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TANK 241TY103 ROTARY CORE SAMPLING & ANALYSIS PLAN

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Kara Broz

10/30/95

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Tank 241-TY-103 Rotary Core Sampling and Analysis Plan

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

by

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LIST OF ABBREVIATIONS

DQO	data quality objective
DSC	differential scanning calorimetry
GEA	gamma energy analysis
HPGE/MCA	high purity germanium - multi channel analysis
IC	ion chromatography
ICP	inductively coupled plasma - atomic emission spectroscopy
LiBr	lithium bromide
PC	Project Coordinator
RSST	reactive system screening tool - adiabatic calorimetry
SAP	Sampling and Analysis Plan
SARP	Safety and Analysis Report for Packaging
TCP	Tank Characterization Plan
TGA	thermogravimetric analysis
TIC	total inorganic carbon
TOC	total organic carbon
TY-103	Tank 241-TY-103
WHC	Westinghouse Hanford Company

1.0 SAMPLING AND ANALYSIS OBJECTIVES

This Sampling and Analysis Plan (SAP) will identify characterization objectives pertaining to sample collection, laboratory analytical evaluation, and reporting requirements for two rotary-mode core samples from tank 241-TY-103 (TY-103). It is written in accordance with the *Tank Safety Screening Data Quality Objective* (Dukelow et al. 1995), *Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objective Process* (Meacham et al. 1995), and *Test Plan for Samples From Hanford Waste Tanks 241-BY-103, BY-104, BY-105, BY-106, BY-108, BY-110, TY-103, U-105, U-107, U-108, and U-109* (Meacham 1995). These data quality objectives (DQOs) are described in the Tank Characterization Plan (TCP) for tank TY-103 (Homi 1995a). This SAP will also identify procedures and requirements for collecting and characterizing samples from tank TY-103 by the rotary core sampling method.

2.0 SAMPLING EVENT REQUIREMENTS

As of May 31, 1995, tank TY-103 contained approximately 613,000 liters (162,000 gallons) of non-complexed waste. The tank contents was comprised entirely of sludge with no pumpable liquid remaining. The total volume of waste within the tank corresponded to a center line tank bottom depth of 169 centimeters (66 inches) (Hanlon 1995).

Prior to core sampling, the dome space (below the riser) shall be sampled and analyzed for the presence of flammable gases. The sample shall be taken from within the dome space and the data reported as a percentage of the Lower Flammability Limit (LFL). The results shall be submitted to the project coordinator (PC) within one week of the sampling event. If the limits are above 25% of the LFL when analyzing by gas chromatography/mass spectrometer (GC/MS) or gas-specific monitoring gauges, or above 10% of the LFL when analyzing with a combustible gas meter, the necessity for recurring sampling will be determined by the Flammable Gas Program.

Tank TY-103 is currently scheduled to be core sampled. At least two samples are expected to be taken from risers 8 and 18. If a different riser is necessary to meet sampling and analysis requirements, this change must be recorded and approved by the cognizant engineer before sampling. The risers used may be recorded on a permanent data sheet or recorded directly in the work package.

Four segments per core are expected to be taken from tank TY-103. Segment one should be 23 centimeters (9 inches), and segments two through four should be 48 centimeters (19 inches). The sampling objective is to obtain a vertical profile of the waste; therefore, more or fewer segments may need to be taken depending on the accuracy of the current waste volume records. For detailed information regarding the sampling activities, refer to work package WS-95-00146. This document contains the operating procedures and the chain-of-custody records for this sampling event.

One field blank for tank TY-103 shall be obtained by filling a sampler with deionized water. This field blank is to accompany the samples to the laboratory hot cell. All collected samples and the field blank shall be shipped to the laboratory following the *Load/Transport Sample Cask(s)* procedure (TO-080-090). Core samples shall be transported to the laboratory within three calendar days of each segment's

Occasionally, lithium bromide (LiBr) solution may be used to aid in the collection of the core samples. If LiBr solution is used, Sampling Operations must state this in the chain-of-custody form that accompanies the sample to the laboratory, and must provide a LiBr solution blank to the laboratory. The LiBr solution blank shall consist of a container filled with LiBr solution from the same batch of LiBr solution used during the sampling. This blank shall be analyzed for lithium and bromide in order to determine the concentration of the tracer at the time the core was taken. Only one LiBr solution blank per tank is required.

3.0 LABORATORY ANALYSIS REQUIREMENTS

3.1 ANALYSIS SCHEME

In order to comply with the safety screening and ferrocyanide DQOs, perform the following steps on each sample:

- ▶ Extrude solids.
- ▶ Filter liquids prior to analysis.
- ▶ Analyze samples on a quarter-segment basis, as shown in Table 1.
- ▶ Archive at least 10 mL of each subsegment or drainable liquid from each segment.

As a precautionary measure, the Safety and Analysis Report for Packaging (SARP) in the *Load/Transport Sample Cask(s)* procedure (TO-080-090) has been reviewed for any safety issues involved with transportation of tank TY-103 core samples. For core samples from tank TY-103, the shipping container must be vented every 47 days to release any accumulated gas.

Any decisions, observations, or deviations made to this work plan or during the sample breakdown and analyses shall be documented in writing with justification. These decisions and observations shall be reported in the data report. The reporting formats for analyses are stated in Table 1 and described in section 6.

3.2 SPECIFIC METHODS AND ANALYSES

The analyses in Table 1 to be performed on tank TY-103 core samples are based on the safety screening, and ferrocyanide DQOs referenced in Section 1.0. The laboratory procedure numbers, which shall be used for the analyses, are included in the table.

3.3 INSUFFICIENT SEGMENT RECOVERY

If the amount of material recovered from samples taken from a tank is insufficient to perform the analyses requested in the respective SAP and permit a minimum 10 mL archive per sample, the laboratory shall notify the PC within one working day. At that time, a prioritization of the analyses may be provided to the laboratories. Any analyses prescribed by the SAP, but not performed, shall be identified in the appropriate data report with justification for non-performance.

Table 1: Tank TY-103 Chemical, Radiological, and Physical Analytical Requirements

SOLID ANALYSES																
Project Name		TY-103 Rotary Mode Core Sample				COMMENTS							REPORTING LEVELS			
Plan Number		WHC-SD-WM-TSAP-039, REV. 0				Homogenization Test - Per Laboratory Discretion							FORMAT I		Early Notify	
						Field Blank - Required							FORMAT II		Process Control	
PROGRAM		PROGRAM CONTACTS				Hot Cell Blank - Per Laboratory Discretion							FORMAT III		Safety Screening	
A. Safety Screening		Safety Screening		E. J. Lipke		LiBr Solution Blank - Required							FORMAT IV		Waste Management	
B. Ferrocyanide		TWRS		J. Jo		TANK		#CORES					FORMAT V		RCRA Compliance	
C. Organic Test Plan						TY-103		2					FORMAT VI		Special	
PROGRAM	PRIMARY ANALYSES			SAMPLE ¹		PREP ²	QUALITY CONTROL ³						CRITERIA			FOR-MAT
	METHOD	ANAL.	WHC PROCEDURE	% SEG SLDG	% SEG SC		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT ⁴	EXPECTED RANGE ⁴	
A, B	DSC	Energy	LA-514-113	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	J/g ⁶	≥ 480	unknown	I, III, IV
A, B	TGA	% H ₂ O	LA-560-112	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	wt%	.022 [fuel (in J/g) - 1200]	47.5	I, III, IV
A	Alpha	Total Alpha	LA-508-101	X ¹⁰	X ¹⁰	f	ea smpl	1/mtrx	ea PB	ea AB	±10	90-110	µCi/g	> 41	0.2	I, III, IV
A, B	ICP	Fe, Al, Na, Mn, U, Cr, Ni, Si, Ca, P, Bi, Li	LA-505-151	X		f or a	ea smpl	see ⁷	ea PB	ea AB	±10	90-110	µg/g	Ni > 8000	unknown	I, III, IV
A	Gravimetry	bulk density	LO-160-103	X	X	d	N/A	N/A	N/A	ea AB	±10	90-110	g/mL	none	1.56	III, IV
A, B	Distillation	CN	LA-695-102	X		d	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/g	> 39,000	unknown	I, III, IV
A	IC	Br	LA-533-105	X	X	w	ea smpl	1/mtrx	ea PB	ea AB	±10	90-110	µg/g	none	unknown	III, IV
PROGRAM	SECONDARY ANALYSES			SAMPLE ¹		PREP ²	QUALITY CONTROL ³						CRITERIA			FOR-MAT
	METHOD	ANAL.	WHC PROCEDURE	% SEG SLDG	% SEG SC		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT ⁴	EXPECTED RANGE ⁴	
A	Sep. & α counting ⁹	Pu-239/240	LA-503-156	X ¹⁰	X ¹⁰	f	ea smpl	1/mtrx ⁶	ea PB	ea AB	±10	90-110	µCi/g	none	0.2	I, III, IV
A ⁹ , B ¹¹	ICP	Fe, Al, Na, Mn, U, Cr, Ni, Si, Ca, P, Bi	LA-505-151		X	f or a	ea smpl	see ⁷	ea PB	ea AB	±10	90-110	µg/g	none	unknown	III, IV
A, B, C	RSST ⁸	Energy	see 8 below	X	X	d	N/A	N/A	N/A	ea AB	±10	90-110	J/g ⁵	none	unknown	I, III, IV
B	Laser ¹¹	Particle Size	LT-519-101	X	X	d	N/A	N/A	ea AB	ea AB	N/A	70-130	J/g	none	unknown	IV
B	Direct Persulfate ¹¹	TC	LA-342-100	X	X	d	ea smpl	1/mtrx	ea AB	ea AB	±20	80-120	µg C/g	none	unknown	IV
A ¹² , B ⁶	Distillation	CN	LA-695-102		X	d	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/g	> 39,000	unknown	I, III, IV
A, B	Direct Persulfate ⁶	TOC	LA-342-100	X	X	d	ea smpl	1/mtrx	ea AB	ea AB	±20	80-120	µg C/g	> 30,000	1170	I, III, IV

Table 1: Tank TY-103 Chemical, Radiological, and Physical Analytical Requirements

¹¼ SEG SLDG-¼ segment, sludge; ¼ SEG SC-¼ segment saltcake

²d-direct, f-fusion, a-acid, w-water

³PR-precision, AC-accuracy, ea-each, smpl-sample, DUP-duplicate, SPK/MSD-spike and matrix spike duplicate, AB-analytical batch, PB-preparation blank, N/A-not applicable, mtrix-matrix

⁴Units for notification limits and expected range are those listed in the "units" column.

⁵Dry weight basis (to be calculated by Ferrocyanide Safety Program, with the exception of exothermic energy).

⁶Tracer or carrier may be used in place of a spike and results corrected for recovery.

⁷Either serial dilutions or matrix spikes will be performed.

⁸These analyses required if DSC exceeds notification limits. (The RSST method, yet to be proceduralized, may be found in WHC-SD-WM-TP-104.)

⁹Performed if total alpha exceeds notification limit

¹⁰Analyze only the bottom quarter segment of each segment extruded.

¹¹Perform this analysis if moisture decision threshold is violated.

¹²Perform if TOC is < 3 wt%.

Table 1: Tank TY-103 Chemical, Radiological, and Physical Analytical Requirements

LIQUID ANALYSES																
Project Name		TY-103 Rotary Mode Core Sample				COMMENTS							REPORTING LEVELS			
Plan Number		WHC-SD-WM-TSAP-039, REV. 0				Homogenization Test - Per Laboratory Discretion Field Blank - Required Hot Cell Blank - Per Laboratory Discretion LiBr Solution Blank - Required							FORMAT I		Early Notify	
													FORMAT II		Process Control	
PROGRAM		PROGRAM CONTACTS											FORMAT III		Safety Screening	
A. Safety Screening		Safety Screening		E. J. Lipke		TANK#CORES							FORMAT IV		Waste Management	
B. Ferrocyanide		TWRS		J. Jo									FORMAT V		RCRA Compliance	
C. Organic Test Plan						TY-103		2					FORMAT VI		Special	
PROGRAM	PRIMARY ANALYSES			SAMPLE ¹		PREP ²	QUALITY CONTROL ³						CRITERIA			FOR-MAT
	METHOD	ANAL.	WHC PROCEDURE	FB & S-LEV LIQ	LIQ COMP		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT ⁴	EXPECTED RANGE ⁴	
A, B	DSC	Energy	LA-514-113	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	J/g ⁵	≥ 480	unknown	I, III, IV
A, B	TGA	% H ₂ O	LA-560-112	X	X	d	ea smpl	N/A	N/A	ea AB	±10	90-110	wt%	.022 [fuel (in J/g) - 1200]	47.5	I, III, IV
A	ICP	Li, Fe, Mn, U, Cr, Ni, Al, Na, Si	LA-505-151	X		d ⁶	ea smpl	see 7	ea AB	ea AB	±10	90-110	µg/mL	none	unknown	III
A	IC	Br	LA-533-105	X		d ⁶	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/mL	none	unknown	III
A	α counting	Total Alpha	LA-508-101	X		d ⁵	ea smpl	1/mtrx	ea PB	ea AB	±10	90-110	µCi/g	> 41	0.2	I, III
A	SpG	Density	LA-510-112	X		d	ea smpl	N/A	N/A	ea AB	±20	80-120	g/mL	none	1.56	III
A	Visual	Organic Layer	LA-519-151	X		d	N/A	N/A	N/A	N/A	N/A	N/A		presence	unknown	I, III
PROGRAM	SECONDARY ANALYSES			SAMPLE ¹		PREP ²	QUALITY CONTROL ³						CRITERIA			FOR-MAT
	METHOD	ANAL.	WHC PROCEDURE	FB & S-LEV LIQ	LIQ COMP		DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	UNITS	NOTIFICATION LIMIT ⁴	EXPECTED RANGE ⁴	
A, C	RSST ⁸	Energy	see 8 below	X		d	N/A	N/A	N/A	ea AB	±10	90-110	J/g ⁵	none	unknown	I, III
B	ICP ¹⁴	Al, Bi, Ca, Fe, P, Na	LA-505-151		X	f or a	ea smpl	see ⁷	ea PB	ea AB	±10	90-110	µg/g	none	unknown	IV
B	Direct Persulfate ¹⁴	TC	LA-342-100		X	d	ea smpl	1/mtrx	ea AB	ea AB	±20	80-120	µg C/g	none	unknown	IV
A ¹³ , B ¹²	Distillation	CN	LA-695-102	X	X	d ⁶	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg/mL	> 39,000 ¹⁰	unknown	I, III, IV
A ⁹	Sep. & α counting	Pu-239/240	LA-503-156	X		f	ea smpl	1/mtrx	ea PB	ea AB	±10	90-110	µCi/g	none	unknown	I, III, IV
A, B	Direct Persulfate ¹²	TOC	LA-342-100	X	X	d ⁶	ea smpl	1/mtrx	ea AB	ea AB	±10	90-110	µg C/mL	> 30,000 ¹⁰	1170	I, III, IV

Table 1: Tank TY-103 Chemical, Radiological, and Physical Analytical Requirements

¹ S-LEV LIQ-liquid taken from the segment level, FB-field blank
² d-direct, f-fusion, a-acid, w-water
³ PR-precision, AC-accuracy, ea-each, snpl-sample, DUP-duplicate, SPK/MSD-spike and matrix spike duplicate, AB-analytical batch, PB-preparation blank, N/A-not applicable, mtrx-matrix
⁴ Units for notification limits and expected range are those listed in the "units" column.
⁵ Dry weight basis.
⁶ Direct liquid samples may be diluted in acid or water to adjust to proper sample size and/or pH.
⁷ Either serial dilutions or matrix spikes will be performed.
⁸ These analyses required if DSC exceeds notification limits. (The RSST method, yet to be proceduralized, may be found in WHC-SD-WM-TP-104.)
⁹ Perform if total alpha exceeds notification limit.
¹⁰ Converted from µg/g limit assuming a liquid density of 1.0 g/mL.
¹² Perform this analysis if DSC is ≥ 480 J/g
¹³ Perform if TOC < 3 wt%.
¹⁴ Perform this analysis if moisture decision threshold is violated.

4.0 QUALITY ASSURANCE CONTROL

4.1 LABORATORY OPERATIONS

Laboratories performing analyses in support of this SAP shall have approved and implemented quality assurance project plans. These QA plans shall meet the *Hanford Analytical Services Quality Assurance Plan* (DOE 1995) minimum requirements as the baseline for laboratory quality systems. Quality requirements for conducting Characterization Project sampling and analysis are described in *Tank Waste Remediation System, Characterization Project, Quality Policies* (Sparks 1995), *Fiscal Year 1996 Tank Waste Analysis Plan* (Homi 1995b), and in this SAP. Characterization Project sampling and analysis shall be conducted in conformance with these quality assurance requirements.

Sample quality control (duplicates, spikes, standards) are identified in Table 1. If no criteria are provided, the performing laboratory shall perform to its quality assurance plan.

4.2 SAMPLE COLLECTION

Before sampling can be performed on a tank, available risers must be identified for use in the sampling event. The selected risers must be inspected and prepared to confirm their ability to be used in sampling. Safety hazards must be identified and special precautions must be made if needed. If deemed necessary by the sampling and tank cognizant engineers, video surveillance should be performed to identify any potential problems that may occur during the sampling event.

Samples are to be taken from a tank and shipped to the performing laboratory by Sampling Operations in accordance with the respective work package. That work package shall also initiate the chain-of-custody for the samples. Approved procedure TO-080-090 ("Load/Transport Sample Cask(s)") is to be used during the sampling event. Samples shall be identified by a unique number before being shipped to the performing laboratory. The sampling team is responsible for documenting any problems and procedural changes affecting the validity of the sample in a field notebook. Sampling Operations shall enter this information in the comment section of the chain-of-custody form for addition to the data reports.

Sampling Operations should transport each sample collected to the performing laboratory within 1 working day of removing the sample from the tank, but must transport each segment or sample within three calendar days. Sampling Operations is responsible for verbally notifying the WHC 222-S Laboratory (373-2435) at least 24 hours in advance of an expected shipment.

4.3 SAMPLE CUSTODY

The chain-of-custody form is initiated by the sampling team as described in the work package. Samples are shipped in a cask and sealed with a Waste Tank Sample Seal.

WASTE TANK SAMPLE SEAL	
Supervisor:	Sample No.:
Date of Sampling:	Time of Sampling:
Shipment No.:	Serial No.:

The sealed and labeled samples are shipped to the laboratory along with the chain-of-custody form. The receipt and control of samples in the WHC 222-S Laboratory are described in laboratory procedure LO-090-101.

5.0 EXCEPTIONS, CLARIFICATIONS, AND ASSUMPTIONS

5.1 EXCEPTIONS TO DQO REQUIREMENTS

The ferrocyanide DQO lists cyanide as a secondary analyte; however, discussions with the Ferrocyanide Safety Program indicate that cyanide should now be considered as a primary analyte.

5.2 CLARIFICATIONS AND ASSUMPTIONS

A number of clarifications and assumptions relating to the notification limits or decision thresholds identified in the applicable DQO efforts need to be made with respect to the analyses in Table 1. Each of these issues is discussed below:

- Any exothermic reaction (in cal/g or J/g) determined by differential scanning calorimetry (DSC) must be reported on a dry weight basis as shown in equation (1) using the weight percent water determined from thermogravimetric analysis (TGA).

$$\text{Exotherm (dry wt)} = \frac{[\text{exotherm (wet wt)} \times 100]}{(100 - \% \text{ water})} \quad (1)$$

NOTE: A large error in the DSC value may result when converting samples containing greater than 90% water to a dry weight basis. However, this conversion is still required.

- The safety screening DQO (Dukelow et al. 1995) requires that additional analyses be performed if total alpha activity is greater than 1 g/L. Total alpha is measured in $\mu\text{Ci/g}$ rather than g/L. To convert the notification limit for total alpha into a number more readily usable by the laboratory, it was assumed that all alpha decay originates from Pu-239. The notification limit

may then be calculated as shown in equation (2):

$$\left(\frac{1 \text{ g}}{L}\right)\left(\frac{1 \text{ L}}{10^3 \text{ mL}}\right)\left(\frac{1}{\text{density}} \frac{\text{mL}}{\text{g}}\right)\left(\frac{0.062 \text{ Ci}}{1 \text{ g}}\right)\left(\frac{10^6 \text{ } \mu\text{Ci}}{1 \text{ Ci}}\right) = \frac{61.5}{\text{density}} \frac{\text{ } \mu\text{Ci}}{\text{g}} \quad (2)$$

NOTE: Samples measured for total alpha shall also be measured for density. The notification limit shall be 41 $\mu\text{Ci/g}$ unless the measured density exceeds 1.5 g/mL when the notification limit will be adjusted according to equation 2.

- The laboratory is expected to report all analytical results recovered from inductively coupled plasma spectroscopy (ICP), ion chromatography (IC), and gamma energy analysis (GEA), even though only specific analytes are requested. These results should be reported only if no additional preparatory work is required (e.g. running additional standards) or if the results meet internal quality control criteria. No reruns nor additional analyses should be performed to improve recovery for analytes not specifically requested in Table 1.

6.0 DELIVERABLES

All analyses will be reported as Format I, III, or IV as indicated in Table 1. Additional information regarding reporting formats is given in Schreiber (1994a).

6.1 FORMAT I REPORTING

Table 1 contains the notification limits for each analyte. Any results exceeding their notification limits shall be reported via telephone by the 222-S Laboratory Shift Manager to the West Tank Farm Operations Shift Manager as soon as the data are obtained and reviewed (Kristofzski 1995). This verbal notification must be followed within one working day by written communication to the Safety Screening Representative, Process Control, and the Characterization Project Office documenting the observations (Schreiber 1994b). Additional analyses for verification purposes may be contracted between the performing laboratory and the contacts above by a revision to this document, or by a memorandum of understanding.

6.2 FORMAT III REPORTING

A Format III report, giving the results of the primary analyses required by the safety screening DQO, shall be issued to the Safety Screening Representative, the Characterization Project, Process Control, the Tank Characterization Resource Center, and Tank Characterization Database (Schreiber 1994b) within 45 days of receipt of the last sample at the laboratory loading dock. The final report should be written per format IV reporting if no secondary analysis are required. The DSC and TGA scans have been requested due to the interpretive nature of the analysis. If analyses for the safety screening secondary analytes are required, these results shall be provided within 90 days of receipt of the last sample at the laboratory loading dock. If no other analyses are required, the final report should be written as per format IV report. Detailed information regarding the contents of this reporting format are given in Schreiber (1994a).

6.3 FORMAT IV REPORTING

This report shall include the results of the analyses required by the ferrocyanide and safety screening DQOs, and the organic test plan (see Table 1 for delineation of program requests). The data package shall be provided to the Characterization Project, Ferrocyanide Safety Program, the Tank Characterization Resource Center, and Tank Characterization Database representatives within 105 days of the sampling event. Detailed information regarding the contents of this reporting format are given in Schreiber (1994a).

In addition to this data package, an electronic version of the analytical results shall be provided to the Tank Characterization Database representative. The data must be available to the Washington State Department of Ecology within 7 days of the release of the final data package. The electronic version shall be in the standard electronic format specified in Bobrowski et al. (1994).

7.0 CHANGE CONTROL

Under certain circumstances, it may become necessary for the performing laboratory to make decisions concerning a sample without review of the data by the customer or the Characterization Program. All significant changes (such as changes in scope) shall be documented by Characterization Plans, Coordination, and Reports via an Engineering Change Notice to this plan. All changes shall also be clearly documented in the final data report. Insignificant changes may be made by the PC by placing a notation in the permanent record (i.e. note change in extrusion log book or memo to file). Significance is determined solely by the PC.

At the request of the Characterization Program, additional analysis of sample material from this characterization project shall be performed following a revision of this Sampling and Analysis Plan or issuance of a letter of instruction.

8.0 REFERENCES

- Bobrowski, S.F., S.J. Harris, and J.D. Schwab, 1994, "Standard Electronic Format Specification for Tank Characterization Database Loader, Version 2.0", Pacific Northwest Laboratory, Richland, Washington (Transmitted by PNL Letter TCD-94-002, June 16, 1994, S.F. Bobrowski, PNL, to C.S. Haller, WHC).
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- Dukelow, G.T., J.W. Hunt, Babad, H, and J.E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.
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- Schreiber, R.D., 1994b, Letter to J.G. Kristofzski, "Point of Contact/Distribution List", 7E720-94-141, dated October 11, 1994.
- Sparks, J.S., 1995 *Tank Waste Remediation System, Characterization Project, Quality Policies*, WHC-SD-WM-QAPP-025, Rev. 1, Westinghouse Hanford Company, Richland, Washington.