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7. Abstract

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-AZ-102.

8. RELEASE STAMP

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Tank 241-AZ-102 Tank Characterization Plan

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

by

Los Alamos Technical Associates
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Kennewick, Washington 99336

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CONTENTS

APPENDICES

LIST OF TABLES

LIST OF ABBREVIATIONS

ACL	Analytical Chemistry Laboratory
AZ-102	Tank 241-AZ-102
DOE	United States Department of Energy
DQO	data quality objective
DN	dilute non-complexed
DST	double-shell tank
EB	evaporator bottoms
EVAP	Post-1976 designation for evaporator feed
HEPA	high-efficiency particulates air filter
NCAW	neutralized current acid waste
NCPLX	non-complexed waste
RCRA	*Resource Conservation and Recovery Act of 1976*
SST	single-shell tank
TCP	Tank Characterization Plan
TOC	total organic carbon
TWRS	Tank Waste Remediation System
USQ	unreviewed safety question
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

The Defense Nuclear Facilities Safety Board has advised the DOE to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues (Conway 1993). The Data Quality Objective (DQO) process was chosen as a tool to be used in the resolution of safety issues. As a result, a revision in the Federal Facilities Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process ... Development of TCPs by the DQO process is intended to allow users (e.g., Hanford Facility user groups, regulators) to ensure their needs will be met and that resources are devoted to gaining only necessary information" (Ecology et al. 1994). This document satisfies that requirement for tank 241-AZ-102 (AZ-102) sampling activities.

2.0 DATA QUALITY OBJECTIVES APPLICABLE TO TANK AZ-102

The sampling and analytical needs associated with the 177 single-shell and double-shell underground storage tanks have been identified through the DQO process. DQOs identify the information needed by a program group concerned with safety issues, regulatory requirements, or the transporting and processing of tank waste. Present characterization objectives for Fiscal Year 1995 involve sampling of tanks to resolve safety issues. Other sampling may be requested for ongoing waste processing and regulatory requirements in active tanks. Tank AZ-102 is currently a non-Watch List tank, so the only DQOs applicable to this tank are the safety screening DQO and the compatibility DQO, as described below.

2.1 SAFETY SCREENING DATA QUALITY OBJECTIVE

The *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994) describes the sampling and analytical requirements that are used to screen waste tanks for unidentified safety issues. Both Watch List and non-Watch List tanks will be sampled and evaluated to classify the waste tanks into one of three categories (SAFE, CONDITIONALLY SAFE, or UNSAFE) following the guidelines for the four Watch List classifications and other safety issues. A tank can be removed from a Watch List if it is classified as SAFE. The safety screening DQO identifies the requirements used to determine the classification to which a tank belongs based on analyses that indicate if certain measures are within established parameters. The measures begin with the determination of the concentration of primary analytes which have been determined as indicators of potentially unsafe conditions within a tank. The primary analytical requirements for the safety screening of a tank are energetics, total alpha activity, moisture content, and flammable gas concentrations. If a specific criteria level for one of these indicators is exceeded, further analysis of a secondary set of analytes, resulting in a possible change in tank classification, is required.

To meet the sampling requirements of this DQO effort, a vertical profile of the waste shall be obtained from at least two widely-spaced risers. This vertical profile may be realized using core, auger, or grab samples. The safety screening analyses shall be applied to all core samples, DST RCRA samples, and all auger samples, except auger samples taken exclusively to assess the flammable gas tank crust burn issue.

2.2 WASTE COMPATIBILITY DATA QUALITY OBJECTIVES

The *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994) identifies four safety-related decision elements, criticality, flammble gas accumulation, energetics, and corrosivity, needed to determine potential incompatibility of wastes that may occur from routine waste transfers into and within a DST. A routine transfer has the appropriate historical data necessary for the Waste Compatibility Program to determine the acceptability of the transfer from an engineering process control perspective.

Four operations-related decision elements have been identified for a non-routine transfer; separation of transuranic from non-transuranic waste, limits on heat generation, segregation of complexant waste, and ensuring pumping system capabilities. A non-routine transfer includes waste that has unique chemical and/or physical properties for which no historical data exists to judge compatibility with safety and operations decision rules.

3.0 TANK AND WASTE INFORMATION

This section summarizes some of the available historical information on tank AZ-102. Discussions of the process history, recent sampling events for the tank, and general information about the tank are included. The fill history information is available in *A History of the 200 Area Tank Farms* (Anderson 1990) and *Waste Volume Projections: Thermocouple and Surface Level Readings* (Koreski 1994).

3.1 TANK CONFIGURATION

Double Shell Tank AZ-102 was constructed between 1971 to 1975 and is located in the 200-East Area. Tank AZ-102 is 27 meters (75 feet) in diameter, 11.1 meters (30 feet 4 inches) tall, and has a capacity of 3,785kL (1,000 kgals). The AZ tanks were designed to provide aging waste storage for high-level radioactive waste generated at the PUREX and B Plants. It has the latest tank design, consisting of an insulating concrete base and reinforced concrete shell. Inside the concrete shell is a heat-treated, stress-relieved primary steel liner and a nonstress-relieved outer steel liner. To accommodate high-heat generating wastes, airlift circulators, steam coils, and exhaust condensers were installed to minimize the probability of a loss of integrity. No cascading line links it to other tanks. Maximum design temperature for inside the tank are: sludge 177°C (350°F), vapor 104°C (220°F), and a liquid temperature of 126°C (260°F). The tank is currently listed as sound (Brevick 1994).

3.2 AGE AND HISTORY OF TANK AZ-102

Tank AZ-102 first received water in April, 1976 in preparation for receiving aging waste. Multiple additions of aging waste, strontium waste, residual liquor, and complex concentrate brought the tank to near capacity in late 1980. Several transfers of dilute non-complexed (DN) waste emptied the tank briefly in the third quarter of 1983. The third and fourth quarters of 1983 saw several transfers and additions to and from the evaporator. Several additions of complexed and non-complexed waste late in the fourth quarter of 1983 brought the tank contents to 2,610 kL (690 kgal).

The tank was nearly emptied during the first quarter of 1986. Since that time, AZ-102 has almost exclusively become a receptacle for PUREX aging waste and PUREX miscellaneous waste (sump water, dilute laboratory wastes, and steam condensate). The one exception was a single addition of approximately 8 kL (2 kgal) of dilute non-complexed waste from AZ-101 in the first quarter of 1990. Water was also frequently added in small quantities. Table 3-1 summarizes the fill history from when tank AZ-102 was first placed on active status to the present time.

Table 3-1: Tank AZ-102 Fill History

Qtr:Year	Waste type and Description	Total final volume kL (kgals)
2:1976	Addition of water.	106 (28)
3:1976	Received aging waste from evaporator.	397 (105)
4:1976-2:1977	Received high strontium dilute waste from evaporator.	3,680 (971)
3:1977-4:1977	Received residual liquor, high strontium waste.	2,840 (751)
1:1978-4:1980	Multiple additions of complex concentrate from Tanks A-102 and AX-102.	3,490 (921)
1:1981-3:1983	Multiple additions of dilute non-complexed (DN) waste from PUREX and evaporator; multiple transfers of DN waste to unknown destination.	0 (0)
3:1983-4:1983	Multiple additions of complex concentrate (CC) from evaporator, and PUREX; multiple transfers of CC to evaporator, AW-101 and AN-107.	484 (128)
4:1983-4:1983	Addition of dilute complexed waste from AY-101.	1,400 (370)
4:1983-4:1983	Transfer of complex concentrate to AY-101.	1,120 (296)
4:1983-4:1983	Addition of water.	1,310 (346)
4:1983-4:1983	Addition of dilute complexed waste from AY-101	2,510 (662)
4:1983-4:1983	Addition of dilute non-complexed waste from PUREX.	2,610 (690)
1:1984-1:1986	Multiple additions of water and dilute non-complexed (DN) waste from AN-101, AN-104, AW-105, SY-102, PUREX, and DN liquid waste from the East Area and the B Plant vessel; multiple transfers to AW-102 and AY-101.	2,500 (660)
1:1986-1:1986	Addition of PUREX aging waste.	2,570 (680)
1:1986-1:1986	Transfer of dilute non-complexed waste to unknown destination.	72 (19)
2:1986-2:1988	Multiple additions of PUREX aging waste.	1,090 (288)

Qtr:Year	Waste type and Description	Total final volume kL (kgals)
3:1988-3:1988	Addition of PUREX miscellaneous aging waste.	1,120 (296)
3:1988-4:1988	Multiple additions of PUREX aging waste.	1,510 (398)
2:1988-4:1988	Addition of water.	3,550 (937)
2:1989-2:1989	Addition of PUREX aging waste.	3,560 (940)
3:1989-1:1990	Additions of water, and dilute non-complexed (DN) waste from AZ-101; transfers of DN to AY-102 and AZ-101.	3,540 (936)
1:1990-1:1990	Addition of PUREX aging waste.	3,590 (948)
2:1990-2:1990	Additions of water.	3,670 (970)
2:1990-2:1990	Transfer of dilute non-complexed waste to AZ-101.	3,640 (962)
3:1990-1:1991	Multiple additions and losses of water.	3,590 (949)
1:1991-1:1991	Addition of miscellaneous PUREX waste.	3,610 (953)
2:1991-1:1993	Multiple additions and losses of water.	3,510 (926)
1:1993-1:1993	Addition of PUREX aging waste.	3,520 (930)
1:1993-4:1993	Multiple additions and losses of water.	3,690 (974)

3.3 EXPECTED TANK CONTENTS

The current contents of Tank AZ-102, as of October 31,1994, consisted of 3,600 kL (950 kgal) of dilute non-complexed waste and aging waste from PUREX (NCAW, neutralized current acid waste). Tank AZ-102 is expected to have two primary layers. The bottom layer is composed of 360 kL (95 kgal) of sludge, and the top layer is composed of 3,240 kL (855 kgal) of supernatant, with a total tank waste depth of approximately 8.9 meters (28.8 feet) (Hanlon 1994).

A summary of the detected tank chemical constituents from an August 1989 sampling event is reported in Table 3-2. At that time, the total tank content was 3,550 kL (939 kgal), and the numbers given in Table 3-2 are based on that total (Van Vleet 1993). Most tank activity since the time of sampling has been minor additions and evaporation of water. Any other transfers or additions were minor.

Table 3-2: Tank AZ-102 Analysis Results

	Supernatant	Sludge
Density	1.18	1.49
Volume L (Kgal)	3.22+06 (851)	3.33+05 (88)
Chemical Constituents	μg/ml	μg/g
Ag	7.13E+00	6.71E+02
Al	1.05E+02	5.37E+04
Ba	8.10E-01	5.53E+02
Be	1.17E-01	1.35E+01
Ca	6.24E+00	3.02E+03
Cd	1.99E+00	1.50E+04
Cr	1.04E+03	1.93E+03
Cu	3.22E+00	3.50E+02
Fe	1.12E+01	1.32E+05
K	1.49E+03	2.07E+03
La	1.80E+00	4.50E+03
Mg	9.18E-01	9.53E+02
Mn	7.78E-01	2.88E+03
Mo	3.76E+01	4.70E+01
Na	4.96E+04	5.90E+04
Nd	5.62E+00	2.91E+03
Ni	2.22E+00	8.86E+03
P	6.91E+01	9.73E+02
Pb	6.11E+00	1.09E+03
Si	5.73E+02	4.50E+03
Sr	2.07E-01	3.27E+02
Ti	5.09E-01	7.78E+01
Zn	3.09E-01	1.40E+02
Zr	4.41E+00	1.80E+04

Chemical Constituents	µg/ml	µg/g
Cl^-	7.07E+01	1.47E+02
F^-	8.72E+02	4.60E+02
NO_2^-	3.33E+03	1.54E+04
NO_3^-	6.78E+03	2.52E+03
PO_4^{-3}	1.52E+02	4.16E+02
SO_4^{-2}	1.41E+04	6.54E+03
TOC	1.59E+03	3.15E+03
Radiological Constituents	µCi/ml	µCi/g
^{241}Am	1.54E-03	1.01E+02
^{14}C	1.25E-03	1.83E-03
^{137}Cs	8.81E+02	8.80E+02
^{244}Cm	---	3.77E-01
^{237}Np	1.97E-03	1.37E-01
$^{239/240}Pu$	3.27E-02	3.67E+00
$^{89/90}Sr$	7.03E+00	2.20E+04
^{99}Tc	1.18E-01	5.86E-01

*(Van Vleet 1993)

4.0 TANK AZ-102 SCHEDULED SAMPLING EVENTS

Two sampling events of tank AZ-102 are currently scheduled: a grab/compatibility sample in January 1995 and a push core sample in February 1997. No other sampling is scheduled through Fiscal Year 1997 (Stanton 1994). The grab/compatibility sample shall be conducted in accordance with the *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994) and the push core sample shall be conducted in accordance with the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994). Sampling and analytical requirements from these DQOs are identified in Table 4-1. A more complete list of analytical requirements are given, as an appended revision, in the appropriate Sampling and Analysis Plan.

Table 4-1: Integrated DQO Requirements

Sampling Event	Applicable DQO	Sampling Requirements	Analytical Requirements
Grab	▶ Waste Compatibility	3 grab samples taken from different depths[1]	Energetics, Moisture, SpG, pH, Separable Organics, Major Anions, Cations, & Radionuclides
Push core	▶ Tank Safety Screening	Samples from 2 risers separated radially to the maximum extent possible	Energetics, Moisture, Total Alpha, Gas Composition

[1] Normally 3 grab samples are taken for compatibility purposes; for the grab sampling event scheduled for tank AZ-102, 4 samples will be taken (see Appendix A, "Sampling and Analysis Plan for Grab Sampling in Fiscal Year 1995").

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APPENDIX A

SAMPLING AND ANALYSIS PLAN FOR GRAB SAMPLING IN FISCAL YEAR 1995

CONTENTS FOR APPENDIX A

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LIST OF FIGURES FOR APPENDIX A

LIST OF ABBREVIATIONS FOR APPENDIX A

ACL	Analytical Chemistry Laboratory
AZ-102	Tank 241-AZ-102
DOE	United States Department of Energy
DQO	data quality objective
DN	dilute non-complexed
DSC	differential scanning calorimetry
DSSF	double shell slurry feed
DST	double-shell tank
EB	evaporator bottoms
EVAP	Post-1976 designation for evaporator feed
GEA	gamma energy analysis
HPGE/MCA	high purity germanium - multi channel analysis
IC	ion chromatography
ICP	inductively coupled plasma - atomic emission spectroscopy
NCPLX	non-complexed waste
PNL	Battelle Pacific Northwest Laboratory
RCRA	*Resource Conservation and Recovery Act of 1976*
RSST	reactive system screening tool
SST	single-shell tank
TGA	thermogravimetric analysis
TOC	total organic carbon
TWRS	Tank Waste Remediation System
USQ	unreviewed safety question
WHC	Westinghouse Hanford Company

A1.0 SPECIFIC TANK OBJECTIVES

A1.1 RELEVANT SAFETY ISSUES

The Double-Shell Tank (DST) System currently receives waste from the Single-Shell Tank (SST) System in support of SST stabilization efforts or from other on-site facilities which generate or store waste. Waste is also transferred between individual DSTs. The mixing or commingling of potentially incompatible waste types at the Hanford Site must be addressed prior to any waste transfers into the DSTs. The primary goal is to prevent the formation of an unreviewed safety question (USQ) as a result of improper waste management.

Tank 241-AZ-102 (AZ-102) is a DST which routinely receives waste from several sources. Two issues related to the overall problem of waste compatibility must be evaluated:

- Assurance of continued operability during waste transfer and waste concentration.

- Assurance that we shall not create safety problems as a result of commingling wastes under interim storage.

The results of the grab sampling activity prescribed by this Sampling and Analysis Plan shall help determine whether tank AZ-102 may be used as a receiving tank for waste without creating safety or operational problems. The potential for four kinds of safety problems shall be addressed: criticality, flammable gas accumulation, energetics, and corrosion and leakage. Operational problems include plugged pipelines and equipment, exceeding the heat load limits of the receiving tank, and transuranic segregation.

A1.1.1 Tank AZ-102 Characterization Objectives

The characterization efforts applicable to this Sampling and Analysis Plan are focused on the resolution of the waste compatibility issue of tank AZ-102. To evaluate the potential for waste incompatibility, analyses will be performed on the grab samples obtained from tank AZ-102. These analyses are discussed in Section A3.0. Only decisions based on sampling and analysis of waste from tank AZ-102 will be addressed within this document; issues such as plugged pipelines and equipment problems are not within the scope of this Sampling and Analysis Plan. Once the characterization of tank AZ-102 has been performed, the waste compatibility assessment shall be conducted. This effort is discussed in *Tank Farm Waste Compatibility Program* (Sutey 1994a).

In addition to the objective above, analyses have been requested for process testing purposes. The *Tank AZ-101 Sludge Washing Test* (MacLean 1995) has been developed to gain information relative to the use of tanks AZ-101 and AZ-102 to fully test the process, equipment, and instruments needed for in-tank processing of waste.

A1.1.2 Waste Compatibility Program Data Quality Objective

The document, *Data Quality Objectives for the Waste Compatibility Program* (Carothers 1994) describes the process used to develop a data quality objective (DQO) for the waste compatibility issue, as well as the analytical requirements for determining waste compatibility. Since samples shall be taken from only one riser and the safety screening DQO requires that at least two risers be sampled, tank AZ-102 is not being safety screened. Further, tank AZ-102 is a non-Watch List tank, so there are no specific safety-issue oriented DQOs appropriate to its characterization. Therefore, the waste compatibility program DQO (Carothers 1994) is the only applicable DQO for this sampling event.

A2.0 TANK STATUS AND SAMPLING INFORMATION

A2.1 TANK STATUS

The current contents of Tank AZ-102 consists of 3,600 kL (950 kgal) of dilute non-complexed waste and aging waste from PUREX (NCAW, neutralized current acid waste). Tank AZ-102 is expected to have two primary layers. The bottom layer is composed of 360 kL (95 kgal) of sludge, and the top layer is composed of 3,240 kL (855 kgal) of supernatant, with a total tank waste depth of approximately 8.9 meters (28.8 feet). Tank AZ-102 is considered sound with respect to tank integrity (Hanlon 1994).

A2.2 SAMPLING INFORMATION

Tank AZ-102 is a non-Watch List DST scheduled to be grab sampled to prepare for receipt of liquid waste, and to gain information regarding process testing purposes. Four 100 mL samples shall be taken from riser 24A using a typical weighted-bottle sampler. The samples shall be taken from four different depths (Table A-1). For detailed information regarding the tank AZ-102 grab sampling activities, refer to work package ES-94-1236. This work package contains all the applicable operating procedures and the chain of custody records for this sampling event.

With respect to sampling quality control, no field/trip blank shall be taken during this sampling event due to the high concentration levels expected in the analyte results. Cross contamination should not have a significant effect on the analytical results (Sutey 1994b).

Table A-1: Tank AZ-102 Grab Sampling Depths

Sample Number	Sample Type	Sample Location	Sample Depth[1]
102-AZ-1	Supernate	Riser 24A	330 in
102-AZ-2	Supernate	Riser 24A	490 in
102-AZ-3	Supernate	Riser 24A	636 in
102-AZ-4	Sludge	Riser 24A	664 in

[1]Sample depth is defined as the distance from the top of the riser to the mouth of the sample bottle.

A3.0 LABORATORY SAMPLE RECEIPT AND ANALYSIS INSTRUCTIONS

A flowchart showing the general analysis scheme for tank AZ-102 is presented in Figure A-1. The steps in the flowchart shall be performed on all four grab samples. The steps are described in detail to provide the laboratory chemist with sample analysis guidance, and may be altered by the performing laboratory as necessary. All changes, with justification, must be included in the data report. Grab sample analyses may not need to be performed in the hot cell (based on radioactivity). If the samples must be analyzed in the hot cell, a hot cell blank should be performed; otherwise, no hot cell blank is necessary. The reporting levels for analyses are contained in Table A-2 and are detailed in Section A7.0 of this document.

As a precautionary measure, the Safety and Analysis Report for Packaging (SARP) has been reviewed for any safety issues involved with transportation of grab samples. **For grab samples, the shipping container <u>must</u> be vented every four days to release retained gas.** However, Sampling Operations has a maximum of three days to ship the containers. Since the containers are opened at the time the samples are received at the laboratory, no safety issues should exist for grab samples with respect to transportation.

Steps 3 through 9 and 10B are guidance specific to the process test plan (MacLean 1995). Since no work is to be done toward that test plan until it is approved, Steps 3 through 9 and 10B are not to be done until that time. The remaining steps, however, may be performed on the compatibility samples as soon as the samples are delivered to the performing laboratory.

Step 1 — Receive three liquid grab samples and one sludge sample. The discussion of sample receipt is discussed in Section A4.2.3, "Sample Custody" of this document.

Step 2 — Record visual observations such as color and clarity of the samples, and the presence of any solid particles in the liquid samples.

Step 3 — Is sample the sludge sample?

Yes: Go to Step 4
No: Go to Step 10

Step 4 — Measure the density of the sludge.

Step 5 — Separate the phases of the sludge sample by filtration and one water wash (keeping them separate), and determine the insoluble solids concentration of the sludge sample.

Step 6 — Measure the volumes of solution filtrate and wash water filtrate.

Step 7 — Remove aliquots from the filtered insoluble phase of the sludge sample and perform analyses in Table A-2.

Step 8 — Remove aliquots from the solution filtrate from the sludge sample and perform analyses in Table A-2.

Step 9 Remove aliquots from the wash water filtrate from the sludge sample and perform analyses in Table A-2.

Step 10A Filter supernate sample and retain supernate filtrate for analysis. Determine the percent total dissolved solids by gravimetric analysis.

Step 10B Wash collected solids once with water. Dry and weigh to determine percent insoluble solids.

Step 11 If greater than 10 mg of solid sample is recovered, archive these solids for possible future analyses (Bratzel 1994).

Step 12 Closely inspect the supernate filtrate sample from Step 10 for the presence and approximate volume of any potential organic layers. If potential organic liquid layers exist, proceed to Step 13. If potential organic layers do not exist, go to Step 14.

Step 13 Any potential organic layer shall be reported immediately by Format I reporting. The potential organic layer shall be separated and retained in a jar for possible future analysis.

Step 14 Remove sufficient aliquots and perform analyses in Table A-2.

Step 15 Retain 40 mL each of any remaining sample as the sample archive (Bratzel 1994).

A3.1 INSUFFICIENT GRAB SAMPLE

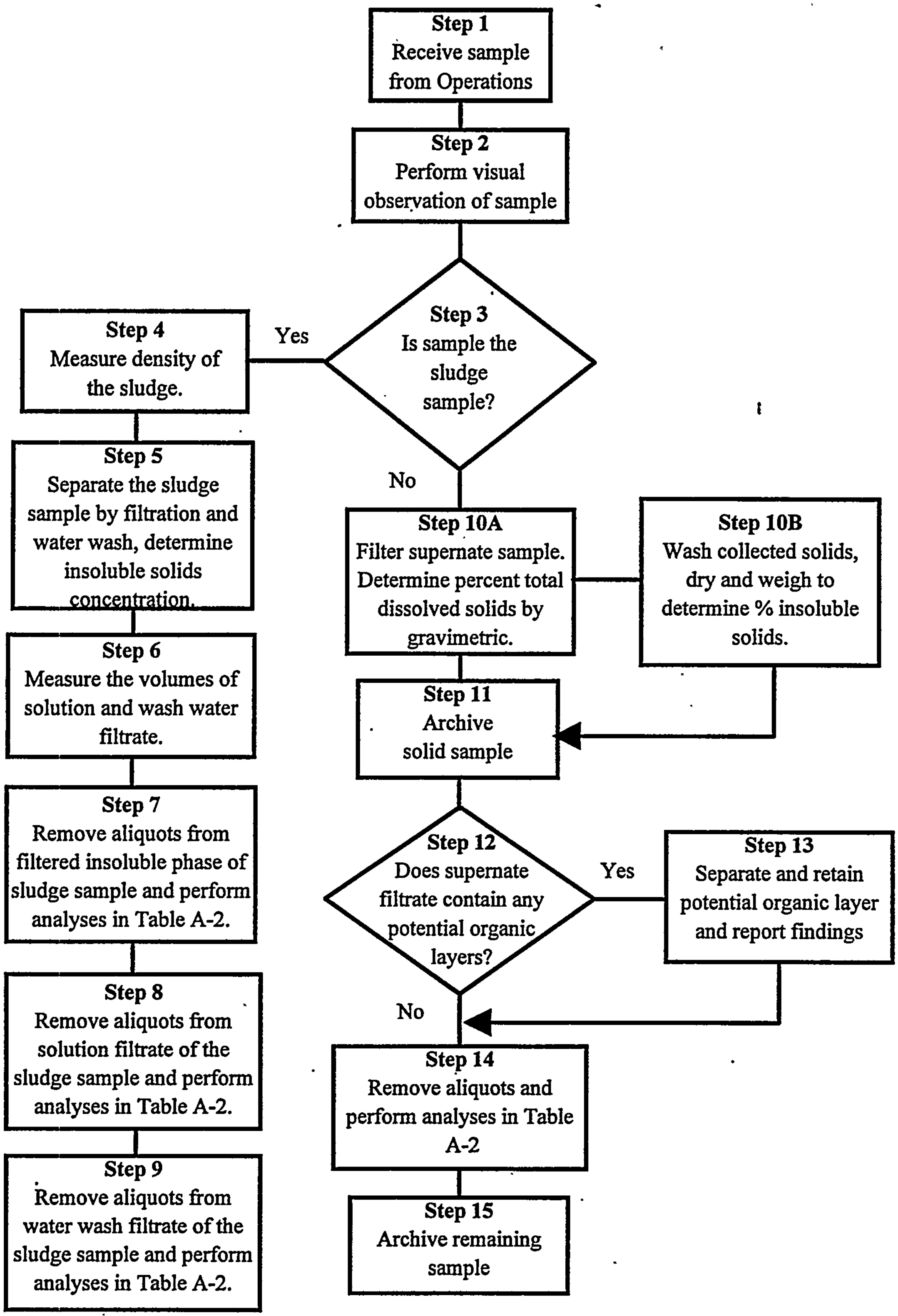
In the event that the sample volume from tank AZ-102 is found to be insufficient to perform the requested analyses in Table A-2, Characterization Support and the manager of Analytical Services, Program Management and Integration shall be notified (for points of contact, see Section A5.0, Table A-3). A prioritization of the analyses required in this Sampling and Analysis Plan is given in Section A3.2. Any analyses prescribed by this document, but not performed, shall be identified in the appropriate data report, with justification for non-performance.

A3.2 PRIORITIES FOR TANK AZ-102

In order to complete the compatibility assessment for tank AZ-102, results from the analyses identified as being performed per the Compatibility DQO in Table A-2 must be received. Therefore, if insufficient sample is retrieved, the tank shall need to be resampled at a later date. However, analyses are still requested on any sample obtained, and should be performed in the following order:

(1) Corrosion Purposes: OH^-, IC, and pH
(2) Energetics: DSC/TGA, Separable Organics
(3) Flammable Gas Accumulation: Specific Gravity
(4) Criticality Analyses: Pu-239/240, Am-241, ICP (Fe), and volume percent solids
(5) TOC
(6) Heat Generation: Sr-90 and Cs-137
(7) Other analyses listed in Table A-2

Figure A-1: Test Plan Flow Chart for Tank AZ-102



A4.0 SPECIFIC ANALYTE, QUALITY ASSURANCE, AND DATA CRITERIA

A4.1 SPECIFIC METHODS AND ANALYSES

Table A-2 summarizes the analyses to be performed on the tank AZ-102 grab samples. The laboratory procedure numbers which shall be used in the analyses are included in the table. These analyses are based on the Waste Compatibility DQO (Carothers 1994) and the test plan referenced in Section A1.1.1 (MacLean 1995).

A4.2 QUALITY ASSURANCE/QUALITY CONTROL

A4.2.1 Laboratory Operations

The 222-S Laboratory has a quality assurance program plan (Meznarich 1994) and a quality assurance project plan (Taylor 1993) that shall provide the quality assurance involved in analyzing the tank AZ-102 waste samples. Additionally, the *Hanford Analytical Services Quality Assurance Plan* (DOE 1994), when implemented (August 31, 1995), shall be used as quality assurance guidance.

Method specific quality control such as calibrations and blanks are also found in the analytical procedures. Sample quality control (duplicates, spikes, standards) are identified in Table A-2. If no criteria are provided in Table A-2, the performing laboratory shall perform to its quality assurance plan(s).

A4.2.2 Sample Collection

Four grab samples from tank AZ-102 are to be taken and shipped to the performing laboratory by Sampling Operations in accordance with work package ES-94-1236. That work package shall initiate the chain-of-custody for the samples. The following documents will be used as guidance in the handling and shipment of the tank AZ-102 grab samples:

- TO-100-052, "Segregate, Package, and Inventory Radioactive Waste."
- WHC-CM-2-14, "Responsibilities and Procedures for all Hazardous Material Shipments."
- WHC-SD-TP-SARP-001, "Sample Pig Transport System Safety Analysis Report for Packaging (onsite)."
- WHC-SD-WM-HSP-002, "Tank Farm Health and Safety Plan."

Samples shall be identified by a unique number before being shipped to the laboratory (Table A-1). 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 send the samples to the laboratory within 1 day of removing the samples from tank AZ-102, but must transport the samples within 3 calendar days. Sampling Operations is responsible for verbally notifying the shift manager at the 222-S Laboratory (373-2435) at least 24 hours in advance of an expected shipment.

A4.2.3 Sample Custody

The chain-of-custody form is initiated by the sampling team as described in the work package. Grab samples are shipped in a bottle and sealed with a Waste Tank Sample Seal. All sample shipments are to be labeled with the following information:

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 Westinghouse Hanford 222-S Laboratory is described in LO-090-101.

Table A-2: AZ-102 Chemical, Radiological and Physical Analytical Requirements

Project Name	AZ-102 Grab Sample		COMMENTS			REPORTING LEVELS	
Plan Number	WHC-SD-WM-TP-228, REV. 0		Homogenization Test - Not Required			FORMAT I	Early Notify
			Field Blank - Not Required			FORMAT II	Process Control
PROGRAM	PROGRAM CONTACTS		Hot Cell Blank - Performed as Necessary			FORMAT III	Safety Screen
A. Waste Compatibility	Waste Compatibility	J. M. Jones				FORMAT IV	Waste Management
B. Process Design Test Plan	Disposal, Process Design	G. T. MacLean	TANK	#SAMPLES	RISER#	FORMAT V	RCRA Compliance
	TWRS	R. D. Schreiber	AZ-102	4	24A	FORMAT VI	Special
	222-S Laboratory	M. D. Rollison					

PROGRAM	PRIMARY ANALYSES: METHOD	ANAL.	WHC PROCEDURE	SAMPLE[9]: SUP	DL	WASH	SLUDGE	LIQ PREP[1]	SOL PREP[1]	QUALITY CONTROL[2]: DUP	SPK/ MSD	BLK	CALIB STD	PR	AC	CRITERIA: UNITS	NOTIFICATION LIMIT[3]	EXPECTED RANGE[3]	FOR-MAT
A	DSC/TGA	Net Exo. Energy	LA-514-113 LA-560-112	A				d[6]	d	ea smpl	N/A	N/A	ea AB	±20	80-120	J/g	net > 0[7]	unknown	I, II
A, B	Furnace Oxidation	TOC	LA-344-105	A,B	B	B	B	d[6]	d[10]	ea smpl	1/mtrx	ea AB	ea AB	±20	80-120	µg/mL, µg/g	> 10,000	1,270 to 1,910	I, II
A, B	HPGE/MCA	GEA ^{137}Cs	LA-548-121	A,B	B	B	B	d[6]	f	ea smpl	N/A	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	none	705 to 1,060	II
A, B	Sep. & β counting	^{90}Sr	LA-220-101	A,B	B	B	B	d[6]	f or a	ea smpl	1/mtrx[5]	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	none	5.62 to 8.44	II
A, B	ICP	Al	LA-505-151	A,B	B	B	B	d[6]	f or a	ea smpl	See[4]	ea AB	ea AB	±20	80-120	µg/mL, µg/g	none	84 to 126	II
		Fe															none	8.96 to 13.4	
		Na															none	39,700 to 59,500	
B	ICP	Ba	LA-505-151	B	B	B	B	d[6]	f or a	ea smpl	See[4]	ea AB	ea AB	±20	80-120	µg/mL, µg/g	none	0.648 to 0.972	II
		Ca															none	4.99 to 7.49	
		Cd															none	1.59 to 2.39	
		Ce															none	unknown	
		Cr															none	832 to 1,250	
		Cs															none	unknown	
		Cu															none	2.58 to 3.86	
		K															none	1,190 to 1,790	
		La															none	1.44 to 2.16	
		Mn															none	0.622 to 0.934	
		Nd															none	4.50 to 6.74	
		Ni															none	1.78 to 2.66	
		P															none	55.3 to 82.9	
		Ru															none	unknown	
		Si															none	458 to 688	
		Sr															none	0.166 to 0.248	
		U															none	unknown	
		Zr															none	3.53 to 5.29	
A, B	Titration[8]	OH^-	LA-661-103	A,B	B	B	B	d[6]	d	ea smpl	N/A	ea AB	ea AB	±20	80-120	µg/mL, µg/g	≤ 170 or ≥ 136,00	unknown	I, II
A, B	IC	Cl^-	LA-533-105	A,B	B	B	B	d[6]	w	ea smpl	1/mtrx	ea AB	ea AB	±20	80-120	µg/mL, µg/g	none	56.6 to 84.8	I, II
		F^-															none	698 to 1,050	
		NO_3^-															≥ 62,000	5,420 to 8,140	
		NO_2^-															≤ 506 or ≥ 253,000	2,660 to 4,000	
		PO_4^{3-}															none	122 to 182	
		SO_4^{2-}															none	11,300 to 16,900	
B	Spectrophotometry	Cr (VI)	LA-265-101	B	B	B	B	a	a	ea smpl	1/mtrx	ea AB	N/A	±20	80-120	µg/mL, µg/g	none	unknown	II
A, B	pH	[H+]	LA-212-103	A,B	B	B	B	d[6]	d	ea smpl	N/A	N/A	ea AB	±20	80-120	units	none	unknown	II
A, B	Furnace Oxidation	TIC CO_3^{2-}	LA-344-105	A,B	B	B	B	d[6]	d[10]	ea smpl	N/A	ea AB	ea AB	±20	80-120	µg/mL, µg/g	none	unknown	II
B	Combustion/ Coulometry	TC	LA-344-105	B	B	B	B	d[6]	d[10]	ea smpl	N/A	ea AB	ea AB	±20	80-120	µg/mL, µg/g	none	unknown	II
A, B	Sep. & α counting	$^{239/240}Pu$	LA-503-156	A,B	B	B	B	d[6]	f	ea smpl	1/mtrx[5]	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	> 0.8	0.026 to 0.039	I, II
A, B	Sep. & α counting	^{241}Am	LA-953-103	A,B	B	B	B	d[6]	f	ea smpl	1/mtrx[5]	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	> 0.1	0.012 to 0.018	I, II

Table A-2: AZ-102 Chemical, Radiological and Physical Analytical Requirements

PROGRAM	PRIMARY ANALYSES METHOD	ANAL.	WHC PROCEDURE	SAMPLE[9] SUP	DL	WASH	SLUDGE	LIQ PREP[1]	SOL PREP[1]	QUALITY CONTROL[2] DUP	SPK/MSD	BLK	CALIB STD	PR	AC	CRITERIA UNITS	NOTIFICATION LIMIT[3]	EXPECTED RANGE[3]	FORMAT
B	Sep. & α counting	^{238}Pu	LA-503-156	B	B	B	B	d[6]	f	ea smpl	1/mtrx[5]	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	> 0.8	unknown	I, II
B	Mass Spec. Radiochem	^{241}Pu	no capability[11]	B	B	B	B	d[6]	f	ea smpl	1/mtrx[5]	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	none	unknown	II
B	HPGE/MCA	GEA ^{106}Ru ^{144}Ce	LA-548-121	B	B	B	B	d[6]	a	ea smpl	N/A	ea AB	ea AB	±20	80-120	µCi/mL, µCi/g	none	unknown unknown	II
A, B	SpG	Density	LA-510-112	A,B	B	B	B	d[6]	d	ea smpl	N/A	N/A	N/A	±20	80-120	g/mL	> 1.3	1.18	I, II
B	Filtration	Suspended Solids	N/A[12]		B	B	B	d	d	ea smpl	N/A	N/A	N/A	±20	80-120	wt%	none	unknown	II
A, B	Gravimetric	% H_2O	LA-564-101	A,B	B	B	B	d[6]	d	ea smpl	N/A	N/A	ea AB	±20	80-120	wt%	none	unknown	II
A	Visual	Organic Layer	LA-519-151	A				d	d	N/A	N/A	N/A	N/A	N/A	N/A	none	presence	not present	I, II

[1]d-direct, f-fusion, a-acid, w-water

[2]PR-precision, AC-accuracy, ea-each, smpl-sample, DUP-duplicate, SPK/MSD-spike and matrix spike duplicate, AB-analytical batch, N/A-not applicable, mtrx-matrix

[3]Units for notification limits and expected ranges are those listed in the "units" column.

[4]Either serial dilutions or matrix spikes will be performed.

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

[6]Direct liquid samples may be diluted in acid or water to adjust to proper sample size and/or pH.

[7]Action limit is applicable up to 500 °C. If the energetics action limit is exceeded, laboratory personnel and East Sytems Engineering will decide if adiabatic calorimetry shall be performed.

[8]OH will not be run if pH < 12.

[9]SUP-supernate filtrate; DL-drainable liquid (solution filtrate); WASH-wash water filtrate; SLUDGE-filtered insoluble sludge; A and B designate programs requesting analyzes.

[10]For solid samples, persulfate oxidation method may be used in place of furnace oxidation.

[11]When the WHC 222-S Laboratory gains this capability, or another laboratory is contracted to perform this work, archived material will be used (see Section A6.0).

[12]Not performed on a routine basis. If necessary, this test will be performed per (MacLean 1995).

A5.0 ORGANIZATION

The organization and responsibility of key personnel involved in this tank AZ-102 characterization project are listed in Table A-3.

Table A-3: Tank AZ-102 Tank Project Key Personnel List

Individual	Organization	Responsibility
J. G. Kristofzski	222-S Analytical Operations	Program Support Manager of Analytical Operations
R. D. Schreiber	TWRS Characterization Support	Tank AZ-102 Tank Characterization Plan Cognizant Engineer
J. M. Jones	East Systems Engineering	Sampling and Compatibility Cognizant Engineer
G. T. MacLean	TWRS Disposal Engineering, Process Design	Process Testing Point of Contact
J. L. Deichman	Analytical Services	Manager of Analytical Services Program Management and Integration
East Tank Farm Operations Shift Manager	Tank Farm Operations	200 East Tank Farm Point of Contact if Action Limit is Exceeded (373-2689)

A6.0 EXCEPTIONS FOR TANK AZ-102

In the Waste Compatibility DQO, several necessary specifications concerning sampling and analysis were omitted. These clarifications are addressed in (Sutey 1994b).

In (Sutey 1994b), accuracy requirements are specified in terms of spike recovery. However, the laboratory can also assess accuracy via standards. Therefore, it was presumed that the Characterization Program would like to have information on accuracy for those analyses for which spikes are not performed, and would specify accuracy requirements as 80-120% regardless of the method of accuracy determination (Table A-2).

Since historical information exists to adequately address the potential for line plugging and precipitation of solids during the transfer of waste, no viscosity or cooling curve analysis shall be required during this analysis activity (Jones 1994).

In (MacLean 1995), Pu-241 analysis is requested. However, at the present time the WHC 222-S Laboratory does not have the capability to perform this analysis. Therefore, this analysis may be performed using archived material once either the WHC 222-S Laboratory acquires the capacity to perform this work or another laboratory is identified which is able to do the analysis. This analytical work would be governed by Letter of Instruction or Memorandum of Understanding.

A number of analyses in Table A-2 are required by a test plan currently being written (MacLean 1995). Since the Characterization Program is responsible for the taking of tank samples, the Characterization Program will need to approve the test plan. This approval will not only ensure that the DQO process has been used in the generation of the test plan and that there is justification for the samples, but also that the facility receiving the samples is in an adequate position to handle radioactive material. In addition, the test plan must be approved by the performing laboratory and TWRS Quality Assurance to ensure that the analytical work can be performed to the satisfaction of the customer and that the appropriate quality controls are in place. At such time that the test plan is approved by the above programs, the performing laboratory will be given written direction to proceed with analyses required by the test plan. Analyses requested by the compatibility DQO may be performed as soon as samples are delivered to the lab since this DQO has been previously approved.

A7.0 DELIVERABLES

All analyses of tank AZ-102 waste material will be reported as Formats I and/or II as shown in Table A-2. The Waste Compatibility Program may have previously requested progress reports from the laboratory regarding the analyses. However, due to the rapid turn around time required for the AZ-102 analyses (see Section A7.2), no special progress reports for this tank characterization project shall be required from the laboratory. All reports generated as part of normal operations (e.g., monthly reports) shall still be done. The data shall be reported in the units given by Table A-2, and all procedure and revision numbers used in the analyses shall be included in the report. Additional information regarding reporting formats is given in (Schreiber 1994a).

A7.1 FORMAT I REPORTING

Table A-2 contains the notification limits for each analyte. Any results that exceed the notification limits defined in the DQO processes shall be reported immediately by calling the East Tank Farm Operations Shift Manager at 373-2689 and the Characterization Program Office (Schreiber 1994b). This verbal communication must be followed within 24 hours by written notification to East Systems Engineering, the Characterization Program Office, Analytical Services, Waste Tanks Process Engineering, and Characterization Support, documenting the observations. Points of contact within each program or project are defined by Schreiber (1994c). Additional analyses for verification purposes may be contracted between the performing laboratory and the contacts above either by a revision to this document or by letter of instruction.

A7.2 FORMAT II REPORTING

The data found from these analyses shall determine whether or not waste from tank AZ-102 is compatible with the waste in the SST tanks to be stabilized, and will also assist with in-tank processing studies. Due to the immediate necessity of the compatibility data, the 222-S Laboratory has agreed to have the analyses identified in Table A-1 as being done for the compatibility program completed and results reported within 60 days of receipt of the samples at the laboratory loading dock. The results shall be reported using a Laboratory Information Management Systems (LIMS) report or electronically to East Systems Engineering. Although no data validation, supporting raw data, or quality control results are to be included, the results still require review and approval by the cognizant scientist or manager of the laboratory operation. In addition to the LIMS/electronic report, a letter report shall be sent to East Systems Engineering, the Characterization Program Office, Los Alamos Technical Associates, Characterization Support, and the Tank Characterization Resource Center representative summarizing the results. Any observations taken during the receipt and analysis of the grab samples should be included in this letter report.

For those analyses identified in (MacLean 1995) for in-tank processing information, the reporting requirements will be agreed to between the performing laboratory and the requesting program and documented in the test plan.

A8.0 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. These changes shall be documented through the use of internal characterization change notices or analytical deviation reports for minor low-impact changes and documented in applicable laboratory notebooks. All significant changes (such as changes in scope) shall be documented by Characterization Support via an Engineering Change Notice to this Tank Characterization Plan. All changes shall also be clearly documented and justified in the final data report.

Additional analysis of grab sample material from this characterization project at the request of the Characterization Program shall be performed according to a revision of this Tank Characterization Plan.

A9.0 REFERENCES

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