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DATACHEM LABORATORIES
QUALITY ASSURANCE/
QUALITY CONTROL PROJECT
PLAN

QA-5/90

[This plan applies to DataChem Laboratories' response to RFP W060648 issued by Westinghouse Hanford Company]

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1.0 DOCUMENT IDENTIFICATION

Document Title:	Quality Assurance / Quality Control Project Plan
Document Control Number:	QA-5/90
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Plan Coverage: This document describes the Quality Assurance / Quality Control Project Plan for Analytical Testing Services in support of the Westinghouse Hanford Company.

CONCURRENCES:

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Approval for Implementation:

By: _____ Date: 9/20/90
James H. Nelson, Ph.D.
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By: _____ Date:

Westinghouse Hanford Company

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2.0 INTRODUCTION

This document is the DataChem Laboratories Quality Assurance/Quality Control Project Plan, prepared in response to request for proposal No. W060648 to provide analytical testing services in support of the Westinghouse Hanford Company (WHC), Richland, Washington 99352.

DataChem Laboratories (DCL) is committed, in strictly following this plan, to providing to WHC, analytical data that are of known and acceptable quality relating to accuracy, precision, and comparability.

3.0 PROJECT DESCRIPTION

3.1 Project Objective

The specific objective of this project is to provide the Westinghouse Hanford Company (WHC) with timely, accurate analytical results derived from analytical determinations performed according to EPA Contract Laboratory Program protocol on environmental and groundwater samples.

3.2 Samples and Analyses

Samples submitted under this project to DCL by WHC will include water and aqueous phases in solutions, and soil, sludge or sediment phase samples. The analyses will be performed by DCL in accordance with specific Task Agreements issued by WHC. Organic analyses will include identification and quantification of volatiles, semivolatiles (B/N/A), pesticides, and PCBs. Inorganic analyses will include identification and quantification of metals and cyanide.

3.3 Analytical Methodology

Analyses will be performed following analytical methods published by the federal Environmental Protection Agency (EPA) in the Contract Laboratory Program "Statement of Work - Organics" (2/88) and the Contract Laboratory Program "Statement of Work - Inorganics" (7/88).

4.0 ORGANIZATION AND RESPONSIBILITIES

4.1 Introduction

Ultimate responsibility for the conduct of all projects, and approval for the implementation of all programs at DCL, resides with the Laboratory Director, Dr. James H. Nelson. Functional responsibility for the analytical work is delegated to the Project Manager, Mr. James B. Johnston, and to the Quality Assurance Section Manager, Mr. Ronald H. Marsden.

4.2 Laboratory Director

The Laboratory Director is responsible to assure that DCL resources are adequately allocated to the project and that sufficient staffing and equipment are provided. He oversees and supports the Quality Assurance Section Manager.

4.3 Project Manager

The Project Manager has the responsibility of communication with the WHC Office of Sample Management (OSM) Technical Representative. He also works closely with the Technical Operations Section Managers at DCL in coordinating all functions relating to the receipt and analysis of samples from WHC and the reporting of data. The Project Manager is also responsible to assure that QA/QC recommendations and corrective actions are implemented for the project.

The Project Manager is authorized to conduct official discussions with the WHC OSM Technical Representative concerning the original contractual agreement and delivery orders, and any subsequent modifications to the contractual agreement and/or delivery orders.

4.4 Technical Operations Section Manager

The Technical Operations Section Manager has the responsibility of implementing the QA Project Plan, and for coordinating the sample analysis flow in the laboratory. This will be achieved through the following:

1. Assuring the provision of sufficient equipment, laboratory space, resources, personnel, and quality reagents and materials to properly conduct the required analyses;

2. Supporting the Quality Assurance Section Manager;

3. Assuring approved analytical methods and laboratory procedures are used for the analysis of field samples;

4. Ensuring that all provisions of the approved Quality Assurance/Quality Control Project Plan are fully implemented in the laboratory;

5. Ensuring the implementation of corrective action for any QA/QC deficiencies.

4.5 Quality Assurance Section Manager

The Quality Assurance Section Manager has the responsibility of establishing, overseeing, and auditing specific procedures for documenting, controlling, and validating analytical data quality. This will be accomplished, in part, through the following:

1 Monitoring the QA and QC activities of the laboratory to ensure conformance with authorized policies, procedures, and good laboratory practices, and recommending improvements as necessary;

2. Informing the Project Manager and/or the Technical Operations Section Managers of noncompliance with the approved QA Program;

3. Ensuring that all records, logs, standard operating procedures, project plans and analytical results and related data are maintained in a retrievable fashion;

4. Ensuring that standard operating procedures and project QA/QC plans are distributed to all appropriate laboratory personnel;

5. Establishing the correct procedures and criteria for evaluating whether analytical performance is acceptable and in-control;

6. Reviewing all laboratory QC data before those data are released, verifying that all data were collected properly under an in-control analytical system;

7. Maintaining quality control charts, documenting corrective actions, and ensuring that analysts implement and document corrective actions as they become necessary;

8. Ensuring that sample logs, instrumentation logs, and all QC documents are properly maintained, including frequency of entries;

The Quality Assurance Section Manager has the authority to:

1. Approve all analytical reports;

2. Reject analytical data which does not meet applicable quality control criteria;

3. Require re-performance of sample analyses which are determined to be out-of-control;

4. Evaluate data and determine apparent long-term trends which may require corrective action;

5. Suspend analytical work, when necessary, to assure corrective actions are taken and that an analysis is again in control.

5.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

5.1 Data Quality

The standard of data quality has been set primarily in the legislative acts of the Environmental Protection Agency, in the form of the analytical methods published for SW-846 and in the requirements of the Contract Laboratory Program. DataChem Laboratories, as a EPA Contract Laboratory, assents to those standards of analytical data quality.

Specific requirements for data quality are generally defined by the EPA for an analyte, matrix, and analytical system. These requirements generally specify calibration and tuning criteria. If these criteria are maintained, then the instrumental system is considered to be producing data of acceptable quality. Recovery of analytes from a matrix is monitored through the use of surrogate or analyte spikes. EPA has generated guidelines within the CLP protocols for acceptable spike recovery. The implication that spike recoveries within these guidelines are indicative of acceptable recovery of all analytes from the matrix is the criteria for acceptable data quality. All data reported by DCL will be documented to be within the EPA-CLP quidelines for acceptable quality. Any deviations from those guidelines will also be documented.

5.2 Data Precision and Accuracy

Data precision relates to the degree with which an analytical system can reproduce an analytical result either on the same sample (instrument precision) or on a duplicate sample processed through the entire analytical procedure (method precision). Instrumental precision is generally limited by the sample delivery system (injector) and/or the detector system. Overall analytical precision is affected by the entire process through which a sample passes, including sample splitting, extraction, digestion, or other sample preparation steps, and analysis.

Data accuracy relates to the degree with which the final calculated analytical result for a parameter agrees with the true value of that parameter in the sample. No direct comparison of values is possible with field sample

analyses, so accuracy is assessed through the analysis of quality control samples. Precision may be assessed from the analysis of field samples and quality control samples.

General data quality objectives for precision and accuracy for the WHC work are presented in Table 1.

TABLE 1

Data Precision and Accuracy Criteria

Parameter	Precision	Accuracy
Metals by ICP	± 20% RPD	± 20%
Metals by GFAA	± 20% RPD	± 15%
Metals by AA	± 20% RPD	± 20%
Volatiles by GC/MS	± 15% RPD	± 30%
Semi-Volatiles by GC/MS	± 40% RPD	30-120%
Pesticides/ Herbicides by GC	± 50% RPD	50-125%

RPD = Relative Percent Difference

5.3 Data Completeness

Completeness, or the measure of the amount of valid data produced by an analytical system compared to the amount of data expected from that system under normal conditions, is nominally at a level of 98% or better for all analytical systems. When an analytical system at DCL produces valid data on less than 95% of the samples processed through that system, the system is

considered to be out of control, and is investigated to determine the need for corrective action.

5.4 Data Representativeness

Representativeness, as a measure of the degree to which a field sample accurately reflects the conditions of the environment at the sampling point from which it was taken, is not within the auspices of the laboratory. DCL assures that field samples which require splitting into portions for analysis, will be split such that the split portion will be a reasonable representative of the whole of the sample submitted for analysis.

5.5 Data Comparability

All analyses performed for WHC will be done in strict accordance with approved analytical methods and within quality control guidelines, insuring the comparability of all data acquired under a specific method, within the confidence limits of the quality control parameters.

6.0 SAMPLE HANDLING

6.1 Sample Collection

DataChem Laboratories is not required to perform sample collection for WHC.

6.2 Sample Containers

DataChem Laboratories is not required to supply to WHC containers for sample collection or shipment. Sample containers used at DCL for receiving sample splits during sample preparation are of the same EPA standard quality as required for the original sample.

6.3 Sample Receipt

Samples are received at DCL during regular working hours (7:30 a.m. - 5:30 p.m., Monday through Friday) by the Sample Receipt Officer (SRO), or his designee. Samples which are received during other than regular working hours are placed into the Sample Receiving walk-in cooler until DCL Sample Receiving personnel are able to process them.

At the time of receipt of a sample shipment, the sample shipping containers are opened and the samples are inspected. An EPA-CLP Sample Log-in Sheet (Exhibit 1) is initiated at this time. This form includes entries for date of receipt, chain-of-custody identification, the condition of custody seals, documentation and sample tags present or missing, and correlation of sample labeling and sample document information.

Any irregularities or discrepancies between the samples and the documentation, including missing, broken, or damaged samples, are reported to the Project Manager.

6.4 Chain of Custody

Chain of custody records will be maintained for all WHC samples received at the laboratory. As samples are received at the laboratory, the SRO

(Page___of___Pages) **USEPA-CLP SAMPLE LOG-IN SHEET**

CASE NUMBER:_____

S.D.G. NUMBER:_____

AIR CARRIER:_____

AIR BILL No:_____

CHAIN-OF-CUSTODY RECORD No(s):
1._____
2._____
3._____

DATE:___-___-___ TIME:_____
(Mon-Day-Yr) (AM/PM)

_____
SAMPLE CUSTODIAN (signature)

Indicate if the following ITEMS are present.

	YES	NO	NO
1. Custody Seals on Shipping Container(s)	( )	( )	[
2. Chain of Custody Record(s)	( )	( )	[
3. Sample Tag(s)	( )	( )	[
4. Sample Container Lable(s)	( )	( )	[
5. Traffic Report(s) or S.A.S. Packing List(s)	( )	( )	[

SAMPLE INFORMATION: (*'s) Require a NOTE and NOTIFICATION of PROJ. MNGR.

MTRX -Sample Matrix---------- (S)Soil/Sediment;(W)water

COCR -Chain of Custody Record--- (A)No descrepencies-SMO Form Or Tag(s)
(*)Descrepencies

FDNO -SMO No(s) on Containers--- (A)Yes;
(*)No

SMOR -SMO Record Form---------- (A)SMO Record Form complete;
(*)SMO Record Form Incomplete

INTG -Container(s) Integrity---- (A)Acceptable;
(*)Broken or Leaking

SMO Sample No(s)	DataChem Sample No(s)	No Of Containers							SAMPLE INFORMATION					NOTES
		VOA	EXTR	SVOA	PEST	METL	CYAN		MTR.X	FDNO	COCR	SMOF	INTG	

NOTES:_____ _____

Exhibit 1.

9 1 1 2 2 4 3 1 6 3 0

signs the field chain of custody record and initiates the DCL Chain-of-Custody Record (Exhibit 2) and Sample Work Order (Exhibit 3). Copies of the Chain-of-Custody Record are maintained with all samples, sample splits, and sample extracts.

6.5 Sample Logging

At the time of sample receipt, an appropriate DCL reference number is assigned to each unique set of samples. Each individual sample is also labeled with a unique DCL laboratory sample number. Assigned laboratory numbers are recorded on the Sample Work Order, the DCL Chain-of-Custody Record, and the Sample Log-in Sheet. The Sample Secretary enters the data from the Work Order into the Laboratory Information Management System (LIMS) and files all pertinent documentation.

6.6 Sample Splitting

When required, samples are split in accordance with specific analytical requirements. Each container into which the samples are split is labeled with the associated laboratory number and a split identification.

6.7 Sample Storage

Except when samples are being split or processed for analysis, they are stored under refrigeration. Sample material remaining after splitting is stored in the Sample Receiving walk-in cooler for two weeks, then relocated to the long-term sample storage area. Approximately one week after the final report on a sample has been received by WHC, the remaining sample material will be returned to WHC, unless otherwise directed by WHC.

Samples awaiting transfer to an analyst are stored in the Sample Receiving walk-in cooler. As samples are assigned for analysis, the analyst transfers the samples to refrigerated storage in the laboratory or sample preparation area. Chain-of-Custody documents are maintained with the stored samples.

9 1 1 2 2 1 6 3 2

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CHAIN-OF-CUSTODY RECORD

Date Extracted: _____
Date Digested: _____
Date Analyzed: _____

Account:	DCL Set ID:	Sponsor:	SPLITS					
Field Comment:								

Date Sampled	Field ID Number	DCL Sample Number(s)	Sample Matrix	Number of Containers	Remarks

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Final Disposition: _____ Signature: _____

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Sample Work Order

QC Clearance: _____ TAT GOAL: _____

Sample Medium: _____ DCL Ref. #: _____

Project Manager: _____ DCL Lab. #: _____

Total # Samples: _____

Date Received: _____ RUSH Results by: Date: Time: Date Collected: _____

Client: _____ Preparation Required? ☐ ORG ☐ EPTX ☐ NO

Date for Mailing Report: _____

Reporting Group	Inorganic Analytes Requested	No. of Samples	Split ID	Storage Location	Method	Inst.	AF Item	Prep. By	Anal. By	Based On

Special Instructions: _____

Account: _____

AF Task Order: _____

Section Manager Approval: _____ Date

Reporting Group	Organic Analytes Requested	No. of Samples	Split ID	Storage Location	Method	Inst.	AF Item	Prep. By	Anal. By	Based On

Special Instructions: _____

Account: _____

AF Task Order: _____

Section Manager Approval: _____ Date

Reporting Group	Mass Spec. Analytes Requested	No. of Samples	Split ID	Storage Location	Method	Inst.	AF Item	Prep. By	Anal. By	Based On

Special Instructions: _____

Account: _____

AF Task Order: _____

Section Manager Approval: _____ Date

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Exhibit 3.

6.8 Sample Preparation

Samples are prepared for analysis in accordance with EPA-CLP Protocol delineated in SOW 7/88 and SOW 2/88.

After samples have been received, and split, those not requiring extraction procedures are transferred to a central walk-in cold storage area. They are stored in this area until they are scheduled for analysis. Samples not requiring extraction procedures are prepared for analysis, within the required holding times, by the analyst, or by a technician working under the direction of the analyst. These samples are usually analyzed within hours after preparation.

Samples which require multi-hour extraction procedures are usually prepared for analysis by a separate Extraction Group. The extracts of these samples are stored in refrigerators in appropriate analytical areas of the laboratory until analyzed. Samples are extracted and the extracts are analyzed within the holding times specified.

6.9 Holding Times

The holding times specified in applicable EPA-CLP SOW 7/88 or SOW 2/88 are adhered to for all WHC analytical work.

7.0 SAMPLE ANALYSIS

7.1 Standards

Analytical standards are prepared from analytical quality standard materials obtained by DCL from the EPA, the National Institute of Standards and Technology (NIST), or other commercial sources. Commercial secondary standard materials are used when primary standard materials (EPA, NIST) are available in only limited quantity. The secondary standards are referenced to primary standards whenever possible.

Standard materials procured from commercial sources other than the EPA, or the NIST, are considered as off-the-shelf materials. The purity and identity these materials is established from both analysis documentation supplied by the vendor and DCL analytical data.

Metals are traceable to NIST standards, whenever possible. Off-the-shelf materials are characterized against EPA or NIST known standards whenever possible.

7.2 Solutions

Analytical standard working solutions are normally prepared by the analyst performing the analysis, in accordance with the protocol defined in the approved analytical method. In some analytical procedures, a designated analyst prepares the standards, while other analysts carry out the procedure.

As new or replacement standard solutions are prepared, they are validated against either the previously used standard, a commercially prepared quantitative standard, or a standard prepared by another analyst for the purpose of validation.

Although validation acceptance criteria are established for each analytical method, protocol guidelines for acceptance of a new solution are that the new solution is found, by analysis, to be within ±5% of the target value. All validations are documented either in the analyst's notebook or in a standards preparation logbook unique to the analytical area using the standards.

7.3 Instrument Calibration Procedures and Frequency

Instrument calibration protocols are included in each analytical method. Chromatographic and spectrometric instrumentation are tuned according to the procedures and criteria, and at the frequency, required in the analytical methods. For all analytical systems, analytical standards are analyzed routinely with each batch of samples. For inorganic analyses, a standard curve is established, then check standards are analyzed with each subsequent set of samples to validate the initial calibration curve. Check standards must be within ± 10% of the original curve for validation. Failure requires the initiation of investigation and corrective action. For organic analyses, instrument tuning and new calibration curves are generated with the analysis of each set, or as specified in the applicable method. The criteria for the calibration curve and tuning are achieved, or corrective action is pursued by the analyst. Representative procedures are presented in Table 2.

Analytical balances are calibrated annually by the manufacturer. The calibration is checked weekly by quality control personnel, and by the analyst at the time of use. Thermometers are checked against an NIST traceable thermometer when placed in service.

7.4 Analytical Procedures

All field samples are analyzed in accordance with published EPA, or State of Washington approved analytical methods. Any minor deviations which are considered to be within the realm of analyst's discretion, such as optimization of the detector system or adjustment of gas flows, are recorded in the analyst's notebook.

9 1 1 2 2 5 1 6 3 6

TABLE 2
Calibration Procedures

INSTRUMENT	STANDARDS	FREQUENCY
GC	Three Analytical Standards to verify linearity plus one mid-range check sample.	Inject all standards at beginning of run. Inject check standard or evaluation standard every five analyses.
GC/MS	Mass calibration with PFTBA (tuning) and meet DFTPP criteria or BFB.	Every 12 hours
	Performance check SPCC and CCC compound criteria for standard must be met.	Before analysis of samples or blanks.
	Five Analytical Standards and continuing standard must pass CCC and SPCC criteria.	Before analysis of samples and blanks.
ICP	One analytical standard per analyte. One blank	Analysis of an ICV and an ICB at beginning of analytical run and a CCV and a CCB every 10 samples.

8.0 DATA PROCESSING

8.1 Data Reduction

The specific procedure used for reducing each type of analytical data is detailed in the appropriate analytical method.

Data are collected during the analysis of samples either directly into computer based data files (PE Nelson ACCESS*CHROM Data System for GC, HPLC, and IC systems, IBM PC interface for Finnigan GC/MS, PE 7300 or IBM PC-AT data systems for ICP), or onto hardcopy print-out sheets, which, in turn, are either instrument generated or hand written. Data are ultimately compiled in computer files either on a dedicated computer associated with the analytical instrument, as with GC/MS and ICP systems, or onto the DCL DEC-MicroVAX system.

To accomplish data reduction, mathematical models based on the analysis of standard samples are generated and used to determine the quantity of analyte present in field samples. Data processing by the computer includes calculations, generation of standard calibration curves, statistical analyses, and the generation of hardcopy output.

Four different computerized mathematical models are available at DCL for the generation of calibration curves. The analyst has the option of selecting the model which best fits standard data. The optional standard mathematical models are:

Linear	$Y = aX + b$
Quadratic	$Y = aX^2 + bX + c$
Exponential	$Y = a + b(1 - e^{cX})$
Nernst	$Y = a + b\,[\log (c + X)]$

where Y is the experimental observation and X is the concentration or amount of analyte of interest.

Data from the analysis of standards are used to determine the coefficients a, b, and c, as appropriate. These values define the standard curve, which is used to determine X from the observed value of Y (determined

experimentally for each analyte of each field sample). Data generated from the analysis of quality control samples are evaluated against the same calibration curve used for the evaluation of field sample data.

8.2 Data Validation

Initial data validation is accomplished during data collection through the use of quality control samples and calibration check standards. The quality control and calibration check standard data are reviewed during the data collection phase of the analysis to assure that the system is operating within acceptable quality control parameters. Detected errors initiate corrective action on the part of the analyst and a regeneration of data. Only analytically valid data are processed further.

The DCL quality assurance computer program is an integral companion to the data reduction program. Computer systems are used to provide an evaluation of QC results to the analyst at the time of the data processing pertinent to each sample set. QC results are evaluated against control limits, calculated from previously generated analytical data, and a report is given to the analyst automatically, with the report of QC replicate analyses and results of the field sample analyses.

Following an analyst's computer-based reduction of data and production of a final report, the entire assemblage of data is given to a peer analyst for review and validation. The peer analyst checks that the analytical method was followed, that there are no errors in the transcription of data, that the best-fit curve was used, and that the numerical report of data contains no calculation or transcription errors.

The data package is then reviewed by the Group Leader or Section Manager. The data report is particularly scrutinized to assure that all reported data values are in the proper range or have dilution factors, that the method has been carefully followed, and that instrumentation was properly tuned or calibrated. A general review of the data package is also made to assure that all required documentation is present.

The final step in data validation is the review by quality assurance. The quality control sample data are evaluated and any corrective action is initiated and documented as necessary.

8.3 Data Reporting

Following data validation, all documents and information pertinent to the analysis of a set of samples are collected into a data package. This package consists of chromatograms, copies of notebook and log pages, calibration and tuning data, final computer printouts, all chain of custody and shipping documents, and sample tags. The exact package contents vary with the method of analysis. The data package is copied and organized in accordance with EPA-CLP reporting requirements. The report data package is reviewed by the Document Control Officer, approved, and sent to WHC. The original documentation is filed in archives.

9.0 ANALYTICAL SYSTEM CONTROLS

9.1 Sample Control

As discussed in Section 5.1 (Sample Handling/Sample Collection), DCL is not responsible for the collection of samples from sites in the field. However, DCL will work in concert with WHC field personnel to assure sample and data quality. The Project Manager will communicate regularly with WHC Project personnel to alleviate sample shipping, holding time, and analysis difficulties.

Samples in the DCL facility are handled in accordance with Chain-of-Custody procedures.

9.2 Quality Control Samples

Quality control samples will be administered in accordance with the requirements of EPA-CLP SOW 7/88 and SOW 2/88. This will include blanks, replicate analyses, surrogates, matrix spikes, and matrix spike duplicates as specified in each analytical method.

At least one blank sample and one reagent blank are included with each set of analyses and processed through the complete analytical procedure to detect contamination in either collection media or reagents.

Replicate analyses of field samples will be performed at a rate of one in twenty samples, but not less then one in each sample set.

Matrix spikes and matrix spike duplicates will be performed for those analytical methods to which they are applicable.

Check standards are samples prepared by a person other than the analyst, at a concentration near the mid-range of the analytical method. They are used to validate that the analytical standards are properly prepared and that the instrumentation is properly calibrated. Check standards are not processed as are field samples, but are prepared ready for analysis.

Surrogate spiking solutions and surrogate spiked samples required in the GC/MS methods for volatile and semi-volatile organic compounds are prepared and administered by the GC/MS Sections and the Extraction Group, respectively.

9.3 Double Blind Quality Control Samples

Double blind quality control spike samples are normally introduced into the sample handling procedure at the time of sample collection. DCL will not be collecting samples for WHC. However, double blind quality control samples may be introduced into the sample handling process at the time that field samples, sent by WHC, are received at DCL. The QC samples will be introduced at the rate of one sample for each ten sets of samples received for a single type of analysis. (e.g., semivolatiles, ICP-AES, cyanide, etc.)

If properly labeled field sample containers are available from WHC, they will be used by QA/QC personnel to introduce the double blind samples at the time of sample receipt. Otherwise, DCL containers will be used.

For water samples, distilled, deionized water from the DCL laboratory system will be used as a matrix. No standardized matrix is available for use in a soil double blind QC sample. Since matrix interaction with any spiked analyte is both irregular and unpredictable, the use of a real soil greatly lessens the value of any spiked sample. Therefore, double blind QC samples for soil analyses will be introduced in an appropriate solvent matrix comparable to that of the field samples following extraction. Alternatively, DCL will work with WHC to prepare double-blind QC samples from an appropriate clean (contaminant free) matrix supplied by WHC, if this is desired.

The samples will contain from one to four analytes common to WHC field samples and at comparable concentrations.

QC data from double blind samples will be reported to WHC as requested.

9 1 1 2 2 0 1 3 4 2

10.0 AUDITS

10.1 WHC Audits

DataChem Laboratories is available for any required audits by WHC representatives.

10.2 Performance Audits

The DCL Quality Assurance Manager administers a continuous internal performance audit of the laboratory. The quality control procedures and samples referenced in this QA Project Plan are a major aspect of that audit system. Evaluation of the QC data generated and regular review of control charts are other aspects. As required, corrective action is initiated pursuant to the QC data review and evaluation.

Extramural performance audit programs include those administered by the State of Utah and by the EPA. The programs include the EPA's Water Supply Laboratory Performance Evaluation Study (WS series) and the Water Pollution Performance Evaluation Study (WP series). Under the EPA Contract Laboratory Program (CLP) quarterly audits are performed for both organic and inorganic parameters.

10.3 System Audits

The Quality Assurance Section Manager conducts internal system audits of critical functions within the laboratory. These audits including verification that instrument and data record keeping procedures are adequate, and verification that general good laboratory practices, analytical methods and standard operating procedures are being followed.

DataChem Laboratories is routinely audited by the EPA, the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Program Manager Rocky Mountain Arsenal (PMRMA, Army), State of Utah Department of Health, the National Institute of Occupational Safety and Health (NIOSH, industrial hygiene and environmental analyses), and, as scheduled, by a private auditor for work performed by DCL under EPA Toxic Substance Control Act Good Laboratory Practices (TSCA-GLP) regulations.

11.0 PREVENTATIVE MAINTENANCE

All analytical instrumentation used at DCL is maintained such that it will always provide high quality performance. Most instruments are maintained by the manufacturer, under contract. Instrument service records are maintained in a logbook unique for each instrument.

The primary objective of the instrument maintenance program is to assure the quality of the analytical data generated by the instrument. While there are analytical systems which require absolute calibration, such as balances, the majority of analytical systems used by DCL for the analysis of WHC samples are calibrated by the analyst at the time of use through analytical standards, as indicated in this Project Plan.

Major instrument systems which are calibrated on an "as used" basis are maintained under either an "on call" or a preventative maintenance contract with the manufacturer. Preventative maintenance is scheduled in each instrument contract. When an instrument cannot perform to specifications, and DCL electronics technicians cannot return it to specification, a contracted repair service, usually the manufacturer, is called.

Instrument systems which must maintain an absolute calibration, such as analytical balances, are serviced under contract with the manufacturer, usually on an annual basis. Balances are also periodically checked for accuracy by Quality Control personnel, using NIST traceable weights.

12.0 DATA ASSESSMENT

12.1 Assessment Policy

It is established DCL policy that no analytical data are reported by the laboratory until approved by the Quality Assurance Section Manager or his designee.

12.2 Acceptance/Rejection Criteria

The criteria for acceptance of a set of field sample analysis data may be based on either of two data sources. One criteria is based on the evaluation of precision and accuracy data, generated from the replicate analyses of field samples and/or the analyses of internally generated QC samples or spikes, which have been analyzed with the set of field samples.

Acceptable precision measurements, based on replicate field sample analytical values, are indicative of an analytical system that is in control and producing accurate data. However, the accuracy of field sample data may more precisely be assessed through the analysis of data generated from appropriate QC samples processed with the field samples. Data from the analysis of internally prepared QC samples are evaluated against established quality control limits and determined to be in control, within warning limits, or out-of-control. Unacceptable results for accuracy in the analysis of quality control samples will generally override any acceptability based upon field sample precision measurements. Statistical procedures for the generation of control limits for accuracy and precision are presented in the DCL Environmental Chemistry Quality Assurance Manual (QA-2/83, Revised 9/90).

Accuracy and precision charts are maintained for all analytes used in control samples. Control limits are updated after 20 additional in-control points have been accumulated in the data base. Computer generated control charts are maintained by Quality Assurance.

A second criteria for the acceptance of field sample data is based on EPA guidelines for surrogate or spike recovery, as delineated in EPA-CLP SOW 7/88 and SOW 2/88.

12.3 Out-of-Control Conditions

An out-of-control situation may involve either a single data point or the trend established by several data points in succession. Data trends, which may indicate an out-of-control situation, include several related points on the same side of the mean value, several related points trending in the same direction (higher or lower), or cyclical trends.

9 1 1 2 2 4 3 1 6 4 6

13.0 CORRECTIVE ACTION

When, as a result of a performance or system audit, or the analysis of quality control samples, the analytical or other laboratory systems are found to be operating unsatisfactorily, corrective action is initiated.

The unsatisfactory situation may be of a long or short term nature. Immediate short term problems may include unsatisfactory performance on quality control samples (which may be more involved than simply out-of-control data), errors or omissions in the compilation of a data package, or other problems peculiar to a single set of samples. Long term problems include trends or cycles in quality control sample analysis data, standard and solution preparation control, staff training in analytical and quality control procedures, or other problems which affect several analytical methods or multiple sets of samples.

When an analytical method or sample preparation procedure is determined to be out of control, the analysis of field samples relating to that method or procedure is suspended. Investigation by the analyst and Quality Assurance personnel is required to determine the cause of the condition and to decide upon appropriate corrective action. The pertinent details of the situation, and the corrective action taken, are fully documented in a Corrective Action Report (CAR) (Exhibit 4). The method or procedure must be demonstrated to be in control, usually through the acceptable analysis of an appropriate set of quality control samples, before analysis of field samples is reinstated. Field sample data affected by the situation are evaluated and field samples are reanalyzed, as necessary.

Corrective action peculiar to EPA-CLP requirements for reporting and documentation are delineated in SOP-EPA-035. Pertinent corrective action, as required under CLP protocol, will be reported to WHC.

Finalized corrective action reports are maintained by the Quality Assurance Manager.

Problem Analyte(s) _____ DCL or Agency ID No. _____

QUALITY ASSURANCE/QUALITY CONTROL CORRECTIVE ACTION RECORD

Quality Assurance Comments:

QAM: Date:

Management Action:

Signature: Date:

Analyst Response (see back of form):

Analyst: Date:

Quality Assurance Approval:

QAM: Date:

Exhibit 4. Corrective Action Record

9 1 1 2 2 9 3 1 5 4 8

14.0 QUALITY CONTROL REPORTS

Quality control data are generated with each set of analyzed field samples. These data are documented in the data package associated with each set. The data package, which contains all information pertinent to the reported data, including instrumental output (chromatograms or other hard copy output) for each field sample, replicates, reagent blanks, matrix spikes, matrix spike duplicates, and laboratory control samples; copies of laboratory notebook pages containing data relating to the preparation or analysis of each WHC sample; and documentation of instrumental calibrations during analysis of each WHC sample. A copy of the data package for each set of WHC samples will be available to WHC upon request.

DataChem Laboratories will provide to WHC the evaluation report on results of the EPA WS and WP series performance audits. DCL will also provide to WHC any follow-up reports on WS or WP series audits.

Quality control situations which adversely affect data generated from the analysis of WHC samples will be reported to WHC by the DCL Project Manager.