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PCB Analysis Plan for Tank Archive Samples

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PCB ANALYSIS PLAN FOR TANK ARCHIVE SAMPLES

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LIST OF ABBREVIATIONS

BLK	blank
DQO	data quality objective
DST	double-shell tank
EPA	U.S. Environmental Protection Agency
GC/ECD	gas chromatography/electron capture detector
LCS	laboratory control sample
MSD	matrix spike duplicate
MTRX	matrix
N/A	not applicable
PCB	Polychlorinated Biphenyls
RPD	relative percent difference
QA	quality assurance
QC	quality control
TSCA	Toxic Substance Control Act
Wt%	weight percent
%	percent
μg/g	micrograms per gram
μg/L	micrograms per liter
μg/mL	micrograms per milliliter
μg/L	micrograms per liter

PCB ANALYSIS PLAN FOR TANK ARCHIVE SAMPLES

1.0 ANALYSIS OBJECTIVES

This analysis plan specifies laboratory analysis, quality assurance/quality control (QA/QC), and data reporting requirements for analyzing polychlorinated biphenyls (PCB) concentrations in archive samples. Tank waste archive samples that are planned for PCB analysis are identified in Nguyen 2001. The tanks and samples are summarized in Table 1-1. The analytical data will be used to establish a PCB baseline inventory in Hanford tanks.

Table 1-1. Archive Samples To Be Used for PCB Analysis

Tank	Liquid Samples (And Type)	Solids Samples (And Type)	
241-AW-105	Composite of grab samples 96-1, 96-10, and 96-20	Composite of core 195, segments 4, 6, and 9	Composite of core 196, segments 4, 6, and 9
241-SY-101	Composite of grab samples 1SY-00-01, 1SY-00-6, and 1SY-00-10	Composite of grab samples 1SY-00-01, 1SY-00-6, and 1SY-00-10	Not available
241-AP-103	Composite of grab samples 3AP-99-1, 3AP-99-2, and 3AP-99-3	Solids not available	
241-AZ-101	Existing core 269 composite	Grab 67	Not available
241-S-111	Composite of grabs S111-99-1, S111-99-2, and (S111)-99-3	Existing core 149 composite	Existing core 237 composite
241-AZ-102	Existing 268 composite	Existing core 262 composite	Existing core 268 composite
241-AN-104	Existing core 164 composite	PCB data for solids are available	
241-S-102	Composite of grab samples 2S-98-1, 2S-98-2, and 2S-98-3	Existing core 125 composite	Existing core 130 composite
241-AN-103	Existing core 166 composite	PCB data for solids are available	
241-BY-105	Composite of core 251, segments 1, 3, and 5	Existing core 246 composite	Existing core 250 composite
241-BY-106	Existing core 65 composite	Existing core 64 composite	Existing core 121 composite
241-S-101	Composite of grab samples 1S-00-2 and 1S-00-3	Existing core 137 composite	Existing core 138 composite
241-S-107	Composite of core 105, segments 1 and 2 and core 110, segment 2	Existing core 110 composite	Existing core 111 composite
241-S-109	Composite of grab samples 9S-99-1, 9S-99-2, and 9S-99-3	Composite of core 158, segments 1, 2, and 4	Composite of core 160, segments 1 and 2

Until Data Quality Objectives (DQOs) for PCB analysis are developed, analysis of the archive samples will be performed in accordance with the requirements in the *Interim Basis for PCB Sampling and Analyses* (Banning 2001). This analysis plan will be modified as needed when the DQO is issued.

2.0 SAMPLE HANDLING

Some archive samples have been stored in the 222-S Laboratory hotcells for several years. Solids in some sample jars are dry such that water addition may be necessary to remove a sub-sample. If water addition is necessary, the laboratory may use deionized water. The added water shall be weighed and recorded.

Liquid samples shall be observed for a separable organic layer. If an organic phase is observed, the laboratory shall separate and store the organic. In addition, the laboratory shall notify the Toxic Substance Control Act (TSCA) Compliance Coordinator and the PCB Characterization Coordinator within 3 working days of the observation.

The PCB analysis will be performed on composite samples that are identified in Table 1-1. In general, two solids composite samples and one liquid composite sample will be analyzed for each tank. As shown in Table 1-1, most solids and a few liquid composite samples already exist. Preparation of some new solids and liquid composites will be needed. Direction for preparing new composite samples is provided in Section 2.1. Direction for grouping the composite samples for extraction and analysis is provided in Section 2.2.

2.1 DIRECTION FOR PREPARING NEW COMPOSITE SAMPLES

Four types of composites shall be prepared: (1) solids composites from core samples, (2) solids composites from grab samples, (3) liquid composites from grab samples, and (4) liquid composites from core samples. Direction for preparing each type of composite sample is provided below.

2.1.1 PREPARING SOLIDS COMPOSITES FROM CORE SAMPLES

Two core composites shall be prepared for each of the following tanks: 241-AW-105 and 241-S-109. Each new core composite shall be prepared by distributing equal weights of solids from the identified segments into a composite jar. Immediately prior to sub-sampling a segment jar for preparing a composite, the contents of the jar shall be homogenized, if possible. If a segment jar contains so much liquid that a representative solids sub-sample can not be obtained, the sample shall be decanted or centrifuged prior to sub-sampling. The separated liquid shall be retained in archive.

2.1.2 PREPARING SOLIDS COMPOSITES FROM GRAB SAMPLES

Solids composite for tank 241-SY-101 shall be prepared by centrifuging the grab samples and placing all centrifuged solids from the samples into a composite jar. (Note: all tank 241-SY-101 grab samples were taken from a single riser; therefore, only one composite sample will be made).

2.1.3 PREPARING LIQUID COMPOSITES FROM GRAB SAMPLES

Liquid composite samples for tanks 241-AW-105, 241-SY-101, 241-AP-103, 241-S-111, 241-S-102, 241-S-101, and 241-S-109 shall be prepared by distributing equal liquid aliquots (weights) from the appropriate grab samples into a tank composite jar. The liquid tank composite samples shall be centrifuged to remove suspended solids.

2.1.4 PREPARING LIQUID COMPOSITES FROM CORE SAMPLES

Liquid composite for tank 241-S-107 shall be prepared by distributing equal aliquots from the identified core segments into a tank composite jar. The liquid tank composite shall also be centrifuged prior to analysis.

2.2 DIRECTION FOR GROUPING SAMPLES

Solids and liquid samples will be extracted for PCBs using different equipment; therefore, solids and liquid composite samples shall be grouped separately for extraction and subsequent analysis. Batches (i.e., groups) of solids and liquid composites are specified in Tables 2-1 and 2-2, respectively. In general, the samples are grouped together based on availability of existing composite samples so that PCB analysis can start as soon as possible. Although no significant sources of matrix interference are expected for any of the tank wastes, an attempt is also made to group the samples according to possible similarity of waste matrix. For example, solids in Batch 1 consist of existing core composites from the 241-S tank farm; solids in Batch 2 consist of composites from two tank farms: 241-AZ and 241-BY; liquids in Batches 1 and 2 consist of composite samples from double-shell and single-shell tanks, respectively.

A minimum of four QC samples will be used for each batch: a matrix spike, a matrix spike duplicate, a laboratory blank, and a laboratory control sample. If more than one day is needed for analysis of samples in a group, a blank will be used for each day.

Table 2-1. Grouping for Solids Samples

BATCH	SAMPLES
1	241-S-111 core 149 composite 241-S-111 core 237 composite 241-S-102 core 125 composite 241-S-102 core 130 composite 241-S-101 core 137 composite 241-S-101 core 138 composite 241-S-107 core 110 composite 241-S-107 core 111 composite
2	241-AZ-101 grab 67 sample 241-AZ-102 core 262 composite 241-AZ-102 core 268 composite 241-BY-105 core 246 composite 241-BY-105 core 250 composite 241-BY-106 core 64 composite 241-BY-106 core 121 composite
3	241-AW-105 core 195 composite 241-AW-105 core 196 composite 241-SY-101 grab composite 241-S-109 core 158 composite 241-S-109 core 160 composite

Table 2-2. Grouping for Liquid Samples

BATCH	SAMPLES
1	241-AW-105 liquid composite 241-SY-101 liquid composite 241-AP-103 liquid composite 241-AZ-101 liquid composite 241-AZ-102 liquid composite 241-AN-104 liquid composite 241-AN-103 liquid composite
2	241-S-111 liquid composite 241-S-102 liquid composite 241-S-101 liquid composite 241-S-107 liquid composite 241-S-109 liquid composite 241-BY-105 liquid composite 241-BY-106 liquid composite

3.0 PCB ANALYSIS

All composite samples (existing and newly prepared by the direction provided in Section 2.0) shall be analyzed per requirements shown in Tables 3-1 and 3-2. These tables specify the required analyses, analytical method, laboratory procedure, quality control measures, and reporting requirements. All liquid samples shall be centrifuged to remove suspended solids prior to analysis. All liquid and solids samples shall be homogenized immediately before being sub-sampled for analysis.

The term "PCB analysis," as used in this plan, means analysis of the following Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260. The required detection limits specified in this plan are applicable to the individual Aroclors. PCB analytical procedure shall be based on the *Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods*, SW-846, Method 8082 (EPA 1996).

Table 3-1. Analytical Requirements for Liquid Samples

LIQUID ANALYSES													
Project Name		PCB Analysis of Archive Samples			Plan Number		RPP-7684, Rev. 0			REPORTING LEVELS			
PROGRAM		PROGRAM CONTACTS			COMMENTS					FORMAT I	Immediate Notification		
P-PCB		DST Engineering	D. M. Nguyen							FORMAT II	Process Control		
		CHG Environmentalt	J. W. Pratt							FORMAT III	Safety Screening		
										FORMAT IV	Waste Management		
										FORMAT V	RCRA Compliance		
PRIMARY ANALYSES				SAMP[1]	PREP[2]	QUALITY CONTROL[3]				CRITERIA			
PROGRAM	METHOD	ANALYSIS[4]	PROCEDURE	GRAB/SEG/ COMP	c/d/e	SPIKE	MSD	BLK	LCS	UNITS	NOTIFICATION LIMIT	EXPECTED RANGE	FORMAT
P	Visual	Organic	LA-519-151	COMP	d	N/A	N/A	N/A	N/A	none	presence	N/A	IV
P	GC/ECD	PCBs[5] (Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260)	LA-523-140	COMP	c-e[6]	1/batch	1/batch	1/AB	1/batch	µg /L	none	<20µg /L	IV

[1] SAMP: sample type, GRAB: grab sample, SEG: core segment, COMP: composite

[2] PREP: sample preparation, c: centrifugation, d:direct, e: extraction

[3] MSD: matrix spike duplicate, BLK: blank, LCS: laboratory control sample, N/A: not applicable

[4] The laboratory shall notify the PCB Characterization Coordinator if a specified procedure is revised or replaced

[5] Analyze and report results for individual Aroclors

[6] Use procedure LA-519-132 for centrifugation and procedure LA-523-115 for extraction

Table 3-2. Analytical Requirements for Solids Samples

SOLID ANALYSES														
Project Name		PCB Analysis of Archive Samples			Plan Number		RPP-7684, Rev. 0							
PROGRAM		PROGRAM CONTACTS			COMMENTS					REPORTING LEVELS				
P-PCB		DST Engineering	D. M. Nguyen							FORMAT I	Immediate Notification			
		RPP Environmental	J. W. Pratt							FORMAT II	Process Control			
										FORMAT III	Safety Screening			
										FORMAT IV	Waste Management			
										FORMAT V	RCRA Compliance			
PRIMARY ANALYSES				SAMP[1]	PREP[2]	QUALITY CONTROL[3]				CRITERIA				
PROGRAM	METHOD	ANALYSIS	PROCEDURE[4]	GRAB/ SEG/ COMP	c/d/e	SPIKE	MSD	BLK	LCS	UNITS	NOTIFICATION LIMIT	EXPECTED RANGE	FORMAT	
P	Gravimetry	Wt% water	LA-564-101	COMP	c-d	N/A	N/A	N/A	1/AB	wt%	none	50%	IV	
P	GC/ECD	PCBs[5] (Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260)	LA-523-140[5]	COMP	c-e[6]	1/batch	1/batch	1/day	1/batch	μg/kg[7]	none	< 5000 μg/kg	IV	

[1] SAMP: sample type, GRAB: grab sample, SEG: core segment, COMP: composite

[2] PREP: sample preparation, c:centrifugation, d:direct, e: extraction. Centrifugation may be omitted if the chemist determines that the step is not necessary (i.e., if the solids are judged to contain no drainable liquid).

[3] MSD: matrix spike duplicate, BLK: blank, LCS: laboratory control sample, N/A: not applicable

[4] The laboratory shall notify the PCB Characterization Coordinator if a specified procedure is revised or replaced.

[5] Analyze and report results for individual Aroclors

[6] Use procedure LA-519-132 for filtration and LA-523-115 for extraction

[7] The laboratory shall report solids results in both wet and dry weight bases

4.0 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Overall policies for maintaining quality of Characterization Project activities are described in *Waste Remediation System Characterization Project Quality Policies* (Board 1998). The *222-S Laboratory Quality Assurance Plan* (Clark 2001) specifies the requirements for assuring quality of sample analysis conducted at the laboratory. The requirements in the plan (and any revisions thereafter) shall meet the *Hanford Analytical Services Quality Assurance Requirements Document* (DOE-RL 1998) baseline requirements for laboratory quality systems. All analysis activities shall be performed using approved procedures that are consistent with the requirements in the *Letter of Intent for River Protection Project (RPP) Characterization Program: Process Engineering, Hanford Analytical Services, Characterization Project Operations, and Quality Assurance* (Adams et al. 2000).

Items (i.e., processes, services, activities, or conditions) that do not meet the requirements in the above plans (and this analysis plan) shall be controlled to prevent inadvertent use. Nonconforming items shall be identified, controlled, reported, and disposed of as required by the "Nonconforming Item Reporting and Control" (CHG 2001) or by laboratory approved internal procedure.

Specific criteria for QC samples and method detection limits for individual Aroclors are specified in Table 4-1. The laboratory shall achieve detection limits as low as feasible using current procedures and practices. Actual detection limits, instead of the required detection limits, shall be reported. If a required detection limit is exceeded, the laboratory shall notify the PCB Characterization Coordinator within 3 working days. The PCB Characterization Coordinator will provide direction for re-annalysis, if necessary.

The laboratory shall use calibration and calibration check standards appropriate for the analytical instrumentation being used (see DOE-RL 1998 for definition of QC samples and standards). The criteria presented are goals for demonstrating reliable method performance. The laboratory will use internal QC system for address any QC failures. If the QC failures are systematic and cannot be resolved by the internal protocols, the PCB Characterization Coordinator shall be consulted to determine the proper action. The laboratory should suggest a course of action, at that time. All data not meeting the QC requirements shall be properly noted and the associated QC failures be discussed in the narrative of the data report.

Table 4-1. Quality Control Criteria for PCB Analysis[1]

Analyte	Spike Recovery (%)	Matrix Spike Duplicate (Relative Percent Difference)	LCS Recovery (%)	Required Detection Limit
PCB Analysis of Liquid Samples				
PCB	50 - 150	30	70 - 130	20 µg/L[2]
Separable Organic	NA	NA	NA	NA
PCB Analysis of Solids Samples				
PCB	50 - 150	30	70 - 130	5000 µg/kg[2]
Weight % Water	NA	30[3]	80 - 120	NA

Note:

[1]Quality control samples shall be prepared in accordance with SW-846 guidelines whenever possible
[2]Required detection limit for individual Aroclor
[3]Relative Percent Difference (RPD) for primary and duplicate analyses

5.0 EXCEPTIONS AND CLARIFICATIONS

5.1 EXCEPTIONS TO AUTHORIZING REQUIREMENTS

The *Toxic Substance Control Act* (EPA 1998) generally requires PCB concentration in solids to be reported on dry weight basis. Determination of weight percent water in solids is requested to allow the necessary unit conversion to dry weight.

5.2 CLARIFICATIONS

The *Interim Basis for PCB Sampling and Analyses* (Banning 2001) requires that liquids with greater than 0.5% solids must be filtered or filtered prior to analysis. It is difficult to accurately determine percent solids at this level, thus centrifugation is required for all liquid composite samples.

6.0 ORGANIZATION

Points of contact for organizations that play significant roles in the PCB characterization are identified in Table 6-1.

Table 6-1. Points of Contact for PCB Archive Analysis Project

Roles	Point of Contact	Organization
PCB Characterization Coordinator	D. M. Nguyen 372-3042	Data Development and Interpretation (CHG)
TSCA Compliance Coordinator	J. W. Pratt 373-3035	Environmental (CHG)
Laboratory Project Coordinator	K. E. Bell 372-2553	222-S Analytical Services (FH)

Notes:

CHG CH2M HILL Hanford Group, Inc.
FH Fluor Hanford, Inc.
TSCA Toxic Substances Control Act

7.0 DELIVERABLES

All analyses shall be reported as Format IV as indicated in Tables 3-1 and 3-2. The Format IV report shall be a data package reporting the results of analyses performed and will resemble a regulatory data package without third party validation. A single data package shall be prepared for all analyses specified in this plan. The recommended reporting format and the raw data that shall be included are given in Section A5.0 of Adams et al. (2000). The data package shall include amounts and concentrations of standards used for preparing QC samples. The raw data shall be accessible to the program in accordance with the laboratory's Records Inventory and Disposition. The data package shall be issued 180 days after issuance of this analysis plan. In addition, a compact disk containing the data package shall be provided to the PCB Characterization Coordinator within 5 days of issuance.

In addition to this data package, the analytical results shall be up-loaded (i.e., electronically entered) into the Tank Characterization Database within seven (7) days of release of the data package. The electronic version shall be in the standard electronic format (Lang et al. 1999).

8.0 CHANGE CONTROL

All significant changes (such as deviations from the direction for sample handling or not performing some of the requested analyses) shall be documented by Double-Shell Tank Engineering via an Engineering Change Notice to this analysis plan or by a letter. Minor

changes may be made by the PCB characterization coordinator or the laboratory project coordinator via a Characterization Change Notice (CCN). Significance is determined by the PCB characterization coordinator. All changes shall be clearly documented in the final data report.

9.0

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