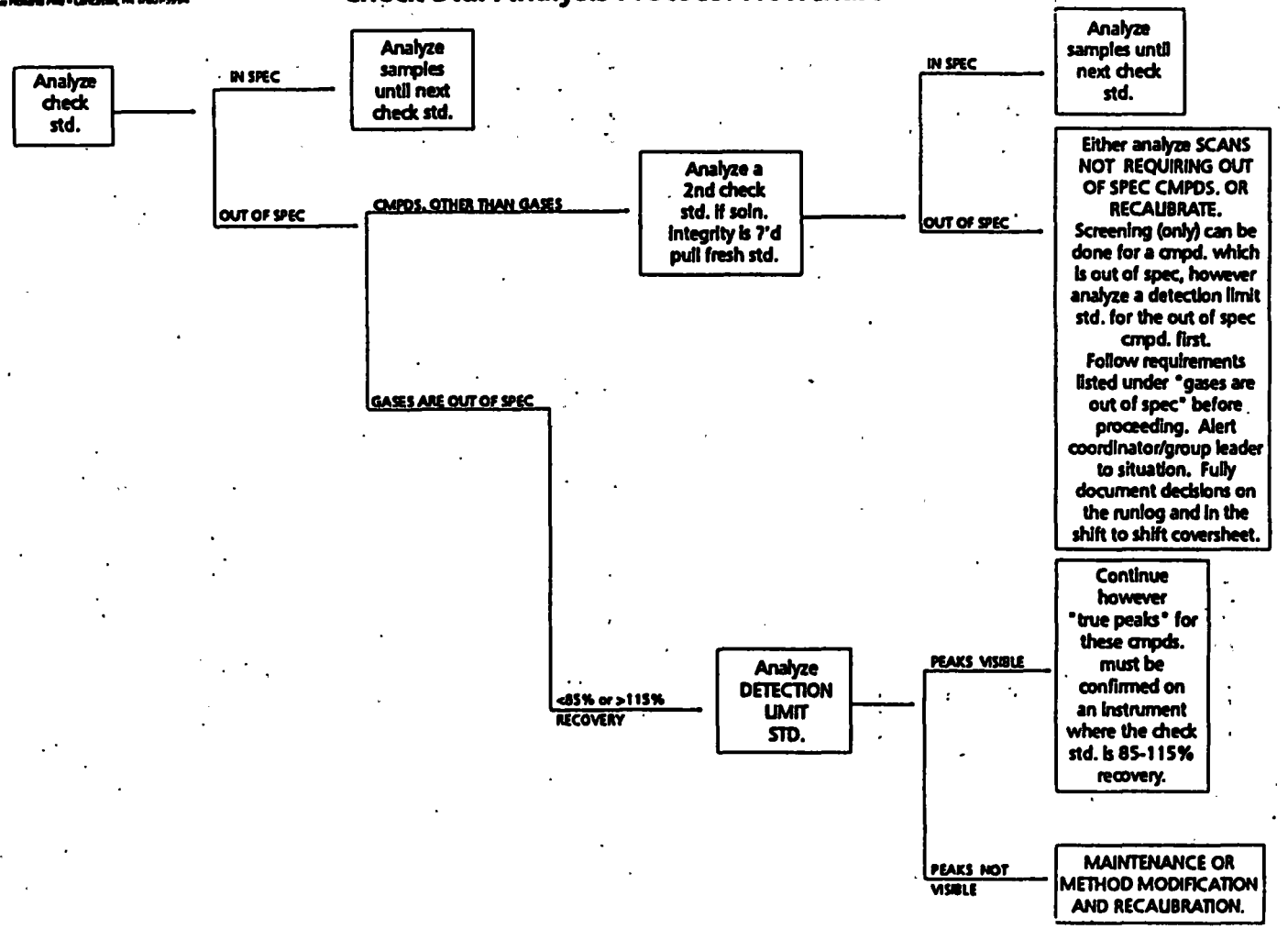
Table 11-6A
Volatiles by GC

For data package groups with the background, spike, and spike dup. as independent LLI numbers, the 2nd injection of the spiked sample (*) should be from the matrix spike dup. vial. If the result of the 2 spikes match but are both out of spec. (values), run a check std. and a spike in deionized water. If the check std. is in spec., samples can be started. If the check std. is out of spec., STOP! and recalibrate. The spike in deionized water purpose is to help us evaluate the bkg./sp./sp. dup. results. Being in spec. is not required to continue with samples. The critical determinate is the check std., this must be in spec. for all compounds being reported before continuing with samples. When one spike result is in spec. and the other out of spec., run a 3rd injection of a spiked sample using either the spike or spike dup. vial. This will be decided through analyst experience. Then follow protocol (+) from the point of the spike dup. injection.

Table 11-6B
Volatiles by GC

Lancaster Laboratories

Check Std. Analysis Protocol Flowchart



2398 6/17/92

Table 11-7

Quality Control Acceptance Criteria

Parameter	Blank	Spike Recovery (%)	Duplicate RPD (%)	Lab Control Recovery (%)
TOC	<LOQ	75-125	≤20	80-120
Moisture	NA	NA	≤20	80-120
Ammonia-N	<LOQ	75-125	≤20	80-120
Kjeldahl-N	<LOQ	75-125	≤20	80-120
Phosphorus	<LOQ	75-125	≤20	80-120
pH	NA	NA	≤20	80-120
Nitrate-N	<LOQ	75-125	≤20	80-120
COD	<LOQ	75-125	≤20	80-120
BOD	<LOQ	75-125	≤20	80-120
TSS	<LOQ	NA	≤20	80-120
Oil and Grease	<LOQ	75-125	≤20	80-120

Corrective Action: If either the LCS or Blank are outside the criteria, the QC and associated samples will be reprepped and re-analyzed.

Maximum batch size is 20 field samples.

12. Performance and System Audits

System audits are conducted on each department at Lancaster Laboratories, Inc. (LLI) by members of the Quality Assurance Department. The audits include checks on methodology, reagent preparation, equipment calibration and maintenance, quality control results, and training of personnel. The results of the audits and corrective action, where necessary, are communicated to laboratory personnel and management by means of a written report. Audits by outside organizations including clients, regulatory personnel, and the USEPA are permitted by arrangement with the Quality Assurance Department.

The Quality Assurance Department reviews summaries of the quality control data entered onto the computerized sample management system by analysts. Control charts and statistics are reviewed for trends which may indicate problems with the analytical data. In this way, small problems are identified before they have any significant impact on laboratory results.

Performance audits consist of both intralaboratory and interlaboratory check samples. Blind samples containing known amounts of target analytes are prepared by the Quality Assurance Department and submitted to the laboratories under fictitious client names. In addition, QC samples from commercial suppliers are analyzed quarterly to assess laboratory accuracy. LLI also participates in a number of interlaboratory performance evaluation studies which involve analysis of samples with concentrations of analytes that are known to the sponsoring organization, but unknown to the laboratory. Inorganics, pesticide/herbicides, trihalomethanes, volatile organic compounds, semivolatile organic compounds, and traditional wet chemistry analyses are analyzed by LLI for studies conducted by the USEPA and

the New York Department of Health. LLI has participated in the USEPA Contract Laboratory Program which provides laboratory analysis in support of the Superfund program. Part of maintaining this contract includes analysis of quarterly blind samples. Representative results from some of these studies are attached to this section.

REGION 3
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR 08 1 FY 93

LABORATORY: Lancaster Laboratories (PA)
PERFORMANCE: ACCEPTABLE - No Response Required
RANK: Above = 0 Same = 3 Below = 38

% SCORE: 100
REPORT DATE: 12/24/92
MATRIX: WATER

COMPOUND	TOLERANCE INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-ONT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
TCL VOLATILE										
CHLOROMETHANE	35	71	29	91	51		2	1	58	59
1,1-DICHLOROETHANE	NU	NU	NU	NU	11		0	0	59	59
CHLOROFORM	61	75	59	83	71		1	0	59	59
2-BUTANONE	71	110	66	110	110		15	2	57	59
CIS-1,3-DICHLOROPROPENE	66	87	63	98	89	S	3	1	58	59
BROMOFORM	57	74	54	77	68		8	0	59	59
2-HEXANONE	110	250	92	270	210		3	0	59	59
1,1,2,2-TETRACHLOROETHANE	120	160	110	160	140		5	0	59	59
CHLOROBENZENE	36	41	34	44	39		3	0	59	59
STYRENE	160	200	150	210	180		3	0	59	59
XYLENES (TOTAL)	73	92	70	100	88		2	3	56	59
TCL SEMIVOLATILE										
PHENOL	17	28	16	29	24		4	1	58	59
BIS(2-CHLOROETHYL)ETHER	32	46	30	54	42		3	0	59	59
4-METHYLPHENOL	23	34	21	40	29		6	0	59	59
HEXACHLOROETHANE	33	60	28	76	47		0	0	59	59
2,4-DIMETHYLPHENOL	17	30	15	38	23		6	2	57	59
BIS(2-CHLOROETHOXY)METHANE	20	25	19	28	24		11	0	59	59
1,2,4-TRICHLOROBENZENE	28	43	26	51	38		2	0	59	59
HEXACHLOROCYCLOPENTADIENE	NU	NU	NU	NU	10	U	0	31	28	59
2,4,6-TRICHLOROPHENOL	21	31	20	32	28		7	0	59	59
4-NITROPHENOL	41	64	38	67	63		11	1	58	59
4-BROMOPHENYL PHENYL ETHER	13	22	12	24	20		0	0	59	59
HEXACHLOROBENZENE	36	44	32	49	40		5	0	59	59
ANTHRACENE	NU	NU	NU	NU	10		0	0	59	59
PYRENE	74	140	65	180	120		3	0	59	59
BUTYL BENZYL PHTHALATE	38	63	35	67	53		9	0	59	59
BENZO(A)PYRENE	25	43	22	52	35		5	0	59	59
TCL PESTICIDES										
ALPHA-BHC	0.16	0.22	0.16	0.23	0.19		10	1	58	59
BETA-BHC	0.16	0.24	0.14	0.26	0.23		4	4	55	59
GAMMA-BHC (LINDANE)	0.15	0.22	0.14	0.23	0.2		6	0	59	59
HEPTACHLOR	0.29	0.43	0.27	0.45	0.34		8	1	58	59
ALDRIN	0.12	0.2	0.11	0.21	0.16		5	0	59	59
HEPTACHLOR EPOXIDE	0.31	0.43	0.29	0.44	0.35		7	1	58	59
ENDOSULFAN I	0.21	0.38	0.19	0.48	0.31		4	1	58	59
ENDOSULFAN II	0.43	0.7	0.39	0.84	0.63		2	1	58	59
ENDOSULFAN SULFATE	0.82	1.3	0.74	1.4	1.2		4	1	58	59
4,4'-DDT	0.95	1.5	0.87	1.5	1.4		6	0	59	59
ENDRIN KETONE	0.68	1.1	0.62	1.1	0.83		6	1	58	59
NON-TCL VOLATILE										
EPICHLOROHYDRIN					0	NR		59	0	59

REGION 3
ORGANIC PERFORMANCE EVALUATION SAMPLE
INDIVIDUAL LABORATORY SUMMARY REPORT
FOR QB 1 FY 93

LABORATORY: Lancaster Laboratories (PA)
PERFORMANCE: ACCEPTABLE - No Response Required
RANK: Above = 0 Same = 3 Below = 38

% SCORE: 100
REPORT DATE: 12/24/92
MATRIX: WATER

COMPOUND	TOLERANCE INTERVALS WARNING LOWER	WARNING UPPER	ACTION LOWER	ACTION UPPER	LABORATORY DATA CONC	Q	#LABS MIS-ONT	PROGRAM DATA #LABS NOT-ID	#LABS ID-CPD	TOTAL #LABS
PROPANE,1,2-DIBROMO-3-CHLORO-					12			23	36	59
TOLUENE,2-CHLORO-					69			7	52	59
NON-TCL SEMIVOLATILE										
4,4'-DDT					44			15	44	59
TCL VOLATILE (Contaminants)										
ACETONE					6			33	26	59
TRICHLOROETHENE					1			28	31	59
TCL PESTICIDES (Contaminants)										
4,4'-DDE					0.011			49	10	59
NON-TCL VOLATILE (Contaminants)										
2-PROPANOL					140			23	36	59
NON-TCL SEMIVOLATILE (Contaminants)										
UNKNOWN					2			37	22	59

OF TCL COMPOUNDS NOT-IDENTIFIED: 0
OF TCL COMPOUNDS MIS-QUANTIFIED: 0
OF TCL CONTAMINANTS: 0

OF NON-TCL COMPOUNDS NOT-IDENTIFIED: 0
OF NON-TCL CONTAMINANTS: 0

Program Summary Data (cont.):

Header	Definition
# LABS NOT-ID:	The number of CLP contractors who did not identify a TCL or non-TCL compound added to the PEM.
# LABS ID-CPD:	The number of CLP contractors who identified a TCL or non-TCL compound in the PEM.
TOTAL # LABS:	The number of CLP contractors who analyzed the PEM.
ILSR CODES:	The following codes are used on the ILSR.

U -- Compound analyzed for but not detected.

& -- Compound not identified -- points deducted for identification.

X -- Compound correctly identified but the reported value is not within the action limit -- points deducted for quantification.

$ -- The reported value for the compound is not within the warning limit but is within the action limit -- points not deducted.

C -- Contaminant -- points deducted.

CO -- Contaminant which may have been introduced during preparation of the PEM or during shipment -- points not deducted.

NS -- Data required but not submitted -- points deducted.

NR -- Data not required.

NU -- Data not used; insufficient amount of usable data for scoring submitted by the contractors.

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

Lancaster Laboratories, Inc.
7176562301 LANCASTER, PA cdo

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	80.5		76.3	62.6- 93.2	ACCEPTABLE
ANTIMONY	2	3.15		4.69	3.20- 6.10	NOT ACCEPTABLE
ARSENIC	1	70.0		70.2	58.2- 80.2	ACCEPTABLE
BARIUM	2	686.		681	579- 783	ACCEPTABLE
BERYLLIUM	1	3.42		3.27	2.78- 3.76	ACCEPTABLE
BORON	2	763.		720	652- 818	ACCEPTABLE
CADMIUM	1	12.8		12.8	10.2- 15.4	ACCEPTABLE
CHROMIUM	1	82.1		81.6	69.4- 93.8	ACCEPTABLE
COPPER	1	111.		110	99.0- 121	ACCEPTABLE
LEAD	1	10.9		12.4	8.68- 16.1	ACCEPTABLE
MANGANESE	1	16.2	**	17.0	13.6- 18.7	ACCEPTABLE
MERCURY	1	0.82		0.908	0.636- 1.18	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRACE METALS IN MICROGRAMS PER LITER:					
MOLYBDENUM	2	43.2	42.3	29.2- 58.3	ACCEPTABLE
NICKEL	1	67.1	68.0	57.8- 78.2	ACCEPTABLE
SELENIUM	1	21.5	22.9	18.3- 27.5	ACCEPTABLE
SILVER	2	108.	109	92.4- 123	ACCEPTABLE
THALLIUM	2	1.66	1.48	0.022- 2.26	ACCEPTABLE
VANADIUM	1	24.8	24.2	20.2- 27.5	ACCEPTABLE
ZINC	1	187.	179	161- 190	ACCEPTABLE
NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:					
NITRATE AS N	1	6.5	6.50	5.85- 7.15	ACCEPTABLE
NITRITE AS N	1	0.8	0.830	0.366-0.494	ACCEPTABLE
FLUORIDE	1	5.76	5.70	5.13- 6.27	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
INSECTICIDES IN MICROGRAMS PER LITER:						
ALACHLOR	5	1.30		2.50	1.38- 3.62	NOT ACCEPTABLE
ATRAZINE	5	5.03		9.39	5.16- 13.6	NOT ACCEPTABLE
CHLORDANE	3	2.58		5.16	2.84- 7.48	NOT ACCEPTABLE
ENDRIN	1	0.338		0.699	0.489-0.909	NOT ACCEPTABLE
HEPTACHLOR	4	0.526		1.48	0.792- 2.09	NOT ACCEPTABLE
HEPTACHLOR EPOXIDE	4	0.960		1.92	1.06- 2.78	NOT ACCEPTABLE
HEXACHLOROBENZENE	4	1.48	**	2.40	0.518- 2.95	ACCEPTABLE
LINDANE	1	0.401		0.971	0.519- 1.41	NOT ACCEPTABLE
METHOXYCHLOR	1	4.92		12.9	7.10- 18.7	NOT ACCEPTABLE
SIMAZINE	5	9.31		12.5	0.500- 22.5	ACCEPTABLE
TOXAPHENE	2	2.06		3.31	1.82- 4.80	ACCEPTABLE
CARBAMATES IN MICROGRAMS PER LITER:						
ALDICARB	1	8.79		8.84	5.56- 11.3	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT DATE: 7/ 1/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA007

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
CARBAMATES IN MICROGRAMS PER LITER:						
ALDICARB SULFONE	1	11.6		9.33	5.37- 13.6	ACCEPTABLE
ALDICARB SULFOXIDE	1	9.70		7.66	3.74- 10.7	ACCEPTABLE
CARBOFURAN	1	14.4		11.3	6.22- 16.4	ACCEPTABLE
METHOMYL	1	7.10		6.76	0.519- 8.30	ACCEPTABLE
OXAMYL (VYDATE)	1	6.42		5.72	D.L.- 11.0	ACCEPTABLE
HERBICIDES IN MICROGRAMS PER LITER:						
2,4-D	1	13.2		20.3	10.2- 30.4	ACCEPTABLE
2,4,5-TP (SILVEX)	1	5.09		8.66	4.33- 13.0	ACCEPTABLE
BENTAZON	2	13.5		12.7	D.L.- 21.8	ACCEPTABLE
DALAPON	2	32.2	**	22.3	D.L.- 31.5	NOT ACCEPTABLE
DICAMBA	2	10.6	**	9.43	0.778- 14.2	ACCEPTABLE
DINOSEB	2	14.5	**	18.3	D.L.- 26.1	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
HERBICIDES IN MICROGRAMS PER LITER:						
PENTACHLOROPHENOL	1	9.10		11.0	5.70-.17.1	ACCEPTABLE
PICLORAM	2	22.6	**	26.7	D.L.- 82.5	ACCEPTABLE
POLICHLORINATED BIPHENYLS IN MICROGRAMS PER LITER:						
DECACHLOROBIPHENYL	1	0.380		0.485	D.L.-0.890	ACCEPTABLE
PAH'S IN MICROGRAMS PER LITER:						
BENZO(A)PYRENE	1	0.160		0.202	D.L.-0.350	ACCEPTABLE
BENZO(B)FLUORANTHENE	1	0.048	**	0.060	D.L.-0.132	ACCEPTABLE
FLUORENE	1	1.70	**	1.93	0.859- 2.38	ACCEPTABLE
PHENANTHRENE	1	1.29	**	1.40	0.333- 2.03	ACCEPTABLE
ADIPATE/PHTHALATES IN MICROGRAMS PER LITER:						
BIS(2-ETHYLHEXYL)ADIPATE	1	7.61		8.10	D.L.- 13.6	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 2/ 7/91

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA027

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
ACIDIC/PHTHALATES IN MICROGRAMS PER LITER:						
BIS(2-ETHYLHEXYL) PHTHAL.	1	12.3		11.7	0.300- 21.2	ACCEPTABLE
BUTYLBENZYL PHTHALATE	1	7.99	**	6.30	D.L.- 9.71	ACCEPTABLE
DIETHYL PHTHALATE	1	8.01		8.20	D.L.- 7.82	ACCEPTABLE
DIMETHYL PHTHALATE	1	8.46	**	5.30	D.L.- 7.83	ACCEPTABLE
MISCELLANEOUS SOC'S IN MICROGRAMS PER LITER:						
DIQUAT	1	31.8		17.8	D.L.- 88.8	ACCEPTABLE
ENDOTHALL	1	82.7		69.0	D.L.- 235	ACCEPTABLE
GLYPHOSATE	1	176.		207	71.8- 812	ACCEPTABLE
TRIHALOMETHANES IN MICROGRAMS PER LITER:						
BROMODICHLOROMETHANE	1	38.8		36.9	29.5- 44.3	ACCEPTABLE
BROMOFORM	1	44.3		43.7	35.0- 52.8	ACCEPTABLE
CHLORODIBROMOMETHANE	1	29.8		31.8	25.8- 38.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.
D.L. STANDS FOR DETECTION LIMIT

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
TRIHALOMETHANES IN MICROGRAMS PER LITER:					
CHLOROFORM	1	48.1	48.4	38.7- 58.1	ACCEPTABLE
TOTAL TRIHALOMETHANE	1	156.0	160.8	129- 193	ACCEPTABLE
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
BENZENE	1	12.7	12.6	10.1- 15.1	ACCEPTABLE
CARBON TETRACHLORIDE	1	8.93	8.69	5.21- 12.2	ACCEPTABLE
CHLOROBENZENE	2	7.40	7.68	4.61- 10.8	ACCEPTABLE
1,2 DICHLOROBENZENE	2	14.4	16.3	13.0- 19.6	ACCEPTABLE
1,4-DICHLOROBENZENE	1	8.39	9.40	5.64- 13.2	ACCEPTABLE
1,2-DICHLOROETHANE	1	9.43	9.25	5.55- 12.9	ACCEPTABLE
1,1-DICHLOROETHYLENE	1	7.76	7.02	4.21- 9.83	ACCEPTABLE
C 1,2 DICHLOROETHYLENE	2	14.8	14.5	11.6- 17.4	ACCEPTABLE
T 1,2 DICHLOROETHYLENE	2	9.76	10.1	8.08- 12.1	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 2/ 1/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA007

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
1,2 DICHLOROPROPANE	2	12.2	12.7	10.2- 15.2	ACCEPTABLE
ETHYLBENZENE	2	8.72	9.27	5.56- 13.0	ACCEPTABLE
STYRENE	2	11.2	11.8	7.12- 13.7	ACCEPTABLE
TETRACHLOROETHYLENE	2	11.1	11.6	9.28- 13.9	ACCEPTABLE
TOLUENE	2	15.3	15.3	12.2- 18.4	ACCEPTABLE
1,1,1-TRICHLOROETHANE	1	13.7	13.0	10.4- 15.6	ACCEPTABLE
TRICHLOROETHYLENE	1	7.79	7.86	6.29- 10.4	ACCEPTABLE
VINYL CHLORIDE	1	10.9	11.9	7.14- 16.7	ACCEPTABLE
TOTAL XYLENES	2	12.5	13.2	10.6- 15.8	ACCEPTABLE
1,2DIBROMO3CHLOROPROPANE	4	2.385	2.65	1.59- 3.71	ACCEPTABLE
2,2-DICHLOROPROPANE	3	13.9	15.7	12.6- 18.8	ACCEPTABLE
1,1-DICHLOROPROPENE	3	6.30	7.31	4.39- 10.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA009

ANALYTES	SAMPLE NUMBER	REPORTED VALUE		TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:						
ETHYLENE DIBROMIDE (EDB)	1	0.631		0.637	0.382-0.892	ACCEPTABLE
FLUOROTRICHLOROMETHANE	3	12.8		12.6	10.1- 15.1	ACCEPTABLE
N-PROPYLBENZENE	3	11.2		11.7	9.36- 14.0	ACCEPTABLE
1,3,5-TRIMETHYLBENZENE	3	7.93		8.60	5.16- 12.0	ACCEPTABLE
MISCELLANEOUS ANALYTES:						
RESIDUAL FREE CHLORINE (MILLIGRAMS PER LITER)	1	0.285	**	0.360	0.160-0.851	ACCEPTABLE
TURBIDITY (NTU'S)	1	2.85		3.00	2.55- 3.57	ACCEPTABLE
TOTAL FILTERABLE RESIDUE (MILLIGRAMS PER LITER)	1	349.	**	406	283- 618	ACCEPTABLE
CALCIUM (MG. CACO3/L)	1	221.		230	218- 288	ACCEPTABLE
PH-UNITS	1	8.86		9.13	8.88- 9.38	ACCEPTABLE
ALKALINITY (MG. CACO3/L)	1	44.0	**	46.0	43.1- 52.0	ACCEPTABLE
CORROSIVITY (LANGELIER IND. AT 20C)	1	1.0		1.19	0.798- 1.49	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT DATE: 2/ 3/93

WATER SUPPLY STUDY NUMBER WS031

LABORATORY PA007

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATION
MISCELLANEOUS ANALYTES:					
SODIUM (MILLIGRAMS PER LITER)	1	19.6	21.1	19.2- 23.0	ACCEPTABLE
SULFATE (MILLIGRAMS PER LITER)	1	7.89	8.60	6.88- 10.6	ACCEPTABLE
TOTAL CYANIDE (MILLIGRAMS PER LITER)	1	0.217	0.270	0.202-0.337	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029 7176562301 LANCASTER, PA
Lancaster Laboratories, Inc.

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ALUMINUM	1	75.0	65.9	40.1- 100	47.7- 92.6	ACCEPTABLE
	2	567.	548	435- 645	462- 619	ACCEPTABLE
ARSENIC	1	142.	140	113- 168	120- 161	ACCEPTABLE
	2	15.3	15.0	11.1- 19.4	12.2- 18.4	ACCEPTABLE
BERYLLIUM	1	16.1	16.8	12.4- 21.4	13.5- 20.2	ACCEPTABLE
	2	602.	609	497- 714	525- 686	ACCEPTABLE
CADMIUM	1	15.9	16.8	12.2- 21.5	13.4- 20.4	ACCEPTABLE
	2	385.	380	319- 440	334- 425	ACCEPTABLE
COBALT	1	670.	651	566- 724	586- 703	ACCEPTABLE
	2	12.0	13.3	9.54- 17.0	10.5- 16.0	ACCEPTABLE
CHROMIUM	1	581.	620	516- 717	541- 691	ACCEPTABLE
	2	7.31	8.11	3.37- 12.3	4.49- 11.2	ACCEPTABLE
COPPER	1	5.10	6.33	3.68- 8.58	4.30- 7.97	ACCEPTABLE
	2	246.	241	213- 267	219- 260	ACCEPTABLE
IRON	1	717.	711	625- 800	647- 778	ACCEPTABLE
	2	84.7	83.0	68.2- 97.7	71.9- 94.0	ACCEPTABLE
MERCURY	1	7.71	8.12	6.26- 10.3	6.77- 9.81	ACCEPTABLE
	2	12.4	13.0	9.49- 16.9	10.4- 15.9	ACCEPTABLE
MANGANESE	1	343.	340	303- 373	312- 364	ACCEPTABLE
	2	34.4	30.6	25.7- 35.6	26.9- 34.3	CHECK FOR ERROR
NICKEL	1	35.8	31.7	25.5- 37.4	27.0- 35.9	ACCEPTABLE
	2	586.	569	498- 632	515- 616	ACCEPTABLE
LEAD	1	992.	959	831- 1080	862- 1050	ACCEPTABLE
	2	1610.	1500	1300- 1680	1350- 1630	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
SELENIUM	1	5.13	6.01	3.28- 8.06	3.88- 7.46	ACCEPTABLE
	2	142.	170	116- 203	127- 192	ACCEPTABLE
VANADIUM	1	485.	490	431- 541	445- 527	ACCEPTABLE
	2	38.3	38.2	30.6- 46.8	32.7- 44.7	ACCEPTABLE
ZINC	1	23.0	17.0	11.3- 22.9	12.8- 21.4	NOT ACCEPTABLE
	2	637.	612	536- 689	555- 670	ACCEPTABLE
ANTIMONY	3	20.6	22.0	12.4- 29.9	14.6- 27.6	ACCEPTABLE
	4	151.	146	96.6- 182	107- 171	ACCEPTABLE
SILVER	3	4.90	5.59	4.20- 7.01	4.56- 6.66	ACCEPTABLE
	4	12.3	14.0	11.1- 16.8	11.8- 16.1	ACCEPTABLE
THALLIUM	3	5.49	5.30	3.45- 7.01	3.92- 6.54	ACCEPTABLE
	4	84.8	76.2	58.3- 94.0	63.0- 89.4	ACCEPTABLE
MOLYBDENUM	3	49.5	49.0	38.0- 61.2	41.0- 58.2	ACCEPTABLE
	4	8.74	7.96	4.27- 12.2	5.31- 11.2	ACCEPTABLE
STRONTIUM	3	13.5	12.9	10.1- 15.4	10.8- 14.7	ACCEPTABLE
	4	63.4	61.9	50.3- 71.9	53.2- 69.1	ACCEPTABLE
TITANIUM	3	217.	214	185- 237	192- 230	ACCEPTABLE
	4	77.4	78.0	65.4- 88.2	68.5- 85.2	ACCEPTABLE
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	4.39	4.40	4.28- 4.48	4.31- 4.45	ACCEPTABLE
	4	7.93	8.00	7.76- 8.21	7.81- 8.16	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	189.	182	162- 199	167- 194	ACCEPTABLE
	2	807.	812	752- 862	769- 865	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
TDS AT 180 C	1	81.2	99.7	64.0- 148	73.9- 138	ACCEPTABLE
	2	407.	459	342- 572	370- 543	ACCEPTABLE
TOTAL HARDNESS (AS CACO3)	1	45.0	46.5	39.6- 51.0	41.0- 49.6	ACCEPTABLE
	2	211.	221	203- 237	207- 233	ACCEPTABLE
CALCIUM	1	14.3	15.0	12.8- 15.9	13.2- 15.5	ACCEPTABLE
	2	50.5	49.0	44.7- 54.1	45.9- 53.0	ACCEPTABLE
MAGNESIUM	1	2.52	2.48	2.07- 2.90	2.17- 2.79	ACCEPTABLE
	2	24.6	24.0	21.0- 26.9	21.8- 26.2	ACCEPTABLE
SODIUM	1	9.26	9.68	8.19- 11.3	8.59- 10.9	ACCEPTABLE
	2	48.1	48.4	42.4- 55.2	44.0- 53.6	ACCEPTABLE
POTASSIUM	1	6.28	6.30	5.16- 7.32	5.44- 7.05	ACCEPTABLE
	2	33.2	34.0	29.1- 38.9	30.3- 37.6	ACCEPTABLE
TOTAL ALKALINITY (AS CACO3)	1	9.83	9.70	6.65- 14.1	7.58- 13.2	ACCEPTABLE
	2	55.1	54.0	47.2- 62.0	49.0- 60.1	ACCEPTABLE
CHLORIDE	1	32.0	33.3	28.8- 36.0	29.7- 35.1	ACCEPTABLE
	2	150.	159	143- 171	146- 167	ACCEPTABLE
FLUORIDE	1	0.466	0.460	0.378-0.584	0.399-0.523	ACCEPTABLE
	2	1.89	1.80	1.55- 2.02	1.61- 1.96	ACCEPTABLE
SULFATE	1	15.0	17.0	13.2- 20.2	14.1- 19.4	ACCEPTABLE
	2	81.0	84.0	70.1- 93.9	73.1- 90.9	ACCEPTABLE
NUTRIENTS IN MILLIGRAMS PER LITER:						
AMMONIA-NITROGEN	1	1.3	0.960	0.658- 1.25	0.729- 1.18	NOT ACCEPTABLE
	2	0.8	0.350	0.185-0.535	0.227-0.493	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
NUTRIENTS IN MILLIGRAMS PER LITER:						
NITRATE-NITROGEN	1	0.16	0.170	.0849-0.256	0.105-0.235	ACCEPTABLE
	2	1.3	1.30	1.00- 1.59	1.07- 1.52	ACCEPTABLE
ORTHOPHOSPHATE	1	0.027	0.030	.0116-.0498	.0162-.0452	ACCEPTABLE
	2	0.710	0.670	0.555-0.779	0.582-0.752	ACCEPTABLE
KJELDAHL-NITROGEN	3	2.2	2.40	1.47- 3.36	1.69- 3.13	ACCEPTABLE
	4	0.4	0.490	.0120- 1.11	0.148-0.979	ACCEPTABLE
TOTAL PHOSPHORUS	3	6.29	7.02	5.20- 7.72	5.50- 7.42	ACCEPTABLE
	4	0.62	0.713	0.512-0.802	0.586-0.767	ACCEPTABLE
DEMANDS IN MILLIGRAMS PER LITER:						
COD	1	328.	304	240- 341	253- 328	ACCEPTABLE
	2	154.	157	122- 179	129- 172	ACCEPTABLE
TOC	1	120.	120	100- 142	105- 136	ACCEPTABLE
	2	63.	62.0	51.8- 73.6	54.6- 70.8	ACCEPTABLE
5-DAY BOD	1	219.	193	120- 266	138- 248	ACCEPTABLE
	2	116.	99.6	61.1- 138	70.7- 128	ACCEPTABLE
CARBONACEOUS BOD	1	206.	162	76.0- 258	101- 233	ACCEPTABLE
	2	110.	83.7	34.7- 133	48.2- 119	ACCEPTABLE
PCB'S IN MICROGRAMS PER LITER:						
PCB-AROCLOR 1248	2	1.88	1.76	0.538- 2.78	0.816- 2.46	ACCEPTABLE
PCB-AROCLOR 1254	1	2.44	2.37	1.41- 2.95	1.60- 2.76	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
PCB'S IN OIL IN MILLIGRAMS PER KILOGRAM:						
PCB IN OIL- 1016/1242	2	23.7	42.6	8.20- 60.7	14.9- 54.0	ACCEPTABLE
PCB IN OIL- 1254	1	32.8	35.2	12.2- 51.4	17.2- 46.4	ACCEPTABLE
PESTICIDES IN MICROGRAMS PER LITER:						
CHLORDANE	3	6.38	6.48	3.59- 8.25	4.19- 7.65	ACCEPTABLE
	4	1.53	1.43	0.764- 1.88	0.907- 1.74	ACCEPTABLE
ALDRIN	1	0.582	0.676	0.179-0.834	0.262-0.751	ACCEPTABLE
	2	.0948	0.126	.0254-0.176	.0446-0.157	ACCEPTABLE
DIELDRIN	1	0.690	0.617	0.309-0.892	0.384-0.817	ACCEPTABLE
	2	0.120	0.137	.0650-0.200	.0823-0.183	ACCEPTABLE
DDD	1	0.839	0.777	0.431- 1.05	0.510-0.973	ACCEPTABLE
	2	0.125	0.129	.0511-0.192	.0690-0.175	ACCEPTABLE
DDE	1	0.512	0.548	0.245-0.785	0.314-0.716	ACCEPTABLE
	2	.0491	0.087	.0352-0.124	.0465-0.112	ACCEPTABLE
DDT	1	0.729	0.674	0.353-0.856	0.416-0.792	ACCEPTABLE
	2	0.129	0.150	.0572-0.210	.0766-0.191	ACCEPTABLE
HEPTACHLOR	1	0.474	0.486	0.168-0.657	0.231-0.594	ACCEPTABLE
	2	0.110	0.129	.0346-0.190	.0545-0.170	ACCEPTABLE
HEPTACHLOR EPOXIDE	1	0.749	0.571	0.312-0.722	0.368-0.670	NOT ACCEPTABLE
	2	0.168	0.143	.0705-0.189	.0855-0.174	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: PA009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE HALOCARBONS IN MICROGRAMS PER LITER:						
1,2 DICHLOROETHANE	1	14.4	13.8	9.64- 18.6	10.8- 17.4	ACCEPTABLE
	2	60.1	58.5	40.8- 76.1	45.3- 71.6	ACCEPTABLE
CHLOROFORM	1	9.23	8.40	5.60- 11.2	6.32- 10.5	ACCEPTABLE
	2	41.0	38.3	26.1- 50.9	29.3- 47.8	ACCEPTABLE
1,1,1 TRICHLOROETHANE	1	13.8	12.6	7.58- 17.0	8.77- 15.8	ACCEPTABLE
	2	67.4	63.8	41.9- 83.7	47.2- 78.4	ACCEPTABLE
TRICHLOROETHENE	1	16.2	15.5	10.2- 20.0	11.5- 18.8	ACCEPTABLE
	2	55.3	53.3	36.1- 67.2	40.1- 63.3	ACCEPTABLE
CARBONTETRACHLORIDE	1	12.3	10.7	6.73- 14.8	7.76- 13.8	ACCEPTABLE
	2	58.0	54.5	34.2- 77.3	39.6- 71.9	ACCEPTABLE
TETRACHLOROETHENE	1	16.5	14.9	9.77- 19.5	11.0- 18.3	ACCEPTABLE
	2	50.4	46.2	30.5- 60.2	34.2- 56.5	ACCEPTABLE
BROMODICHLOROMETHANE	1	17.4	16.4	11.1- 21.3	12.4- 20.0	ACCEPTABLE
	2	66.0	62.9	43.6- 82.9	48.6- 77.9	ACCEPTABLE
DIBROMOCHLOROMETHANE	1	12.7	12.5	8.09- 16.6	9.17- 15.6	ACCEPTABLE
	2	44.8	45.4	28.8- 61.3	32.9- 57.2	ACCEPTABLE
BROMOFORM	1	15.9	16.3	7.67- 24.0	9.73- 21.9	ACCEPTABLE
	2	37.6	37.7	22.7- 52.3	26.4- 48.6	ACCEPTABLE
METHYLENE CHLORIDE	1	14.0	12.8	6.66- 19.0	8.22- 17.4	ACCEPTABLE
	2	73.5	65.6	43.6- 91.0	49.5- 85.0	ACCEPTABLE
CHLOROBENZENE	1	11.0	10.3	6.92- 13.5	7.76- 12.7	ACCEPTABLE
	2	58.4	57.2	39.7- 73.8	44.1- 69.5	ACCEPTABLE
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
BENZENE	1	44.0	43.9	30.0- 59.0	33.6- 55.4	ACCEPTABLE
	2	12.0	12.7	9.00- 17.0	10.0- 16.0	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT DATE: 12/22/92

WATER POLLUTION STUDY NUMBER WP029

LABORATORY: P1009

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
VOLATILE AROMATICS IN MICROGRAMS PER LITER:						
ETHYLBENZENE	1	46.3	47.7	31.4- 64.3	35.6- 60.2	ACCEPTABLE
	2	9.66	9.71	6.19- 13.0	7.06- 12.2	ACCEPTABLE
TOLUENE	1	59.1	58.7	42.1- 76.7	46.5- 72.3	ACCEPTABLE
	2	16.7	17.2	12.0- 22.0	13.3- 20.8	ACCEPTABLE
1,2-DICHLOROBENZENE	1	55.4	57.1	36.9- 78.5	41.7- 69.7	ACCEPTABLE
	2	14.9	15.4	10.6- 19.7	11.8- 18.5	ACCEPTABLE
1,3-DICHLOROBENZENE	1	46.9	47.0	32.1- 59.6	35.6- 56.2	ACCEPTABLE
	2	15.9	16.5	11.4- 21.2	12.6- 19.9	ACCEPTABLE
1,4-DICHLOROBENZENE	1	48.8	50.0	30.3- 67.8	35.1- 63.0	ACCEPTABLE
	2	13.0	13.3	9.91- 17.8	10.9- 16.8	ACCEPTABLE
MISCELLANEOUS PARAMETERS:						
TOTAL CYANIDE	1	0.032	0.040	.0108-.0592	.0169-.0531	ACCEPTABLE
(IN MG/L)	2	0.292	0.350	0.206-0.461	0.239-0.429	ACCEPTABLE
NON-FILTERABLE RESIDUE	1	15.4	18.0	9.17- 19.8	10.5- 18.4	ACCEPTABLE
(IN MG/L)	2	82.6	93.0	71.8- 98.0	75.1- 94.8	ACCEPTABLE
OIL AND GREASE	1	65.1	72.0	43.7- 84.3	48.8- 79.2	ACCEPTABLE
(IN MG/L)	2	28.1	30.0	17.1- 36.7	19.6- 34.2	ACCEPTABLE
TOTAL PHENOLICS	1	0.811	1.06	0.572- 1.55	0.697- 1.42	ACCEPTABLE
(IN MG/L)	2	0.389	0.488	0.258-0.709	0.316-0.651	ACCEPTABLE
TOTAL RESIDUAL CHLORINE	1	3.55	4.80	3.44- 5.46	3.71- 5.20	CHECK FOR ERROR
(IN MG/L)	2	1.39	1.80	1.23- 2.12	1.35- 2.00	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

13. Preventive Maintenance

In order to ensure timely production of data, Lancaster Laboratories, Inc. (LLI) schedules routine preventive maintenance of instruments based on manufacturer's recommendations. Maintenance of the laboratory instruments is the responsibility of the technical group using the equipment in conjunction with our in-house equipment maintenance group. A schedule of routinely performed instrument maintenance tasks is attached as Table 13-1. All preventive maintenance, as well as maintenance performed as corrective action, is recorded in instrument logs.

Critical spare parts are kept in supply at the laboratory by the equipment maintenance group. Most items not kept in stock at the laboratory are available through overnight delivery from the manufacturer. In addition, LLI maintains multiple numbers of most of the critical instruments used in our laboratory operations. A recent equipment inventory may be found in the Qualification Manual. Because we are a large laboratory with redundant capacity, the problems of instrument downtime are minimized.

Table 13-1

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS	Change septum	Weekly or AN*
	Check fans	Monthly
	Check cool flow	Monthly
	Clean source	Bimonthly or AN
	Change oil in vacuum pump	Semiannually
	Change oil in turbo pump	Semiannually
GC Volatiles	Check propanol level	Semiweekly or AN
	Check all flows	Prior to calib. or AN
	Conductivity Det. Maint.	AN
	Clean cell	AN
	Change reaction tube	AN
	Change Teflon line	AN
	Change resin	AN
	Replace trap	AN
	Column Maintenance	AN
	Change PID Lamp	AN
HPLC	Pump lubrication	Annually
	Check pump seals	Annually
	Check valves cleaned or rebuilt	AN
	Detector Maintenance	AN
	Bulb replacement and adjustment	
	Flow cell cleaning	
	Routine column maintenance	AN
	Replace Teflon lines	AN
	Autosampler septa replacement	AN
	In-line filter sonication/ cleaning	AN
	System Pasivation	AN
	PCRS pump lubrication	AN

Table 13-1

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
Technicon Autoanalyzer	Clean sample probe	Weekly
	Clean proportioning pump	Weekly
	Inspect pump tubing, replace if worn	AN
	Oil proportioning pump	Monthly
	Inspect silicone tubing, replace if worn	Monthly
	Clean optical system	Monthly
	Clean wash receptacles	Monthly
	Inspect condition of distillation head	Monthly
	Oil distillation head	Bimonthly
	Oil chain and bearings	Quarterly
Spectrometer	Check absorbance	Monthly
	Check wavelength	Quarterly
Ion Chromatograph	Check guard column filters	Bimonthly
	Check bed supports	Bimonthly
	Check void space	Bimonthly
	Clean columns	Bimonthly
	Check anal. pump for leaks	Bimonthly
	Check DX-100 interior for leaks and spills	Bimonthly
	Oil sample pump and check seals	Every 2 months
	Check air lines/tubing for crimping and/or discoloration	Every 2 months
	Clean check valve	Every 3 months
	Check conductivity cell	AN
Alpkem Autoanalyzer	Wipe platens/rollers with methanol	Weekly
	Rinse reservoirs with deionized water	Monthly
	Rinse distillation head	Monthly
	Replace sampler/ transmission tubing	Biannual
	Clean sampler probe	AN
	Rinse flowcell with methanol	AN
	Replace pump tubes	AN

Table 13-1

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
Total Organic Carbon Analyzer	Check IR zero	Weekly
	Check for leaks	Weekly
	Check acid pump calib.	Bimonthly
	Check persulfate pump calibration	Bimonthly
	Inspect 6-port rotary valve	Monthly
	Inspect sample pump head	Monthly
	Wash molecular sieve	Quarterly
	Check sample loop calibration	Monthly
	Clean gas permeation tube	Quarterly
	Inspect digestion vessel o-rings	6 Months
	Check activated carbon scrubber	6 Months
	Dust back and clean circuit boards	6 Months
	Check IR cell	Annually
Oxygen Meter	Check membrane	AN
pH Meter	Check level of buffer solution	Weekly

* AN means as needed. Any of these items may be performed more frequently if response during operation indicates this is necessary.

14. Specific Routine Procedures Used to Assess Data Precision, Accuracy and Completeness

Precision - Precision refers to the reproducibility of a method when it is repeated on a second aliquot of the same sample. The degree of agreement is expressed as the Relative Percent Difference (RPD). The RPD will be calculated according to the following equation:

$$RPD = \frac{D_2 - D_1}{(D_1 + D_2) / 2} \times 100$$

Where: D_1 = First sample value

D_2 = Second sample value (Duplicate)

Duplicates will be run on at least 5% of the samples. Acceptance criteria shall be based on statistical evaluation of past lab data. (See Section No. 11.) All Quality Control sample results are entered into the computer and compared with acceptance limits. In addition, there is a monthly review of values on the computer QC system. Data obtained from quality control samples is entered onto our computer system which charts the data, and calculates a mean and standard deviation on a monthly basis. The Quality Assurance Department then reviews this data for trends which may indicate analytical problems. The control charts are graphical methods for monitoring precision and bias over time.

Accuracy - Accuracy refers to the agreement between the amount of a compound measured by the test method and the amount actually present. Accuracy is usually expressed as a percent Recovery (R). Recoveries will be calculated according to the following equations:

$$Surrogate\ Recovery = \frac{Qd}{Qa} \times 100$$

Where: Qd = quantity determined by analysis

Qa = quantity added to sample

$$Matrix\ Spike\ Recovery = \frac{SSR - SR}{SA} \times 100$$

Where: SSR = Spiked Sample Results

SR = Sample Results

SA = Spike added

$$Laboratory\ Control\ Sample\ Recovery = \frac{LCS\ Found}{LCS\ True} \times 100$$

Surrogate standards are added to each sample analyzed for organics. Spikes and Laboratory Control Samples will be run on at least 5% of the samples (each batch or SDG, $\leq$20 samples). Refer to Section 11 for acceptance criteria for accuracy. The computer is programmed to compare the individual values with the acceptance limits and inform the analyst if the results meet specification. If the results are not within the acceptance criteria, corrective action suitable to the situation will be taken. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with documentation of any QC problems in the Case Narrative.

Commercial quality control materials are run at least quarterly to ensure accuracy of the analytical procedure. Repetitive analysis of a reference material will also yield precision data. Accuracy information determined from reference materials is valuable because variables specific to sample matrix are eliminated.

The QC program is capable of charting data for surrogates, spikes, control materials and reference materials. The Quality Assurance Department reviews these charts for any indication of possible problems (i.e., shift in the mean and standard deviation).

Completeness - Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. The objective is analysis of all samples submitted intact, and to ensure that sufficient sample weight/volume is available should the initial analysis not meet acceptance criteria. The laboratory's Sample Management System will assign a unique identification number to the sample which tracks and controls movement of samples from the time of receipt until disposal. All data generated will be recorded referencing the corresponding sample identification number. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. This information will include, but is not limited to, summaries of QC data and sample results, chromatograms, spectra, and instrument tune and calibration data. Additional information will be stored in the laboratory's archives, both hard copy and magnetic tape.

$$Completeness = \frac{Number\ of\ valid\ measurements}{Total\ measurements\ needed} \times 100$$

Method Detection Limit - It is important to ascertain the limit of quantitation that can be achieved by a given method, particularly when the method is commonly used to determine trace levels of analyte. The Environmental Protection Agency has set forth one method for determining method detection limits (MDLs) from which limits of quantitation (LOQs) can be extrapolated.

MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,1-\alpha=0.99)} \times s$$

Where: MDL = method detection limit

s = standard deviation of the replicate analyses

$t_{(n-1,1-\alpha=0.99)}$ = students' t-value for a one-sided 99% confidence level and a standard deviation estimate with with n-1 degrees of freedom

Definitions:

Method Detection Limit (MDL): The method detection limit is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is determined from analysis of a sample in a given matrix containing the analyte.

Limit of Quantitation (LOQ): The limit of quantitation is defined as the level above which quantitative results may be obtained with a specified degree of confidence. The EPA recommends setting quantitation limits at a value of five-to-ten times the MDL.

A list of MDLs and LOQs determined for each sample matrix type will be kept on file in the QA department. MDLs will be verified on an annual basis.

15. Corrective Action

Whenever any of the data generated falls outside of the established acceptance criteria outlined for instrument tune and calibration (Section 8) and Internal QC (Section 11), the cause of this irregularity must be investigated, corrected, and documented. The documentation will be used to prevent a recurrence of the problem and to inform management of the situation.

If the results are not within acceptance criteria, the appropriate corrective action will be initiated. This may include, but is not limited to, checking calculation and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with a comment stating the observed deviation.

A Standard Operating Procedure is in place which outlines the procedures to be followed when quality control data for an analysis falls outside of previously established acceptance limits. All QC data must be entered onto the computerized QC system promptly after its generation and daily "out-of-spec" data is reported via this system. Any data outside the acceptance criteria will be reviewed by the Quality Assurance Department. Where appropriate, the Quality Assurance Department will place outliers in one of three categories:

A. Marginal Outlier
   Data that are outside the 95% confidence interval but within the 99% confidence interval. This category may also be used for QC samples subject to matrix interferences or sample inhomogeneity.

B. Outlier

Data outside the 99% confidence interval and/or observable trends such as a shift in mean and standard deviation.

C. Extreme Outlier

Such data would indicate the system is out of control and no results should be reported to clients; an example would be more than one reference or control falling outside the 99% confidence interval.

The daily out-of-spec reports are then distributed to Group Leaders or their QC Coordinator who will check all supporting data and document their findings and any corrective action taken. Documentation of QC Data will be filed in the departmental QC notebook. In the case of Outliers or Extreme Outliers the Quality Assurance Department may issue a formal request for investigation and corrective action (see sample form that follows). The Quality Assurance Department is responsible for initiating the corrective actions, insuring that the actions are taken in a timely manner, and that the desired results are produced. The QA Department will circulate all completed Investigation & Corrective Action forms to the appropriate manager.

The Quality Assurance Department is also responsible for conducting periodic audits which ensure compliance with laboratory SOPs and assist in identifying and correcting any deficiencies. These audits may entail observation as procedures are carried out or a review of records to demonstrate traceability and compliance with all documented record keeping procedures. The QA Department will then issue a written report which summarizes the audit. The technical centers must respond in writing to the audit report within 30 days of report receipt. The response will

address the corrective action that needs to be taken along with an expected completion date. Audit results and the corresponding response are communicated to laboratory personnel and management. Follow-up audits verify that proper corrective action has been taken for the identified discrepancy.

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601-5994

No. _____

INVESTIGATION AND CORRECTIVE ACTION REPORT

Part I Description of problem

1. Date
2. LLI sample number(s) involved
3. Nature of QA outlier

4. _____ Check if investigation must be complete before reporting further data to clients

Initiated by: _____

Part II (Attach separate sheet if needed)

1. Steps taken to investigate outlier:

2. Explanation of probable cause of outlier:

3. Steps taken to prevent future occurrence:

4. Besides the sample(s) listed above, would data sent to any clients be be affected by this outlier? If yes, explain.

5. Signed: _____ Date: _____

Return by: _____

16. Quality Assurance Reports to Management

Reports of quality status from the Quality Assurance Department to management are made frequently and in various forms. All results from internal or external performance evaluation samples are circulated to management. A report of each audit performed is prepared and copied to management. Monthly summaries of data obtained from analysis of quality control check samples are generated via the computerized sample management system. These summaries include mean and standard deviation to aid in assessment of data accuracy and precision. Forms summarizing problems which require investigation and corrective action are completed by Group Leaders and circulated to management. Through these channels, laboratory management is kept apprised of QA/QC activities.

Any problems or unusual observations that occur during the analysis of samples for a specific project will be listed on the laboratory report and/or in the case narrative delivered with the data package. The items often discussed in this manner include samples with surrogate recovery outside of the acceptance criteria and samples with matrix problems requiring dilution and causing increased detection limits. Where applicable, any corrective action attempted or performed to address the problem will also be presented.

The laboratory will contact the client for direction regarding major problems such as samples listed on the chain of custody but missing from the shipping container, samples which arrive broken or are accidentally broken in the laboratory, and samples with severe matrix problems. The client will be contacted if it is necessary to change any item in the original project plan.

Appendix A

Example Reporting Forms

Data Package Content

- Title Page
- Sample Reference
- Table of Contents
- Chain of Custody
- Laboratory Chronicle
- Methodology/Reference Summary
- Laboratory Analysis Reports
- Per Parameter:
  - Case Narrative
  - Quality Control Summary
    - Tune
    - Surrogate Recovery
    - Method Blank
    - Matrix Spike/Matrix Spike Duplicate
    - Duplicate[2]
    - Standard Addition[2]
    - Serial Dilution[2]
    - Laboratory Control Sample Recovery (if applicable)
    - Interference Check[2]
    - Internal Standard[1]
  - Sample Data
    - Sample Result Summary and LOQs
    - Sample Chromatograms
    - Quantitation Reports
    - Mass Spectra[1]
    - Library Searches[1] (if applicable)
    - Confirmatory Chromatogram[3]
    - Confirmatory Quantitation Report[3]

Standards Data Package
- Initial Calibration Summary Forms
- Initial Calibration Data
- Continuing Calibration Summary Forms
- Continuing Calibration Data
- Chromatograms and Quantitation Reports of Standards
- Calibration Data for Confirmation Columns[3]
- Calibration Curve (When quantitating against init. calib.)
- ICAP Interference Table[2]

Raw QC Data
- BFB/DFTPP Spectra and Mass Listing[1]
- Method Blank Chromatograms, Quantitation Reports, Mass Spectra[1] (GC/MS)
- Matrix Spike/Matrix Spike Duplicate Chromatograms and Quant.
- Duplicate Data Printouts[2]
- Standard Addition Data[2]
- Serial Dilution Data[2]
- Laboratory Control Sample (if applicable)
- Copy of Instrument Run Log

Extraction/Digestion Logs

Gel Permeation Chromatography (GPC), if applicable
- All Peaks Identified
- % Resolution Calculations

[1] GC/MS only
[2] Inorganics only
[3] GC only (if applicable)

* Amount of documentation is dependent upon client request.

Lancaster Laboratories
Where quality is a science.

14:10:24 358848 REP
ASR000 D 2 1
00649 0

Smith Engineering, Inc.
1000 Any Street
Lancaster, PA 17601-5994

LLI Sample No. WW 1892665
Date Reported 11/12/92
Date Submitted 11/11/92
Discard Date 11/20/92
Collected 11/11/92 by MLH
Time Collected 1000
P.O.
Rel.

Water Sample from Monitoring Well #5

ANALYSIS	RESULT AS RECEIVED		LIMIT OF QUANTITATION	LAB CODE
Pesticides/PCB's		attached		017824000
Nitrite Nitrogen	1.0	mg/l	0.02	021900800
Nitrate Nitrogen	N.D.	mg/l	0.05	022000700
Ammonia Nitrogen	6.5	mg/l	0.1	022202700
Ortho-Phosphate as P	N.D.	mg/l	0.01	022601500
Lead	0.05 J	mg/l	0.1	025501400
Total Organic Carbon	1.2	mg/l	0.5	027302500
The Total Organic Carbon (TOC) result reported above was determined by measuring total carbon by a persulfate digestion/infrared detection method on an acidified sample which has been purged of inorganic carbon using nitrogen. It represents "non-purgeable TOC".				
Total Coliform	N.D.	/100ml	2.2	030101500
This sample is SAFE for drinking or swimming according to bacteriological standards established by the U.S. Public Health Service and the Environmental Protection Agency (EPA).				
Trichloroethene	5.4	ug/l	0.5	041800500

1 COPY TO Kathy DiNunzio
1 COPY TO Smith Engineering, Inc. ATTN: Mr. John Smith

Questions? Contact Environmental Client Services at (717) 656-2301
611 00649 90.00 044600

Respectfully Submitted
Lancaster Laboratories, Inc.
Reviewed and Approved by:

David Evans, B.S.
Group Leader/Inst. Water Qlty

Lancaster Laboratories Inc.
2425 New Holland Pike
Lancaster PA 17601-5994
717-656-2301

See reverse side for explanation of symbols and abbreviations.

Lancaster Laboratories
Where quality is a science.

14:10:28 358848 REP
ASR000 D 2 1
00649 0

Smith Engineering, Inc.
1000 Any Street
Lancaster, PA 17601-5994

Water Sample from Monitoring Well #5

LLI Sample No. WW 1892665
Date Reported 11/12/92
Date Submitted 11/11/92
Discard Date 11/20/92
Collected 11/11/92 by MLH
Time Collected 1000
P.O.
Rel.

Pesticides/PCB's	RESULT AS RECEIVED	LIMIT OF QUANTITATION	LAB CODE
Alpha BHC	0.008 J ug/l	0.01	190200000N
Beta BHC	0.007 J ug/l	0.01	190300000N
Gamma BHC - Lindane	0.05 ug/l	0.01	045300000N
Delta BHC	N.D. ug/l	0.01	190400000N
Heptachlor	N.D. ug/l	0.01	045400000N
Aldrin	N.D. ug/l	0.01	045500000N
Heptachlor Epoxide	N.D. ug/l	0.01	190500000N
DDE	2.00 ug/l	0.01	190600000N
DDD	N.D. ug/l	0.01	190700000N
DDT	N.D. ug/l	0.01	047800000N
Dieldrin	N.D. ug/l	0.01	046900000N
Endrin	N.D. ug/l	0.01	047700000N
Chlordane	N.D. ug/l	0.3	190800000N
Toxaphene	2.0 J ug/l	4.	190900000N
Endosulfan I	N.D. ug/l	0.01	191000000N
Endosulfan II	N.D. ug/l	0.01	191100000N
Endosulfan Sulfate	N.D. ug/l	0.03	191200000N
Endrin Aldehyde	N.D. ug/l	0.1	063800000N
PCB-1016	N.D. ug/l	1.	191300000N
PCB-1221	N.D. ug/l	1.	191400000N
PCB-1232	N.D. ug/l	1.	191500000N
PCB-1242	N.D. ug/l	1.	191600000N
PCB-1248	N.D. ug/l	1.	191700000N
PCB-1254	N.D. ug/l	1.	191800000N
PCB-1260	N.D. ug/l	1.	191900000N

1 COPY TO Kathy DiNunzio
1 COPY TO Smith Engineering, Inc. ATTN: Mr. John Smith

Questions? Contact Environmental Client Services at (717) 656-2301

Respectfully Submitted
Lancaster Laboratories, Inc.
Reviewed and Approved by:

Jenifer E. Hess, B.S.
Group Leader Pesticides/PCBs

Lancaster Laboratories, Inc.
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2301

See reverse side for explanation of symbols and abbreviations.

Lancaster Laboratories
Where quality is a science.

14:13:41 358845
ASR000 D 2 1
00649 0

Smith Engineering, Inc.
1000 Any Street
Lancaster, PA 17601-5994

LLI Sample No. WW 1892655
Date Reported 11/11/92
Date Submitted 11/11/92
Discard Date 11/19/92
Collected 11/11/92 by MLH
Time Collected 1000
P.O.
Rel.

Water Sample from Monitoring Well #5

ANALYSIS	RESULT AS RECEIVED		LIMIT OF QUANTITATION	LAB CODE
Pesticides/PCB's		attached		017824000
Nitrite Nitrogen	11.	mg/l	0.02	021900800
Nitrate Nitrogen	< 0.05	mg/l	0.05	022000700
Ammonia Nitrogen	4.1	mg/l	0.1	022202700
Ortho-Phosphate as P	2.1	mg/l	0.01	022601500
Lead	0.3	mg/l	0.1	025501400
Total Organic Carbon	8.5	mg/l	0.5	027302500
The Total Organic Carbon (TOC) result reported above was determined by measuring total carbon by a persulfate digestion/infrared detection method on an acidified sample which has been purged of inorganic carbon using nitrogen. It represents "non-purgeable TOC".				
Total Coliform	< 2.2	/100ml	2.2	030101500
This sample is SAFE for drinking or swimming according to bacteriological standards established by the U.S. Public Health Service and the Environmental Protection Agency (EPA).				
Trichloroethene	12.	ug/l	0.5	041800500

1 COPY TO Kathy DiNunzio
1 COPY TO Smith Engineering, Inc. ATTN: Mr. John Smith

Questions? Contact Environmental Client Services at (717) 656-2301
611 00649 90.00 044600

Respectfully Submitted
Lancaster Laboratories, Inc.
Reviewed and Approved by:

David Evans, B.S.
Group Leader/Inst. Water Qlty

Lancaster Laboratories, Inc.
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2301

See reverse side for explanation of symbols and abbreviations

Lancaster Laboratories
Where quality is a science.

14:13:43 358845
ASR000 D 2 1
00649 0

Smith Engineering, Inc.
1000 Any Street
Lancaster, PA 17601-5994

Water Sample from Monitoring Well #5

LLI Sample No. WW 1892655
Date Reported 11/11/92
Date Submitted 11/11/92
Discard Date 11/19/92
Collected 11/11/92 by MLH
Time Collected 1000
P.O.
Rel.

Pesticides/PCB's	RESULT AS RECEIVED		LIMIT OF QUANTITATION	LAB CODE
Alpha BHC	< 0.01	ug/l	0.01	190200000N
Beta BHC	< 0.01	ug/l	0.01	190300000N
Gamma BHC - Lindane	< 0.01	ug/l	0.01	045300000N
Delta BHC	< 0.01	ug/l	0.01	190400000N
Heptachlor	< 0.01	ug/l	0.01	045400000N
Aldrin	< 0.01	ug/l	0.01	045500000N
Heptachlor Epoxide	< 0.01	ug/l	0.01	190500000N
DDE	< 0.01	ug/l	0.01	190600000N
DDD	< 0.01	ug/l	0.01	190700000N
DDT	< 0.01	ug/l	0.01	047800000N
Dieldrin	< 0.01	ug/l	0.01	046900000N
Endrin	< 0.01	ug/l	0.01	047700000N
Chlordane	< 0.3	ug/l	0.3	190800000N
Toxaphene	< 4.	ug/l	4.	190900000N
Endosulfan I	< 0.01	ug/l	0.01	191000000N
Endosulfan II	< 0.01	ug/l	0.01	191100000N
Endosulfan Sulfate	< 0.03	ug/l	0.03	191200000N
Endrin Aldehyde	< 0.1	ug/l	0.1	063800000N
PCB-1016	< 1.	ug/l	1.	191300000N
PCB-1221	< 1.	ug/l	1.	191400000N
PCB-1232	< 1.	ug/l	1.	191500000N
PCB-1242	< 1.	ug/l	1.	191600000N
PCB-1248	< 1.	ug/l	1.	191700000N
PCB-1254	< 1.	ug/l	1.	191800000N
PCB-1260	< 1.	ug/l	1.	191900000N

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Questions? Contact Environmental Client Services at (717) 656-2301

Respectfully Submitted
Lancaster Laboratories, Inc.
Reviewed and Approved by:

Jenifer E. Hess, B.S.
Group Leader Pesticides/PCBs

Lancaster Laboratories, Inc.
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2301

See reverse side for explanation of symbols and abbreviations.

5B

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

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Lab File ID: >U1450 DFTPP Injection Date: 06/12/92

Instrument ID: HP02861 DFTPP Injection Time: 07:12

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	46.9
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	60.7
70	Less than 2.0% of mass 69	.2 (.4)1
127	40.0 - 60.0% of mass 198	41.6
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.
199	5.0 to 9.0% of mass 198	6.6
275	10.0 - 30.0% of mass 198	21.4
365	Greater than 1.00% of mass 198	2.69
441	Present, but less than mass 443	10.0
442	Greater than 40.0% of mass 198	64.7
443	17.0 - 23.0% of mass 442	12.8 (19.8)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD160	APP1572	>U1451	06/12/92	07:38
02	SSTD50	APP1572	>U1452	06/12/92	08:27
03	SSTD120	APP1572	>U1453	06/12/92	09:56
04	SSTD20	APP1572	>U1454	06/12/92	10:45
05	SSTD80	APP1572	>U1455	06/12/92	11:34
06	CL-6SRE	1825576RE	>F1450	06/12/92	12:58
07	1CL7SR	1826076	>F1451	06/12/92	13:47
08	SBLKWB1626	162WAB	>F1452	06/12/92	14:35
09	162WBLCS	162WBLCS	>F1453	06/12/92	15:24
10	162WBUS	162WBUS	>F1454	06/12/92	16:13
11	162WBMS	162WBMS	>F1455	06/12/92	17:02
12	162WBMSD	162WBMSD	>F1456	06/12/92	17:51
13	EQUPD	1825580	>F1457	06/12/92	18:40
14					
15					
16					
17					
18					
19					
20					
21					
22					

2C

WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01	SBLKWE1706	68	65	72	30	44	71		0
02	170WELCS	74	69	76	31	45	73		0
03	D4LF2	65	62	68	28	41	70		0
04	D4LF2MS	75	74	78	30	43	72		0
05	D4LF2MSD	74	72	76	31	44	76		0
06	D2LF1	62	61	70	28	42	72		0
07	31685	65	65	81	28	41	68		0
08	D5LF3	57	57	65	22	32	48		0
09	61985	65	63	78	28	42	64		0
10	D7PW1	68	66	78	31	45	75		0
11	81285	63	62	72	28	40	68		0
12	D9N51	66	68	82	27	39	69		0
13	D10FB	65	65	74	28	41	67		0
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(35-114)
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)
S3 (TPH)	= Terphenyl-d14	(33-141)
S4 (PHL)	= Phenol-d6	(10-94)
S5 (2FP)	= 2-Fluorophenol	(21-100)
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SBLKLA1709

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Matrix: (soil/water) SOIL Lab Sample ID: SBLKLA170

Sample wt/vol: 30 (g/mL) G Lab File ID: >I6950

Level: (low/med) LOW Date Received:

% Moisture: not dec. _____. dec. _____. Date Extracted: 06/18/92

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 06/22/92

GPC Cleanup: (Y/N) Y pH: _____. Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
62-75-9	N-Nitrosodimethylamine	330	U
109-06-8	2-Picoline	330	U
108-95-2	Phenol	330	U
62-53-3	Aniline	330	U
111-44-4	bis(2-Chloroethyl)ether	330	U
95-57-8	2-Chlorophenol	330	U
541-73-1	1,3-Dichlorobenzene	330	U
106-46-7	1,4-Dichlorobenzene	330	U
95-50-1	1,2-Dichlorobenzene	330	U
108-60-1	bis(2-Chloroisopropyl)ether	330	U
621-64-7	N-Nitroso-di-n-propylamine	330	U
67-72-1	Hexachloroethane	330	U
98-95-3	Nitrobenzene	330	U
78-59-1	Isophorone	330	U
88-75-5	2-Nitrophenol	330	U
105-67-9	2,4-Dimethylphenol	330	U
111-91-1	bis(2-Chloroethoxy)methane	330	U
120-83-2	2,4-Dichlorophenol	330	U
120-82-1	1,2,4-Trichlorobenzene	330	U
91-20-3	Naphthalene	330	U
87-68-3	Hexachlorobutadiene	330	U
59-50-7	4-Chloro-3-methylphenol	330	U
77-47-4	Hexachlorocyclopentadiene	330	U
88-06-2	2,4,6-Trichlorophenol	330	U
91-58-7	2-Chloronaphthalene	330	U
131-11-3	Dimethylphthalate	330	U
208-96-8	Acenaphthylene	330	U
606-20-2	2,6-Dinitrotoluene	330	U
99-09-2	3-Nitroaniline	330	U
83-32-9	Acenaphthene	330	U
51-28-5	2,4-Dinitrophenol	830	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SBLKLA1709

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Matrix: (soil/water) SOIL Lab Sample ID: SBLKLA170

Sample wt/vol: 30 (g/mL) G Lab File ID: >I6950

Level: (low/med) LOW Date Received:

% Moisture: not dec. _____. dec. _____. Date Extracted: 06/18/92

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 06/22/92

GPC Cleanup: (Y/N) Y pH: _____. Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
100-02-7	4-Nitrophenol	830	U
121-14-2	2,4-Dinitrotoluene	330	U
84-66-2	Diethylphthalate	330	U
7005-72-3	4-Chlorophenyl-phenylether	330	U
86-73-7	Fluorene	330	U
100-01-6	4-Nitroaniline	330	U
534-52-1	4,6-Dinitro-2-methylphenol	830	U
86-30-6	N-Nitrosodiphenylamine (1)	330	U
122-66-7	1,2-Diphenylhydrazine	330	U
101-55-3	4-Bromophenyl-phenylether	330	U
118-74-1	Hexachlorobenzene	330	U
87-86-5	Pentachlorophenol	1700	U
85-01-8	Phenanthrene	330	U
120-12-7	Anthracene	330	U
84-74-2	Di-n-butylphthalate	330	U
206-44-0	Fluoranthene	330	U
92-87-5	Benzidine	3300	U
129-00-0	Pyrene	330	U
85-68-7	Butylbenzylphthalate	330	U
91-94-1	3,3'-Dichlorobenzidine	670	U
56-55-3	Benzo(a)anthracene	330	U
218-01-9	Chrysene	330	U
117-81-7	bis(2-Ethylhexyl)phthalate	330	U
117-84-0	Di-n-octylphthalate	330	U
205-99-2	Benzo(b)fluoranthene	330	U
207-08-9	Benzo(k)fluoranthene	330	U
50-32-8	Benzo(a)pyrene	330	U
193-39-5	Indeno(1,2,3-cd)pyrene	330	U
53-70-3	Dibenz(a,h)anthracene	330	U
191-24-2	Benzo(g,h,i)perylene	330	U

(1) - Cannot be separated from Diphenylamine

4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Lab File ID: Lab Sample ID:

Instrument ID: Date Extracted:

Matrix: (soil/water) Date Analyzed:

Level: (low/med) Time Analyzed:

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				

COMMENTS: _____

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLE RECOVERY

Lab Name: LANCASTER LABS Lab Code: LANCAS Instrument: HP03301

SW846 METHOD 8270 SPIKE LEVEL: 100 UG/ML AMT USED: 30.0

SAMPLE SPIKE LEVEL: 3745.UG/KG % MOISTURE 11. DILUTION: 1

US SAMPLE: 0101- 1836265 MS SAMPLE: 0101-MS 1836265 MSD SAMPLE: 0101-MSD 1836265

COMPOUND NAME	US CONC UG/KG	MS CONC UG/KG	MSD CONC UG/KG	MS REC %	MSD REC %	RPD %	RANGE LOWER-UPPER	IN SPEC
N-Nitrosodimethylamine	0.00	3166.89	3166.50	84	84	.01	29.3-100.5	YES
Phenol	0.00	3294.27	3340.31	88	89	-1.39	5.0-112.0	YES
bis(2-Chloroethyl)ether	0.00	3095.69	3175.74	83	85	-2.55	12.0-158.0	YES
2-Chlorophenol	0.00	3356.81	3452.60	90	92	-2.81	23.0-134.0	YES
1,3-Dichlorobenzene	0.00	3125.88	3255.69	83	87	-4.07	1.0-172.0	YES
1,4-Dichlorobenzene	0.00	3127.83	3215.93	84	86	-2.78	20.0-124.0	YES
1,2-Dichlorobenzene	0.00	2963.46	3103.79	79	83	-4.63	32.0-129.0	YES
bis(2-Chloroisopropyl)ether	0.00	3380.23	3476.61	90	93	-2.81	36.0-166.0	YES
N-Nitroso-di-n-propylamine	0.00	3457.82	3466.80	92	92	-.26	1.0-230.0	YES
Hexachloroethane	0.00	3069.69	3143.37	82	84	-2.37	40.0-113.0	YES
Nitrobenzene	0.00	3126.50	3249.55	83	87	-3.86	35.0-180.0	YES
Isophorone	0.00	3437.80	3431.53	92	92	.18	21.0-196.0	YES
2-Nitrophenol	0.00	3892.37	3759.65	104	100	3.47	29.0-182.0	YES
2,4-Dimethylphenol	0.00	3456.81	3447.74	92	92	.26	32.0-119.0	YES
bis(2-Chloroethoxy)methane	0.00	2607.48	2618.57	70	70	-.42	33.0-184.0	YES
2,4-Dichlorophenol	0.00	3343.56	3272.19	89	87	2.16	39.0-135.0	YES
1,2,4-Trichlorobenzene	0.00	3062.25	3144.28	82	84	-2.64	44.0-142.0	YES
Naphthalene	0.00	3311.86	3370.46	88	90	-1.75	21.0-133.0	YES
Hexachlorobutadiene	0.00	3281.52	3226.15	88	86	1.70	24.0-116.0	YES
4-Chloro-3-methylphenol	0.00	3384.94	3436.92	90	92	-1.52	22.0-147.0	YES
Hexachlorocyclopentadiene	0.00	1197.71	896.97	32	24	28.71	1.0-100.0	YES
2,4,6-Trichlorophenol	0.00	3688.74	3493.14	98	93	5.45	37.0-144.0	YES
2-Chloronaphthalene	0.00	3398.26	3331.89	91	89	1.97	60.0-118.0	YES
Dimethylphthalate	0.00	3521.36	3493.16	94	93	.80	1.0-112.0	YES
Acenaphthylene	0.00	3379.58	3349.67	90	89	.89	33.0-145.0	YES
2,6-Dinitrotoluene	0.00	3466.49	3454.84	92	92	.34	50.0-158.0	YES
Acenaphthene	0.00	3548.24	3569.36	95	95	-.59	47.0-145.0	YES
2,4-Dinitrophenol	0.00	2364.86	1513.32	63	40	43.91	1.0-191.0	YES
4-Nitrophenol	0.00	3517.55	3173.26	94	85	10.29	1.0-132.0	YES
2,4-Dinitrotoluene	0.00	3680.27	3608.50	98	96	1.97	39.0-139.0	YES
Diethylphthalate	0.00	3249.98	2931.05	87	78	10.32	1.0-114.0	YES
4-Chlorophenyl-phenylether	0.00	2768.33	2891.71	74	77	-4.36	25.0-158.0	YES
Fluorene	0.00	3277.18	3309.95	88	88	-.99	59.0-121.0	YES
4,6-Dinitro-2-methylphenol	0.00	2551.43	1828.74	68	49	33.00	1.0-181.0	YES
N-Nitrosodiphenylamine	0.00	3511.64	3234.57	94	86	8.21	37.8-147.0	YES
1,2-Diphenylhydrazine	0.00	3249.70	3322.12	87	89	-2.20	25.7-124.9	YES
4-Bromophenyl-phenylether	0.00	3493.55	3514.09	93	94	-.59	53.0-127.0	YES
Hexachlorobenzene	0.00	3326.39	3369.43	89	90	-1.29	1.0-152.0	YES
Pentachlorophenol	0.00	2743.89	2262.51	73	60	19.23	14.0-176.0	YES

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLE RECOVERY

Lab Name: LANCASTER LABS Lab Code: LANCAS Instrument: HP03301

SW846 METHOD 8270 SPIKE LEVEL: 100 UG/ML AMT USED: 30.0

SAMPLE SPIKE LEVEL: 3745.UG/KG % MOISTURE 11. DILUTION: 1

US SAMPLE: 0101- 1836265 MS SAMPLE: 0101-MS 1836265 MSD SAMPLE: 0101-MSD 1836265

COMPOUND NAME	US CONC UG/KG	MS CONC UG/KG	MSD CONC UG/KG	MS REC %	MSD REC %	RPD %	RANGE LOWER-UPPER	IN SPEC
Phenanthrene	0.00	3524.57	3770.24	94	101	-6.74	54.0-120.0	YES
Anthracene	0.00	3079.03	3079.03	82	82	-.00	27.0-133.0	YES
Di-n-butylphthalate	0.00	3218.05	3298.88	86	88	-2.48	1.0-118.0	YES
Fluoranthene	0.00	3280.20	3369.92	88	90	-2.70	26.0-137.0	YES
Benzidine	0.00	8981.62	12650.0	48	68	-33.92	1.0-101.8	YES
Pyrene	0.00	3924.64	4074.19	105	109	-3.74	52.0-115.0	YES
Butylbenzylphthalate	0.00	3370.03	3416.35	90	91	-1.37	1.0-152.0	YES
3,3'-Dichlorobenzidine	0.00	2083.09	2435.33	56	65	-15.59	1.0-262.0	YES
Benzo(a)anthracene	0.00	3660.35	3836.40	98	102	-4.70	33.0-143.0	YES
Chrysene	0.00	3649.47	3633.50	97	97	.44	17.0-168.0	YES
bis(2-Ethylhexyl)phthalate	117.90	3355.54	3598.74	86	93	-7.24	8.0-158.0	YES
Di-n-octylphthalate	0.00	3305.75	3494.29	88	93	-5.55	4.0-146.0	YES
Benzo(b)fluoranthene	0.00	3162.80	3365.10	84	90	-6.20	24.0-159.0	YES
Benzo(k)fluoranthene	0.00	3652.84	3671.10	98	98	-.50	11.0-163.0	YES
Benzo(a)pyrene	0.00	3723.19	3871.58	99	103	-3.91	17.0-163.0	YES
Indeno(1,2,3-cd)pyrene	0.00	4215.66	4304.08	112	115	-2.08	1.0-171.0	YES
Dibenz(a,h)anthracene	0.00	4015.16	4120.64	107	110	-2.59	1.0-227.0	YES
Benzo(g,h,i)perylene	0.00	3750.23	4019.39	100	107	-6.93	1.0-219.0	YES

COMMENTS:

SOIL SEMIVOLATILE QUALITY CONTROL REFERENCE SAMPLE RECOVERY

AB NAME: LANCASTER LABS LAB CODE: LANCAS INSTRUMENT: HP03301

SW846 METHOD 8270 SPIKE LEVEL: 100 UG/L

CS SAMPLE NO: 184LALCS 184LALCS

COMPOUND NAME	QCREF CONC UG/L	QCREF REC %	RANGE LOWER-UPPER	IN SPEC
N-Nitrosodimethylamine	81.74	82	29.3- 100.5	YES
Phenol	85.47	85	5.0- 112.0	YES
Bis(2-Chloroethyl)ether	81.11	81	12.0- 158.0	YES
2-Chlorophenol	87.16	87	23.0- 134.0	YES
1,3-Dichlorobenzene	81.82	82	1.0- 172.0	YES
1,4-Dichlorobenzene	80.99	81	20.0- 124.0	YES
1,2-Dichlorobenzene	79.40	79	32.0- 129.0	YES
bis(2-Chloroisopropyl)ether	88.50	88	36.0- 166.0	YES
N-Nitroso-di-n-propylamine	88.15	88	1.0- 230.0	YES
Hexachloroethane	81.81	82	40.0- 113.0	YES
Nitrobenzene	84.48	84	35.0- 180.0	YES
Isophorone	90.20	90	21.0- 196.0	YES
2-Nitrophenol	100.43	100	29.0- 182.0	YES
2,4-Dimethylphenol	83.05	83	32.0- 119.0	YES
bis(2-Chloroethoxy)methane	68.32	68	33.0- 184.0	YES
2,4-Dichlorophenol	83.75	84	39.0- 135.0	YES
1,2,4-Trichlorobenzene	81.01	81	44.0- 142.0	YES
Naphthalene	85.70	86	21.0- 133.0	YES
Hexachlorobutadiene	85.97	86	24.0- 116.0	YES
4-Chloro-3-methylphenol	86.04	86	22.0- 147.0	YES
Hexachlorocyclopentadiene	88.71	89	1.0- 100.0	YES
2,4,6-Trichlorophenol	89.39	89	37.0- 144.0	YES
2-Chloronaphthalene	84.52	84	60.0- 118.0	YES
Dimethylphthalate	87.31	87	1.0- 112.0	YES
Acenaphthylene	84.89	85	33.0- 145.0	YES
2,6-Dinitrotoluene	87.03	87	50.0- 158.0	YES
Acenaphthene	90.36	90	47.0- 145.0	YES
2,4-Dinitrophenol	94.31	94	1.0- 191.0	YES
4-Nitrophenol	86.96	87	1.0- 132.0	YES
2,4-Dinitrotoluene	91.51	92	39.0- 139.0	YES
Diethylphthalate	80.65	81	1.0- 114.0	YES
4-Chlorophenyl-phenylether	70.89	71	25.0- 158.0	YES
Fluorene	81.22	81	59.0- 121.0	YES
4,6-Dinitro-2-methylphenol	99.75	100	1.0- 181.0	YES
N-Nitrosodiphenylamine	88.05	88	37.8- 147.0	YES
1,2-Diphenylhydrazine	86.08	86	25.7- 124.9	YES
4-Bromophenyl-phenylether	89.22	89	53.0- 127.0	YES
Hexachlorobenzene	85.99	86	1.0- 152.0	YES
Pentachlorophenol	80.55	80	14.0- 176.0	YES

SOIL SEMIVOLATILE QUALITY CONTROL REFERENCE SAMPLE RECOVERY

LAB NAME: LANCASTER LABS LAB CODE: LANCAS INSTRUMENT: HP03301

SUB-6 METHOD 8270 SPIKE LEVEL: 100 UG/L

LCS SAMPLE NO: 184LALCS 184LALCS

COMPOUND NAME	OCREF CONC UG/L	OCREF REC %	RANGE LOWER-UPPER	IN SPEC
Phenanthrene	88.20	88	54.0- 120.0	YES
Anthracene	81.71	82	27.0- 133.0	YES
Di-n-butylphthalate	86.08	86	1.0- 118.0	YES
Fluoranthene	86.63	87	26.0- 137.0	YES
Benzidine	258.59	52	1.0- 101.8	YES
Pyrene	96.38	96	52.0- 115.0	YES
Butylbenzylphthalate	85.74	86	1.0- 152.0	YES
3,3'-Dichlorobenzidine	42.09	42	1.0- 262.0	YES
Benzo(a)anthracene	88.85	89	33.0- 143.0	YES
Chrysene	90.05	90	17.0- 168.0	YES
bis(2-Ethylhexyl)phthalate	87.65	88	8.0- 158.0	YES
Di-n-octylphthalate	83.64	84	4.0- 146.0	YES
Benzo(b)fluoranthene	72.13	72	24.0- 159.0	YES
Benzo(k)fluoranthene	97.12	97	11.0- 163.0	YES
Benzo(a)pyrene	92.44	92	17.0- 163.0	YES
Indeno(1,2,3-cd)pyrene	115.16	115	1.0- 171.0	YES
Dibenz(a,h)anthracene	104.34	104	1.0- 227.0	YES
Benzo(g,h,i)perylene	104.26	104	1.0- 219.0	YES

COMMENTS:

8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Lab File ID (Standard): >U1702 Date Analyzed: 06/19/92

Instrument ID: HP02861 Time Analyzed: 07:03

		IS1(DCB) AREA	#	RT	IS2(NPT) AREA	#	RT	IS3(ANT) AREA	#	RT
	12 HOUR STD	23030		8.57	98150		12.27	57525		17.70
	UPPER LIMIT	46060			196300			115050		
	LOWER LIMIT	11515			49075			28763		
	EPA SAMPLE NO.									
01	45586	24672		8.56	99296		12.25	59784		17.69
02	45588	24154		8.56	96319		12.26	57794		17.69
03	45589	25470		8.56	102266		12.26	60535		17.68
04	45590	24262		8.55	96444		12.25	57609		17.69
05	45591	23391		8.56	93705		12.25	56056		17.69
06	45592	24525		8.56	96816		12.25	57205		17.68
07	SBLKWE1706	23606		8.56	94750		12.25	57234		17.69
08	170WELCS	24132		8.56	96206		12.28	57908		17.70
09	D4LF2	24509		8.56	97080		12.26	58661		17.70
10	D4LF2MS	25182		8.57	102457		12.28	59352		17.70
11	D4LF2MSD	24377		8.57	98374		12.28	57651		17.72
12	D2LF1	23925		8.57	94391		12.26	57152		17.69
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

FORM VIII SV-1 1/87 Rev.

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: LANCASTER LABS Contract: _____.

Lab Code: LANCAS Case No.: _____. SAS No.: _____. SDG No.: _____.

Lab File ID (Standard): >U1702 Date Analyzed: 06/19/92

Instrument ID: HP02861 Time Analyzed: 07:03

		IS4(PHN) AREA	#	RT	IS5(CRY) AREA	#	RT	IS6(PRY) AREA	#	RT
	12 HOUR STD	94913		22.26	45470		30.54	22917		34.71
	UPPER LIMIT	189826			90940			45834		
	LOWER LIMIT	47457			22735			11459		
	EPA SAMPLE NO.									
01	45586	93228		22.24	35881		30.55	21301		34.72
02	45588	85844		22.24	39309		30.54	28105		34.71
03	45589	93886		22.24	38502		30.54	22340		34.72
04	45590	90580		22.23	34712		30.53	21036		34.71
05	45591	88441		22.24	33784		30.53	20133		34.71
06	45592	87212		22.23	34405		30.54	19093		34.71
07	SBLKWE1706	90741		22.24	39826		30.55	25317		34.71
08	170WELCS	94491		22.26	45373		30.55	27570		34.71
09	D4LF2	94980		22.24	39878		30.55	23810		34.71
10	D4LF2MS	93986		22.27	42812		30.56	24431		34.72
11	D4LF2MSD	94170		22.27	46417		30.57	26865		34.73
12	D2LF1	93204		22.24	40849		30.55	26079		34.72
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

Initial Calibration Data

HSL Compounds

Case No: Instrument ID: HP03301

Contractor: LANCASTER LABS Calibration Date: 07/04/92

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.0%

Laboratory ID: >W7203 >W7205 >W7204 >W7202 >W7201

Compound	RF 20.00	RF 50.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
N-Nitrosodimethylamine	.79215	.82554	.85326	.86241	.80014	.413	.82670	3.768		
2-Picoline	1.35951	1.42977	1.51909	1.49935	1.41079	.571	1.44370	4.535		
Phenol	1.82504	1.71783	1.67268	1.64775	1.57239	.913	1.68714	5.535	*	
Aniline	2.23733	2.20556	2.23331	2.20993	2.08297	.921	2.19382	2.895		
bis(2-Chloroethyl)ether	1.56329	1.43752	1.43071	1.43945	1.37231	.937	1.44865	4.820		
2-Chlorophenol	1.46264	1.38858	1.37290	1.36104	1.29364	.948	1.37576	4.404		
1,3-Dichlorobenzene	1.63905	1.45558	1.36515	1.36480	1.30204	.986	1.42532	9.220		
1,4-Dichlorobenzene	1.67988	1.46693	1.35451	1.36371	1.26978	1.004	1.42696	11.054	*	
1,2-Dichlorobenzene	1.68317	1.52105	1.43128	1.39256	1.34090	1.041	1.47379	9.112		
bis(2-Chloroisopropyl)ether	4.50053	4.68677	4.67513	4.58089	4.44439	1.068	4.57754	2.320		
N-Nitroso-di-n-propylamine	1.48989	1.51378	1.49465	1.47022	1.45112	1.104	1.48393	1.618		**
Hexachloroethane	.89850	.84677	.80621	.80198	.78519	1.126	.82773	5.506		
2-Fluorophenol	1.24298	1.24730	1.21432	1.19973	1.11904	.697	1.20467	4.300		
Phenol-d6	1.85609	1.81422	1.79029	1.79168	1.66119	.909	1.78269	4.092		
Nitrobenzene	.21186	.19914	.19299	.18814	.17833	.864	.19409	6.447		
Isophorone	.99067	.94687	.95230	.93721	.91919	.911	.94925	2.777		
2-Nitrophenol	.22090	.23546	.23247	.22523	.21163	.925	.22514	4.218	*	
2,4-Dimethylphenol	.41340	.40459	.39781	.39794	.37792	.932	.39833	3.282		
bis(2-Chloroethoxy)methane	.65025	.59659	.57808	.55937	.54178	.953	.58521	7.131		
2,4-Dichlorophenol	.34382	.33154	.31809	.30781	.29925	.972	.32010	5.596	*	
1,2,4-Trichlorobenzene	.38930	.35400	.32515	.31724	.29668	.989	.33648	10.694		
Naphthalene	1.12051	.96904	.87731	.87843	.81424	1.005	.93190	12.769		
Hexachlorobutadiene	.20654	.19705	.19069	.17496	.16543	1.028	.18693	8.898	*	
4-Chloro-3-methylphenol	.30730	.29278	.28243	.27501	.27113	1.110	.28573	5.114	*	
Nitrobenzene-d5	.51351	.51910	.51234	.49674	.47143	.860	.50262	3.842		
Hexachlorocyclopentadiene	.20422	.32896	.32458	.30685	.30622	.866	.29417	17.443		**
2,4,6-Trichlorophenol	.42036	.43846	.41784	.39389	.39789	.885	.41369	4.386	*	
2-Chloronaphthalene	1.26268	1.17370	1.05965	1.02438	.94311	.917	1.09270	11.539		
Dimethylphthalate	1.60010	1.56057	1.49083	1.42663	1.27337	.960	1.47030	8.744		
Acenaphthylene	2.12120	1.94575	1.78450	1.73436	1.59293	.979	1.83575	11.079		

RF - Response Factor (Subscript is amount in MG/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

PY 7-4-92

Initial Calibration Data
HSL Compounds

Case No: Instrument ID: HP03301

Contractor: LANCASTER LABS Calibration Date: 07/04/92

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.0%

Laboratory ID:	>U7203	>U7205	>U7204	>U7202	>U7201					
Compound	RF 20.00	RF 50.00	RF 80.00	RF 120.00	RF 160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC	SPCC
3-Nitroaniline	.37385	.48117	.46716	.44045	.42082	.995	.43669	9.662		
Acenaphthene	1.32222	1.17549	1.06646	1.02033	.93873	1.006	1.10464	13.462	*	
2,4-Dinitrophenol	.15894	.22404	.23737	.22661	.21763	1.010	.21292	14.562		** (Conc=40.0,50.0,80.0,120.
4-Nitrophenol	.13029	.19084	.19667	.17726	.15701	1.018	.17041	15.918		** (Conc=40.0,50.0,80.0,120.
2,6-Dinitrotoluene	.38226	.40717	.39060	.37954	.36003	.969	.38392	4.470		
2,4-Dinitrotoluene	.54041	.56621	.48378	.48007	.41782	1.030	.49766	11.631		
Diethylphthalate	1.97196	1.84260	1.62296	1.59064	1.42316	1.067	1.69026	12.838		
4-Chlorophenyl-phenylether	.62442	.48771	.40201	.39567	.35449	1.083	.45286	23.727		
Fluorene	1.32669	1.02768	.89695	.85934	.78605	1.084	.97934	21.753		
4-Nitroaniline	.32227	.45515	.44278	.40281	.35447	1.087	.39550	14.355		
2-Fluorobiphenyl	1.33740	1.20670	1.06727	1.03407	.96266	.898	1.12162	13.350		
2,4,6-Tribromophenol	.27263	.31503	.30449	.28091	.25466	1.119	.28555	8.526		
4,6-Dinitro-2-methylphenol	.15465	.16844	.16739	.16289	.16180	.891	.16304	3.359		(Conc=40.0,50.0,80.0,120.
N-Nitrosodiphenylamine	.54129	.50230	.47344	.44622	.44457	.899	.48156	8.486	*	
1,2-Diphenylhydrazine	1.39834	1.33712	1.24190	1.17339	1.16263	.904	1.26267	8.150		
4-Bromophenyl-phenylether	.21620	.19999	.18356	.16861	.17047	.944	.18777	10.789		
Hexachlorobenzene	.32181	.29905	.26912	.25965	.26090	.952	.28210	9.685		
Pentachlorophenol	.14111	.17763	.17289	.16216	.16479	.975	.16372	8.597	*	(Conc=40.0,50.0,80.0,120.
Phenanthrene	1.17905	1.02682	.91801	.88451	.88627	1.003	.97893	12.876		
Anthracene	1.18798	1.06212	.93990	.90084	.87522	1.010	.99321	13.126		
Di-n-butylphthalate	2.09753	1.84120	1.61059	1.57147	1.48288	1.071	1.72073	14.455		
Fluoranthene	1.25600	1.13706	1.02384	.96825	.93051	1.151	1.06313	12.514	*	
Terphenyl-d14	1.25584	1.08434	.99585	.92541	.93559	.901	1.03941	13.133		
Benzidine	.55445	.65906	.62454	.51271	.53230	.879	.57661	10.842		(Conc=100.0,200.0,300.0,4
Pyrene	2.01688	1.73171	1.66909	1.56641	1.55634	.888	1.70809	10.973		
Butylbenzylphthalate	1.39885	1.22386	1.18583	1.11673	1.11323	.946	1.20770	9.663		
3,3'-Dichlorobenzidine	.37029	.49554	.48936	.40532	.43119	.995	.43834	12.311		
Benzo(a)anthracene	1.12577	1.08713	1.05545	.97467	.95318	.999	1.03924	7.074		
bis(2-Ethylhexyl)phthalate	1.99554	1.55638	1.37333	1.31946	1.23819	.998	1.49658	20.208		
Chrysene	1.20220	1.14718	1.10979	1.02970	1.03118	1.003	1.10401	6.773		

RF - Response Factor (Subscript is amount in MG/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Initial Calibration Data
HSL Compounds

Case No: Instrument ID: HP03301

Contractor: LANCASTER LABS Calibration Date: 07/04/92

Contract No:

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % RSD for CCC is 30.0%

Laboratory ID:	>U7203	>U7205	>U7204	>U7202	>U7201				
	RF	RF	RF	RF	RF				
Compound	20.00	50.00	80.00	120.00	160.00	$\overline{RRT}$	$\overline{RF}$	% RSD	CCC SPCC
Di-n-octylphthalate	4.34758	3.67292	3.38699	3.54509	3.40243	.901	3.67100	10.780	*
Benzo(b)fluoranthene	1.22924	1.25774	1.25927	1.35750	1.25857	.949	1.27246	3.867	
Benzo(k)fluoranthene	1.28394	1.21770	1.16070	1.21695	1.14036	.953	1.20393	4.675	
Benzo(a)pyrene	1.05205	1.10999	1.11644	1.16409	1.09115	.993	1.10674	3.678	*
Indeno(1,2,3-cd)pyrene	.76536	.75464	.77939	.81705	.78521	1.190	.78033	3.044	
Dibenz(a,h)anthracene	.69699	.74496	.75972	.78316	.74132	1.196	.74523	4.238	
Benzo(g,h,i)perylene	.78372	.82966	.81472	.85194	.83911	1.251	.82383	3.183	

RF - Response Factor (Subscript is amount in MG/L)

$\overline{RRT}$ - Average Relative Retention Time (RT Std/RT Istd)

$\overline{RF}$ - Average Response Factor

%RSD - Percent Relative Standard Deviation

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: Calibration Date: 07/04/92

Contractor: LANCASTER LABS Time: 13:32

Contract No: Laboratory ID: >W7205

Instrument ID: HP03301 Initial Calibration Date: 07/04/92

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 30.0%

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
N-Nitrosodimethylamine	.82670	.82554	-.14		
2-Picoline	1.44370	1.42977	.97		
Phenol	1.68714	1.71783	1.82	*	
Aniline	2.19382	2.20556	.53		
bis(2-Chloroethyl)ether	1.44865	1.43752	.77		
2-Chlorophenol	1.37576	1.38858	.93		
1,3-Dichlorobenzene	1.42532	1.45558	2.12		
1,4-Dichlorobenzene	1.42696	1.46693	2.80	*	
1,2-Dichlorobenzene	1.47379	1.52105	3.21		
bis(2-Chloroisopropyl)ether	4.57754	4.68677	2.39		
N-Nitroso-di-n-propylamine	1.48393	1.51378	2.01		**
Hexachloroethane	.82773	.84677	2.30		
2-Fluorophenol	1.20467	1.24730	3.54		
Phenol-d6	1.78269	1.81422	1.77		
Nitrobenzene	.19409	.19914	2.60		
Isophorone	.94925	.94687	.25		
2-Nitrophenol	.22514	.23546	4.59	*	
2,4-Dimethylphenol	.39833	.40459	1.57		
bis(2-Chloroethoxy)methane	.58521	.59659	1.94		
2,4-Dichlorophenol	.32010	.33154	3.57	*	
1,2,4-Trichlorobenzene	.33648	.35400	5.21		
Naphthalene	.93190	.96904	3.98		
Hexachlorobutadiene	.18693	.19705	5.41	*	
4-Chloro-3-methylphenol	.28573	.29278	2.47	*	
Nitrobenzene-d5	.50262	.51910	3.28		
Hexachlorocyclopentadiene	.29417	.32896	11.83		**
2,4,6-Trichlorophenol	.41369	.43846	5.99	*	
2-Chloronaphthalene	1.09270	1.17370	7.41		
Dimethylphthalate	1.47030	1.56057	6.14		
Acenaphthylene	1.83575	1.94575	5.99		
3-Nitroaniline	.43669	.48117	10.19		
Acenaphthene	1.10464	1.17549	6.41	*	

RF - Response Factor from daily standard file at 50.00 NG/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: Calibration Date: 07/04/92

Contractor: LANCASTER LABS Time: 13:32

Contract No: Laboratory ID: >W7205

Instrument ID: HP03301 Initial Calibration Date: 07/04/92

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 30.0%

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC	
2,4-Dinitrophenol	.21292	.22404	5.22		**	(Conc=50.00)
4-Nitrophenol	.17041	.19084	11.99		**	(Conc=50.00)
2,6-Dinitrotoluene	.38392	.40717	6.06			
2,4-Dinitrotoluene	.49766	.56621	13.77			(Conc=50.00)
Diethylphthalate	1.69026	1.84260	9.01			
4-Chlorophenyl-phenylether	.45286	.48771	7.70			
Fluorene	.97934	1.02768	4.94			
4-Nitroaniline	.39550	.45515	15.08			
2-Fluorobiphenyl	1.12162	1.20670	7.59			
2,4,6-Tribromophenol	.28555	.31503	10.33			
4,6-Dinitro-2-methylphenol	.16304	.16844	3.31			(Conc=50.00)
N-Nitrosodiphenylamine	.48156	.50230	4.31	*		
1,2-Diphenylhydrazine	1.26267	1.33712	5.90			
4-Bromophenyl-phenylether	.18777	.19999	6.51			
Hexachlorobenzene	.28210	.29905	6.01			
Pentachlorophenol	.16372	.17763	8.50	*		(Conc=50.00)
Phenanthrene	.97893	1.02682	4.89			
Anthracene	.99321	1.06212	6.94			
Di-n-butylphthalate	1.72073	1.84120	7.00			
Fluoranthene	1.06313	1.13706	6.95	*		
Terphenyl-d14	1.03941	1.08434	4.32			
Benzidine	.57661	.65906	14.30			(Conc=200.00)
Pyrene	1.70809	1.73171	1.38			
Butylbenzylphthalate	1.20770	1.22386	1.34			
3,3'-Dichlorobenzidine	.43834	.49554	13.05			
Benzo(a)anthracene	1.03924	1.08713	4.61			
bis(2-Ethylhexyl)phthalate	1.49658	1.55638	4.00			
Chrysene	1.10401	1.14718	3.91			
Di-n-octylphthalate	3.67100	3.67292	.05	*		
Benzo(b)fluoranthene	1.27246	1.25774	1.16			
Benzo(k)fluoranthene	1.20393	1.21770	1.14			
Benzo(a)pyrene	1.10674	1.10999	.29	*		

RF - Response Factor from daily standard file at 50.00 MG/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Continuing Calibration Check
HSL Compounds

Case No: Calibration Date: 07/04/92

Contractor: LANCASTER LABS Time: 13:32

Contract No: Laboratory ID: >W7205

Instrument ID: HP03301 Initial Calibration Date: 07/04/92

Minimum $\overline{RF}$ for SPCC is 0.05 Maximum % Diff for CCC is 30.0%

Compound	$\overline{RF}$	RF	%Diff	CCC	SPCC
Indeno(1,2,3-cd)pyrene	.78033	.75464	3.29		
Dibenz(a,h)anthracene	.74523	.74496	.04		
Benzo(g,h,i)perylene	.82383	.82966	.71		

RF - Response Factor from daily standard file at 50.00 MG/L

$\overline{RF}$ - Average Response Factor from Initial Calibration Form VI

%Diff - % Difference from original average or curve

CCC - Calibration Check Compounds (*) SPCC - System Performance Check Compounds (**)

Surrogate Recovery
Volatiles by GC - Water

LLI Sample No.	Sample Designation	Dilution Factor	S1 (MeBrCl)	S2 (1Cl3FBn)	S3 (1Cl3FBn)	S4 (1,2,3-TCP)	S5 (ProBn)	Other	TOT OUT	Comment

	QC Limits LOW	HIGH
S1 (MeBrCl) = Bromochloromethane (Hall Det)	75	125
S2 (1Cl3FBn) = 1-Chloro-3-fluorobenzene (Hall Det)	75	125
S3 (1Cl3FBn) = 1-Chloro-3-fluorobenzene (PID Det)	75	125
S4 (1,2,3-TCP) = 1,2,3-Trichloropropane (Hall Det)	75	125
S5 (ProBn) = n-Propylbenzene (PID Det)	75	125

* Values outside QC limits

D Surrogates diluted out

Comments:

Quality Control Summary

Method Blank
Volatiles by GC

*** BLANK INFORMATION ***

Matrix.....: Water
Batch Number.....: 92118/A03
Injection Number.....: 221
Analysis Date.....: 04/28/92
Concentration Units.....: ug/l

Sample Information				Blank Contamination Information			
LLI Sample #	Sample Designation	Analysis Date	Time	CAS Number	Compound	Blank Result	LOQ
				74-87-3	Chloromethane	ND	5
				74-83-9	Bromomethane	ND	5
				75-01-4	Vinyl chloride	ND	1
				75-00-3	Chloroethane	ND	1
				75-09-2	Methylene chloride	ND	1
				75-35-4	1,1-Dichloroethene	ND	1
				75-34-3	1,1-Dichloroethane	ND	1
				540-59-0	1,2-Dichloroethene (c/t)	ND	1
				67-66-3	Chloroform	ND	1
				107-06-2	1,2-Dichloroethane	ND	1
				71-55-6	1,1,1-Trichloroethane	ND	1
				56-23-5	Carbon tetrachloride	ND	1
				75-27-4	Bromodichloromethane	ND	1
				78-87-5	1,2-Dichloropropane	ND	1
				10061-02-6	trans-1,3-Dichloropropene	ND	1
				79-1-6	Trichloroethene	ND	1
				124-48-1	Dibromochloromethane	ND	1
				79-00-5	1,1,2-Trichloroethane	ND	1
				10061-01-5	cis-1,3-Dichloropropene	ND	1
				75-25-2	Bromoform	ND	2
				79-34-5	1,1,2,2-Tetrachloroethane	ND	2
				127-18-4	Tetrachloroethene	ND	1
				108-90-7	Chlorobenzene	ND	1
				71-43-2	Benzene	ND	1
				108-88-3	Toluene	ND	1
				100-41-4	Ethylbenzene	ND	1
				106-42-3	p-Xylene	ND	1
				108-38-3	m-Xylene	ND	1
				95-47-6	o-Xylene	ND	1
				106-46-7	p-Dichlorobenzene	ND	1
				541-73-1	m-Dichlorobenzene	ND	1
				95-50-1	o-Dichlorobenzene	ND	1

ABBREVIATION KEY

LOQ = Limit of Quantitation
ND = None Detected
* = above detection limit

COMMENTS:

Matrix Spike/Matrix Spike Duplicate
Volatiles by GC

Unspiked Sample Number :
Spiked Sample Number :
Spiked Dup Sample Number :

Inj. :
Inj. :
Inj. :

Batch Number :
Matrix : Water

Date :

This MS/MSD applies to the following samples	Compound	Spike Added (ug/l)	Sample Conc (ug/l)	MS Conc (ug/l)	MSD Conc (ug/l)	MS % REC	MSD % REC	QC Limits REC	RPD	QC Li s Rl
	Chloromethane		ND					65 -130		--
	Bromomethane		ND					65 -130		
	Vinyl chloride		ND					65 -130		--
	Chloroethane		ND					65 -130		20
	Methylene chloride		ND					75 -125		
	Trichlorofluoromethane		ND					65 -130		
	1,1-Dichloroethene		ND					75 -125		15
	1,1-Dichloroethane		ND					75 -125		15
	1,2-Dichloroethene(cis/trans)		ND					75 -125		
	Chloroform		ND					75 -125		
	1,2-Dichloroethane		ND					75 -125		15
	1,1,1-Trichloroethane		ND					75 -125		--
	Carbon Tetrachloride		ND					75 -125		
	Bromodichloromethane		ND					75 -125		--
	1,2-Dichloropropane		ND					75 -125		15
	Trichloroethene		ND					75 -125		
	Dibromochloromethane		ND					75 -125		
	Bromoform		ND					75 -125		15
	Tetrachloroethene		ND					75 -125		15
	Chlorobenzene		ND					75 -125		
	Benzene		ND					75 -125		15
	Toluene		ND					75 -125		15
	Ethylbenzene		ND					75 -125		
	p-Xylene		ND					75 -125		
	m-Xylene		ND					75 -125		
	o-Xylene		ND					75 -125		15
	p-Dichlorobenzene		ND					75 125		
	m-Dichlorobenzene		ND					75 -125		
	o-Dichlorobenzene		ND					75 125		--

ABBREVIATION KEY
MS = Matrix Spike
MSD = Matrix Spike Duplicate
ND = None Detected
RPD = Relative Percent Difference

COMMENTS: Dichlorodifluoromethane and 2-chloroethyl vinyl ether are not part of the routine spiking solution and no acceptar criteria have been developed.

Lancaster Laboratories
Where quality is a science.

Quality Control Summary

Initial Calibration
Volatiles by GC

Calibration Batch.....:

Sample Batch Number.....:

Calibration Date.....:

Instrument Identification:

Laboratory Standard ID

This IC applies to samples:	Compound	3-200+5 Rf STD 1	15-200+10 Rf STD 2	15-100+10 Rf STD 3	25-100+25 Rf STD 4	25-50+20 Rf STD 5	AVE RF	%RSD	%RSD QC Limit
	Chloromethane								20
	Bromomethane								20
	Vinyl chloride								20
	Chloroethane								20
	Methylene chloride								20
	Trichlorofluoromethane								20
	1,1-Dichloroethene								20
	1,1-Dichloroethane								20
	1,2-Dichloroethene (c/t)								20
	Chloroform								20
	1,2-Dichloroethane								20
	1,1,1-Trichloroethane								20
	Carbon tetrachloride								20
	Bromodichloromethane								20
	1,2-Dichloropropane								20
	Trichloroethene								20
	Dibromochloromethane								20
	2-Chloroethyl vinyl ether								20
	Bromoform								20
	Tetrachloroethene								20
	Chlorobenzene								20
	Benzene								20
	Toluene								20
	Ethylbenzene								20
	p-Xylene								20
	m-Xylene								20
	o-Xylene								20
	p-Dichlorobenzene								20
	m-Dichlorobenzene								20
	o-Dichlorobenzene								20

Dichlorodifluoromethane is not part of the routine calibration standard solution due to its coelution with vinyl chloride on the 1% SP-1000 Carbopack B column. If a peak for vinyl chloride is detected, confirmation, when possible, is performed using a capillary column to separate vinyl chloride and dichlorodifluoromethane.

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Quality Control Summary

Continuing Calibration
Volatiles by GC

Calibration Date.....:

Batch Number:

Instrument Identification..:

Inj #..:

Continuing Calibration Date:

Compound	Reference Concentration	Continuing Calib Result	Acceptance Range 85%-	115%	Out of Range
Chloromethane	20.0	18.7	17.0	23.0	
Bromomethane	20.0	19.2	17.0	23.0	
Vinyl chloride	20.0	18.6	17.0	23.0	
Chloroethane	20.0	19.7	17.0	23.0	
Methylene chloride	20.0	21.3	17.0	23.0	
Trichlorofluoromethane	20.0	17.2	17.0	23.0	
1,1-Dichloroethene	20.0	19.0	17.0	23.0	
1,1-Dichloroethane	20.0	18.3	17.0	23.0	
1,2-Dichloroethene (c/t)	20.0	18.8	17.0	23.0	
Chloroform	20.0	17.7	17.0	23.0	
1,2-Dichloroethane	20.0	21.2	17.0	23.0	
1,1,1-Trichloroethane	20.0	17.9	17.0	23.0	
Carbon tetrachloride	20.0	18.9	17.0	23.0	
Bromodichloromethane	20.0	19.4	17.0	23.0	
1,2-Dichloropropane	20.0	19.7	17.0	23.0	
Trichloroethene	20.0	19.5	17.0	23.0	
Dibromochloromethane	20.0	20.9	17.0	23.0	
2-Chloroethyl vinyl ether	23.3	24.0	19.8	26.8	
Bromoform	20.0	17.1	17.0	23.0	
Tetrachloroethene	20.0	18.9	17.0	23.0	
Chlorobenzene	20.0	17.7	17.0	23.0	
Benzene	20.0		17.0	23.0	
Toluene	20.0		17.0	23.0	
Ethylbenzene	20.0		17.0	23.0	
p-Xylene	20.0		17.0	23.0	
m-Xylene	20.0		17.0	23.0	
o-Xylene	20.0		17.0	23.0	
p-Dichlorobenzene	20.0		17.0	23.0	
m-Dichlorobenzene	20.0		17.0	23.0	
o-Dichlorobenzene	20.0		17.0	23.0	

Reference for LLI #'s 1707904, 1707906

Dichlorodifluoromethane is not part of the routine check standard solution due to its coelution with vinyl chloride on the 1% SP-1000 Carbopack B column. If a peak for vinyl chloride is detected, confirmation, when possible, is performed using a capillary column to separate vinyl chloride and dichlorodifluoromethane.

Surrogate Recovery
Pesticides

Matrix: WATER

LLI Sample No.	Sample Code	S1 (NBNZ)	S2 (TCX)	S3 (DCAA)	S4 (OTHER)
BLK6/4	MTHBLK6/4	85			
1976425BKG	WBKG	85			
1976425MS	WMS	90			
1976425MSD	WMSD	86			
BLK6/12	MTHBLK6/12	82			
1979945	FB2-3	85			
1979946	B3MW3	100			
BLK6/16DK	MTHBLK6/16DK	91			
1980491	MW1PE	89			
1980492	MW4PE	84			
1980493	MW4DU	73			

	QC REC Limits Low	High
S1 (NBNZ) Nitrobenzene D5	60	120
S2 (TCX) Tetrachlorometaxylene		
S3 (DCAA) 2,4-Dichlorophenylacetic Acid		
S4 OTHER		

* = Surrogate Recovery is outside the QC limits
# = No established limits
D = Surrogates diluted out I = Interferences present

Comments:

Method Blank
Pesticides

Matrix..: WATER

Sample Information		Blank Contamination Information					
LLI Sample No.	Sample Code	CAS Number	Compound	Analysis Date	Blank Result	Units	LOQ
BLK6/4	MTHBLK6/4		Naphthalene	06/10/93	ND	ug/l	10
1976425BKG	WBKG		Acenaphthylene	06/10/93	ND	ug/l	20
1976425MS	WMS		Acenaphthene	06/10/93	ND	ug/l	20
1976425MSD	WMSD		Fluorene	06/10/93	ND	ug/l	2
			Phenanthrene	06/10/93	ND	ug/l	2
			Anthracene	06/10/93	ND	ug/l	1
			Fluoranthene	06/10/93	ND	ug/l	0.5
			Pyrene	06/10/93	ND	ug/l	2
			Benzo(a)anthracene	06/10/93	ND	ug/l	0.1
			Chrysene	06/10/93	ND	ug/l	1
			Benzo(b)fluoranthene	06/10/93	ND	ug/l	0.2
			Benzo(k)fluoranthene	06/10/93	ND	ug/l	0.1
			Benzo(a)pyrene	06/10/93	ND	ug/l	0.2
			Dibenzo(a,h)anthracene	06/10/93	ND	ug/l	0.2
			Benzo(g,h,i)perylene	06/10/93	ND	ug/l	0.5
			Indeno(1,2,3-cd)pyrene	06/10/93	ND	ug/l	0.5

COMMENTS:

Abbreviation Key
--- = Analysis not requested
ND = None detected
LOQ = Limit of Quantitation
* = Outside QC Limits

Unspiked Sample #....:1976425BKG
Spiked Sample #.....:1976425MS
Spiked Dup Sample #..:1976425MSD

Matrix: WATER

This MS/MSD applies to the following samples	Compound	Spike Added (ug/l)	Sample Conc (ug/l)	MS Conc (ug/l)	MSD Conc (ug/l)	MS % REC	MSD % REC	QC Limits REC	RPD	QC Limits RPD
LK6/4	Naphthalene	668.000	ND	583.800	591.800	87	89	46 -120	1	100
1976425BKG	Acenaphthylene	696.000	ND	660.500	663.200	95	95	48 -120	0	100
976425MS	Acenaphthene	984.000	ND	916.500	924.400	93	94	49 -120	1	100
976425MSD	Fluorene	101.600	ND	99.000	96.600	97	95	51 -120	2	100
BLK6/12	Phenanthrene	33.000	ND	33.090	32.900	100	100	58 -120	1	100
1979945	Anthracene	16.160	ND	14.210	13.750	88	85	51 -120	3	100
979946	Fluoranthene	13.000	ND	12.350	12.250	95	94	58 -121	1	100
LK6/16DK	Pyrene	64.320	ND	61.330	61.770	95	96	59 -120	1	100
1980491	Benzo(a)anthracene	7.720	ND	6.853	6.734	89	87	61 -124	2	100
1980492	Chrysene	34.800	ND	33.210	32.870	95	94	17 -122	1	100
980493	Benzo(b)fluoranthene	7.120	ND	6.858	6.871	96	97	63 -120	0	100
	Benzo(k)fluoranthene	4.800	ND	4.771	4.762	99	99	55 -122	0	100
	Benzo(a)pyrene	7.440	ND	7.421	7.434	100	100	56 -120	0	100
	Dibenzo(a,h)anthracene	12.960	ND	11.740	11.320	91	87	39 -120	4	100
	Benzo(g,h,i)perylene	41.900	ND	37.220	37.740	89	90	26 -120	1	100
	Indeno(1,2,3-cd)pyrene	20.500	ND	18.920	18.580	92	91	54 -120	2	100

ABBREVIATION KEY

MS = Matrix Spike
MSD = Matrix Spike Duplicate
ND = None Detected
RPD = Relative Percent Difference
--- = Analysis not requested
= No established limits

COMMENTS:

The stated QC limits are advisory limits only.

Lab Control Spike/Lab Control Spike Duplicate
Pesticides

Unspiked Sample #....:
Spiked Sample #.....:
Spiked Dup Sample #..:

Matrix: WATER

This LCS/LCSD applies to the following samples	Compound	LCS Value	LCSD Value	QC Limits REC	RPD	QC Limits RPD
	Naphthalene	100.00		46 -120		
	Acenaphthylene	100.00		48 -120		
	Acenaphthene	100.00		49 -120		
	Fluorene	100.00		51 -120		
	Phenanthrene	100.00		58 -120		
	Anthracene	100.00		51 -120		
	Fluoranthene	100.00		58 -121		
	Pyrene	100.00		59 -120		
	Benzo(a)anthracene	100.00		61 -124		
	Chrysene	100.00		17 -122		
	Benzo(b)fluoranthene	100.00		63 -120		
	Benzo(k)fluoranthene	100.00		58 -122		
	Benzo(a)pyrene	100.00		56 -120		
	Dibenzo(a,h)anthracene	100.00		39 -120		
	Benzo(g,h,i)perylene	100.00		26 -120		
	Indeno(1,2,3-cd)pyrene	100.00		54 -120		

ABBREVIATION KEY

LCS = Lab Control Spike LCSD = Lab Control Spike Duplicate
ND = None Detected --- = Analysis not requested
RPD = Relative Percent Difference
# = No established limits

COMMENTS:

Surrogate Recovery
Pesticides

Matrix: SOIL

LLI Sample No.	Sample Code	S1 (NBNZ)	S2 (TCX)	S3 (DCAA)	S4 (OTHER)
BLK6/160I	MTHBLK6/160I	83			
1980469BKG	SBKG	84			
1980469MS	SMS	88			
1980469MSD	SMSD	73			
1979943	B4-15	73			
BLK6/23	MTHBLK6/23	62			
1979942R	B4-10	80			
BLK6/11	MTHBLK6/11	78			
1978472	B-2-6	78			
1978473	B-2-8	81			
1979040	S36--	78			
1979041	S3-14	74			
1979042	B1-14	78			
1979043	B1-20	69			

	QC REC Limits Low	High
S1 (NBNZ) Nitrobenzene D5	50	120
S2 (TCX) Tetrachlorometaxylene		
S3 (DCAA) 2,4-Dichlorophenylacetic Acid		
S4 OTHER		

* = Surrogate Recovery is outside the QC limits
# = No established limits
D = Surrogates diluted out I = Interferences present

Comments:

Method Blank
Pesticides

Matrix..: SOIL

Sample Information		Blank Contamination Information				
LLI Sample No.	Sample Code	CAS Number	Compound	Analysis Date	Blank Result	Units	LOQ
BLK6/11	MTHBLK6/11		Naphthalene	06/14/93	ND	mg/kg	2
1978472	B-2-6		Acenaphthylene	06/14/93	ND	mg/kg	2
1978473	B-2-8		Acenaphthene	06/14/93	ND	mg/kg	2
1979040	S36--		Fluorene	06/14/93	ND	mg/kg	2
1979041	S3-14		Phenanthrene	06/14/93	ND	mg/kg	0.5
1979042	B1-14		Anthracene	06/14/93	ND	mg/kg	0.5
1979043	B1-20		Fluoranthene	06/14/93	ND	mg/kg	0.2
			Pyrene	06/14/93	ND	mg/kg	0.2
			Benzo(a)anthracene	06/14/93	ND	mg/kg	0.01
			Chrysene	06/14/93	ND	mg/kg	0.1
			Benzo(b)fluoranthene	06/14/93	ND	mg/kg	0.02
			Benzo(k)fluoranthene	06/14/93	ND	mg/kg	0.02
			Benzo(a)pyrene	06/14/93	ND	mg/kg	0.02
			Dibenzo(a,h)anthracene	06/14/93	ND	mg/kg	0.02
			Benzo(g,h,i)perylene	06/14/93	ND	mg/kg	0.05
			Indeno(1,2,3-cd)pyrene	06/14/93	ND	mg/kg	0.05

COMMENTS:

Abbreviation Key
--- = Analysis not requested
ND = None detected
LOQ = Limit of Quantitation
* = Outside QC Limits

Matrix Spike/Matrix Spike Duplicate
Pesticides

Unspiked Sample #....:1980469BKG
Spiked Sample #.....:1980469MS
Spiked Dup Sample #..:1980469MSD

Matrix: SOIL

This MS/MSD applies to the following samples	Compound	Spike Added (mg/kg)	Sample Conc (mg/kg)	MS Conc (mg/kg)	MSD Conc (mg/kg)	MS % REC	MSD % REC	QC Limits REC	RPD	QC Limits RPD
BLK6/160I	Naphthalene	11.100	ND	11.840	10.990	107	99	57 -120	7	100
1980469BKG	Acenaphthylene	11.600	ND	12.190	11.190	105	96	66 -120	9	100
1980469MS	Acenaphthene	16.400	ND	17.730	16.350	108	100	69 -120	8	100
1980469MSD	Fluorene	1.690	ND	1.970	1.690	117	100	71 -124	15	100
1979943	Phenanthrene	0.550	ND	0.637	0.567	116	103	62 -140	12	100
BLK6/23	Anthracene	0.270	ND	0.252	0.269	93	100	43 -140	7	100
1979942R	Fluoranthene	0.220	ND	0.251	0.230	114	105	64 -137	9	100
BLK6/11	Pyrene	1.080	ND	1.213	1.079	112	100	65 -122	12	100
1978472	Benzo(a)anthracene	0.130	ND	0.143	0.126	110	97	51 -150	13	100
1978473	Chrysene	0.580	ND	0.670	0.565	116	97	44 -139	17	100
979040	Benzo(b)fluoranthene	0.120	ND	0.141	0.117	118	98	62 -120	19	100
979041	Benzo(k)fluoranthene	0.080	ND	0.092	0.081	115	101	58 -124	13	100
1979042	Benzo(a)pyrene	0.120	ND	0.116	0.109	97	91	44 -123	6	100
1979043	Dibenzo(a,h)anthracene	0.220	ND	0.249	0.220	113	100	63 -120	12	100
	Benzo(g,h,i)perylene	0.700	ND	0.832	0.687	119	98	58 -120	19	100
	Indeno(1,2,3-cd)pyrene	0.340	ND	0.392	0.330	115	97	42 -127	17	100

ABBREVIATION KEY
MS = Matrix Spike
MSD = Matrix Spike Duplicate
ND = None Detected
RPD = Relative Percent Difference
--- = Analysis not requested
= No established limits

COMMENTS:

The stated QC limits are advisory limits only.

Lab Control Spike/Lab Control Spike Duplicate
Pesticides

Unspiked Sample #....:
Spiked Sample #.....:
Spiked Dup Sample #..:

Matrix: Soil

This LCS/LCSD applies to the following samples	Compound	LCS Value	LCSD Value	QC Limits REC	RPD	QC Limits RPD
	Naphthalene	100.00		64 -120		
	Acenaphthylene	100.00		66 -120		
	Acenaphthene	100.00		51 -131		
	Fluorene	100.00		73 -120		
	Phenanthrene	100.00		80 -115		
	Anthracene	100.00		51 -120		
	Fluoranthene	100.00		80 -120		
	Pyrene	100.00		74 -120		
	Benzo(a)anthracene	100.00		78 -124		
	Chrysene	100.00		44 -125		
	Benzo(b)fluoranthene	100.00		77 -120		
	Benzo(k)fluoranthene	100.00		70 -120		
	Benzo(a)pyrene	100.00		68 -115		
	Dibenzo(a,h)anthracene	100.00		72 -121		
	Benzo(g,h,i)perylene	100.00		68 -120		
	Indeno(1,2,3-cd)pyrene	100.00		64 -122		

ABBREVIATION KEY

LCS = Lab Control Spike LCSD = Lab Control Spike Duplicate
ND = None Detected --- = Analysis not requested
RPD = Relative Percent Difference
# = No established limits

COMMENTS:

Sample Information		Method Blank Analysis				Matrix: WATER			
LLI Sample No.	Client Designation	Parameter	Method	Analysis Date	Meth Blank Desig.	Batch Number	Blank Result	Units	LOQ
		Anion Scan							
		Fluoride	IC				---	mg/L	
		Chloride	IC				---	mg/L	
		Nitrite-N	IC				---	mg/L	
		Bromide	IC				---	mg/L	
		Nitrate-N	IC				---	mg/L	
		Phosphate	IC				---	mg/L	
		Sulfate	IC				---	mg/L	
		Ammonia-N	TAA				---	mg/L	
		Chloride	IC				---	mg/L	
		Chlorine	IC				---	%	
		Cyanide	TAA				---	mg/L	
		Cyanide Reactivity	TAA				---	mg/Kg	
		Nitrite - N	IC				---	mg/L	
		Nitrate - N	IC				---	mg/L	
		Phenol	TAA				---	mg/L	
		Phosphorus	TAA				---	mg/L	
		Sulfate	IC				---	mg/L	
		TOC	TOC				---	mg/L	
		TOX	TOX				---	ug/L	
		Kjeldahl Nitrogen	TAA				---	mg/L	

Comments:

ABBREVIATION KEY

IC = Ion Chromatography	--- = Analysis not requested
TAA = Technicon AutoAnalyzer	ND = Not Detected
D = Distillation	J = Estimated Value below LOQ
TOC = Total Organic Carbon	LOQ = Limit of Quantitation
TOX = Total Organic Halogens	NA = Not Applicable

Sample Information		Matrix Spike Analysis									Matrix: WATER	
LLI Sample No.	Client Designation	Parameter	Meth	Analysis Date	Unspiked Desig.	Unspiked Result	LOQ	Spiked Desig.	Spike Added	Spiked Result	Units	%REC
		Anion Scan										
		Fluoride	IC			---				---	mg/L	
		Chloride	IC			---				---	mg/L	
		Nitrite-N	IC			---				---	mg/L	
		Bromide	IC			---				---	mg/L	
		Nitrate-N	IC			---				---	mg/L	
		Phosphate	IC			---				---	mg/L	
		Sulfate	IC			---				---	mg/L	
		Ammonia-N	TAA			---				---	mg/L	
		Chloride	IC			---				---	mg/L	
		Chlorine	IC			---				---	%	
		Cyanide	TAA			---				---	mg/L	
		Cyanide Reactivity	TAA			---				---	mg/Kg	
		Nitrite - N	IC			---				---	mg/L	
		Nitrate - N	IC			---				---	mg/L	
		Phenol	TAA			---				---	mg/L	
		Phosphorus	TAA			---				---	mg/L	
		Sulfate	IC			---				---	mg/L	
		TOC	TOC			---				---	mg/L	
		TOX	TOX			---				---	ug/L	
		Kjeldahl Nitrogen	TAA			---				---	mg/L	

% Recovery Control Limit 75
% Recovery Control Limit 125

Comments:

ABBREVIATION KEY

IC = Ion Chromatography	--- = Analysis Not Requested
TAA = Technicon AutoAnalyzer	ND = Not Detected
D = Distillation	J = Estimated Value below LOQ
TOC = Total Organic Carbon	LOQ = Limit of Quantitation
TOX = Total Organic Halogens	NA = Not Applicable
	* = Out Of Specification

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Quality Control Summary

Duplicate Analysis
Instrumental Analysis Data

Sample Information		Duplicate Analysis						Matrix: WATER				
LLI Sample No.	Client Designation	Parameter	Meth	Analysis Date	1st Dup Desig.	1st Dup Result	LOQ	2nd Dup Desig.	2nd Dup Result	Units	RPD (%)	Control Limit
		Anion Scan										
		Fluoride	IC			---			---	mg/L		20
		Chloride	IC			---			---	mg/L		20
		Nitrite-N	IC			---			---	mg/L		20
		Bromide	IC			---			---	mg/L		20
		Nitrate-N	IC			---			---	mg/L		20
		Phosphate	IC			---			---	mg/L		20
		Sulfate	IC			---			---	mg/L		20
		Ammonia-N	TAA			---			---	mg/L		20
		Chloride	IC			---			---	mg/L		20
		Chlorine	IC			---			---	%		20
		Cyanide	TAA			---			---	mg/L		20
		Cyanide Reactivity	TAA			---			---	mg/Kg		20
		Nitrite - N	IC			---			---	mg/L		20
		Nitrate - N	IC			---			---	mg/L		20
		Phenol	TAA			---			---	mg/L		20
		Phosphorus	TAA			---			---	mg/L		20
		Sulfate	IC			---			---	mg/L		20
		TOC	TOC			---			---	mg/L		20
		TOX	TOX			---			---	ug/L		20
		Kjeldahl Nitrogen	TAA			---			---	mg/L		20

Comments:

ABBREVIATION KEY

IC = Ion Chromatography	---= Analysis Not Requested
TAA = Technicon AutoAnalyzer	ND = Not Detected
D = Distillation	J = Estimated Value below LOQ
TOC = Total Organic Carbon	LOQ= Limit of Quantitation
TOX = Total Organic Halogens	NA = Not Applicable
NR = Not Required	* = Out Of Specification

Lancaster Laboratories
Where quality is a science.

Quality Control Summary

Laboratory Control Standard
Instrumental Analysis Data

Sample Information		Laboratory Control Standard						Matrix: WATER	
LLI Sample No.	Client Designation	Parameter	Meth	Analysis Date	True LCS Value	LCS Value	LOQ	Units	%REC

Comments: The recovery range for LCS is plus or minus 20%.

ABBREVIATION KEY	
IC = Ion Chromatography	--- = Analysis Not Requested
TAA = Technicon AutoAnalyzer	ND = Not Detected
D = Distillation	AK = AlpKem
TOC = Total Organic Carbon	LOQ = Limit of Quantitation
TOX = Total Organic Halogens	NA = Not Applicable
	* = Out Of Specification

Sample Information		Method Blank Analysis				Matrix: WATER			
LLI Sample No.	Client Designation	Parameter	Method	Analysis Date	Meth Blank Desig.	Batch Number	Blank Result	Units	LOQ
		Alkalinity							
		to pH 8.3	M				---	mg/L	1
		to pH 4.5	M				---	mg/L	1
		Ammonia Nitrogen	TI				---	mg/L	1
		BOD	M				---	mg/L	2
		COD	TI				---	mg/L	50
		Free Cyanide	CO				---	mg/L	0.005
		Hexavalent Chromium	CO				---	mg/L	0.02
		MBAS	CO				---	mg/L	0.02
		Oil and Grease	G				---	mg/L	0.2
		Orthophosphate	CO				---	mg/L	0.01
		pH	M				---		0.01
		Petroleum Hydrocarbons	IR				---	mg/L	0.2
		Total Solids	OD				---	mg/L	10
		Total Dissolved Solids	OD				---	mg/L	10
		Total Suspended Solids	OD				---	mg/L	4
		Sulfide	TI				---	mg/L	0.1

Comments:

ABBREVIATION KEY

TI = Titration	--- = Analysis not requested
TU = Turbidimetric	ND = Not Detected
CO = Colorimetric	J = Estimated Value below LOQ
IR = Infrared Spectrophotometry	LOQ = Limit of Quantitation
G = Gravimetric	NA = Not Applicable
D = Distillation	M = Meter
OD = Oven Dried	

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Matrix: WATER

Sample Information		Matrix Spike Analysis											
LLI Sample No.	Client Designation	Parameter	Meth	Analysis Date	Unspiked Desig.	Unspiked Result	LOQ	Spiked Desig.	Spike Added	Spiked Result	Units	%REC	
		Alkalinity to pH 8.3	M			---				---	mg/L		
		to pH 4.5	M			---	1			---	mg/L		
		Ammonia Nitrogen	TI			---	1			---	mg/L		
		BOD	M			---	2			---	mg/L		
		COD	TI			---	50			---	mg/L		
		Free Cyanide	CO			---	0.005			---	mg/L		
		Hexavalent Chromium	CO			---	0.02			---	mg/L		
		MBAS	CO			---	0.02			---	mg/L		
		Oil and Grease	G			---	0.2			---	%		
		Orthophosphate	CO			---	0.01			---	mg/L		
		pH	M			---	0.01			---			
		Petroleum Hydrocarbons	IR			---	0.2			---	mg/L		
		Total Solids	OD			---	10			---	mg/L		
		Total Dissolved Solids	OD			---	10			---	mg/L		
		Total Suspended Solids	OD			---	4			---	mg/L		
		Sulfide	TI			---	0.1			---	mg/L		

% Recovery Control Limit

% Recovery Control Limit 125

Comments:

ABBREVIATION KEY

TI = Titration	--- = Analysis Not Requested
TU = Turbidimetric	ND = Not Detected
CO = Colorimetric	J = Estimated Value below LOQ
IR = Infrared Spectrophotometry	LOQ = Limit of Quantitation
G = Gravimetric	NA = Not Applicable
D = Distillation	M = Meter
OD = Oven Dried	* = Out Of Specification

Sample Information		Duplicate Analysis									Matrix: WATER				
LLI Sample No.	Client Designation	Parameter	Meth	Analysis Date	1st Dup Desig.	1st Dup Result	LOQ	2nd Dup Desig.	2nd Dup Result	Units	RPD (%)	Control Limit
		Alkalinity										
		to pH 8.3	M			---	1		---	mg/L		20
		to pH 4.5	M			---	1		---	mg/L		20
		Ammonia										
		Nitrogen	TI			---	1		---	mg/L		20
		BOD	M			---	2		---	mg/L		20
		COD	TI			---	50		---	mg/L		20
		Free Cyanide	CO			---	0.005		---	mg/L		20
		Hexavalent										
		Chromium	CO			---	0.02		---	mg/L		20
		MBAS	CO			---	0.02		---	mg/L		20
		Oil and Grease	G			---	0.2		---	%		20
		Orthophosphate	CO			---	0.01		---	mg/L		20
		pH	M			---	0.01		---			20
		Petroleum										
		Hydrocarbons	IR			---	0.2		---	mg/L		30
		Total Solids	OD			---	10		---	mg/L		20
		Total										
		Dissolved										
		Solids	OD			---	10		---	mg/L		20
		Total										
		Suspended										
		Solids	OD			---	4		---	mg/L		20
		Sulfide	TI			---	0.1		---	mg/L		20

Comments:

ABBREVIATION KEY

TI = Titration	---= Analysis Not Requested
TU = Turbidimetric	ND = Not Detected
CO = Colorimetric	J = Estimated Value below LOQ
IR = Infrared Spectrophotometry	LOQ= Limit of Quantitation
G = Gravimetric	NA = Not Applicable
D = Distillation	M = Meter
OD = Oven Dried	* = Out Of Specification
NR = Not Required	