S

ENGINEERING CHANGE NOTICE

☒ DM ☐ FM ☐ TM

1a. ECN 720640 R 0

1b. Proj. ECN W- -

2. Request Information Record Information on the ECN-1 Form	3a. Design Inputs -Record Information on the ECN-2 Form	3b. Design References - Record Information on the ECN-3 Form	3c. Engineering Evaluation / Estimate / Approval to Proceed w/ the Design - Record Information on the ECN-4 Form

4. Originator's Name, Organization, MSIN, & Phone No.
Charles H Mulkey, Environmental Field Support, R1-51, 373-0956

5. USQ Number No. TF- R ☒ N/A
Init. [illegible] Date 6/3/03

6. Date
06/02/2003

7. Title
Revise Double-Shell Tank Waste Analysis Plan, Rev. 6

8. Bldg. / Facility No.
N/A

9. Equipment / Component ID
N/A

10. Approval Designator
E

11. Document Numbers Changed by this ECN (For FM or TM Changes Record Information on the ECN-5 Form) Sheet and Rev.
HNF-SD-WM-EV-053, Rev. 6

12. Design Basis Documents?
☐ Yes ☒ No

13. Safety Designation
☐ SC ☐ SS ☐ GS ☒ N/A

14. Expedited / Off-Shift ECN?
☐ Yes ☒ No

15a. Work Package Number
N/A

15b. Modification Work Completed
N/A
Responsible Engineer / Date

15c. Restored to Original Status (TM)
N/A
Responsible Engineer / Date

16. Fabrication Support ECN?
☐ Yes ☒ No

17. Description of the Change (Use ECN Continuation pages, as needed)
See page 3 of this ECN.

18. Justification of the Change (Use ECN Continuation pages, as needed)
This change will accurately represent the current requirements associated with the Double-Shell Tank Waste Analysis Plan.

19. ECN Category
☒ Direct Revision
☐ Supplemental

ECN Revision Type
☐ Void/Cancel
☐ Closure
☐ Revision

20. Distribution (Name and MSIN)
See attached.

Release Stamp
JUN 03 2003
DATE:
STA: 4
HANFORD RELEASE ID: 21

ENGINEERING CHANGE NOTICE

☒ DM ☐ FM ☐ TM

1a. ECN 720640 R 0

1b. Proj. ECN W- -

21. **Design Check** Record Information on the ECN-6 Form Not required.	22. **Design Verification Required?** ☐ Yes ☒ No If Yes, as a minimum attach the one page checklist from TFC-ENG-DESIGN-P-17.	23. **Closeout / Cancel / Void** ☐ Yes ☒ No If Yes, Record Information on the ECN-7 Form and attach form(s).

24. **Revisions Planned** (Include a brief description of the contents of each revision)

None

Note: All Revisions shall have the approvals of the affected organizations as identified in block 9 "Approval Designator," on page 1 of this ECN.

25a. **Commercial Grade Item Dedication Numbers** (associated with this design change) None	25b. **Engineering Data Transmittal Numbers** (associated with this design change, e.g., new drawings, new documents) None

26a. **Design Cost Estimate** $500	26b. **Materials / Procurement Costs** $0	26c. **Estimated Labor Hours** **6 hours**

27. **Field Change Notice(s) Used?** (Used for ECN Revisions only) ☐ Yes ☐ No If Yes, Record Information on the ECN-8 Form attach form(s) and identify permanent changes.	NOTE: ECN Revisions are required to record and approve all FCN's issued during the field modification work process. If the FCN's have not changed the original design media then they are just incorporated into the ECN file via an ECN revision. If the FCN did change the original design media then the ECN Revision will include the necessary engineering changes to the original design media changes.

28. **Approvals**

	Signature	Date
Design Authority		
Team Lead/Lead Engr. _CH Mulkey		6/2/03
Resp. Engineer _CH Mulkey		6/2/03
Resp. Manager _PC Miller		6/3/03
Quality Assurance		
IS&H Engineer		
NS&L Engineer		
Environ. Engineer		6/3/03
Project Engineer		
Design Checker _PA Powell	Pamela Powell	6/3/03
Design Verifier		
Operations		
Radcon		
Other		
Training		

	Signature	Date
Originator/Design Agent		
Professional Engineer		
Project Engineer		
Quality Assurance		
Safety		
Designer		
Environ. Engineer		
Other		
Other		

DEPARTMENT OF ENERGY / OFFICE OF RIVER PROTECTION

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL SIGNATURES

ENGINEERING CHANGE NOTICE CONTINUATION SHEET	☒ DM ☐ FM ☐ TM	1a. ECN 720640 R 0
Page 3 of 8		1b. Proj. ECN W- -

Document/Drawing No. _HNF-SD-WM-EV-053_____ Sheet _____ Revision _6___

(Note: A separate ECN Continuation page shall be used for each document/drawing to be modified.)

This ECN is a complete replacement of Rev. 6 of HNF-SD-WM-EV-053.

ECN - 1 ENGINEERING REQUEST FORM Page 4 of 8	☒ DM ☐ FM ☐ TM	1a. ECN 720640 R 0 1b. Proj. ECN W- -

Requestor's Name (Print)	Date	REA Reference
Charles H Mulkey	06/02/2003	N/A
Equipment Name		Estimated Need Date
N/A		06/04/2003

Problem/Issue Statement

A number of requirements have changed since the last issuance of the Double-Shell Tank Waste Analysis Plan, and these need to be updated in the document. Additionally, the requirement for radionuclides needs to be removed from the document.

Purpose for the Proposed Modification

This will clarify and more accurately represent the current requirements associated with the Double-Shell Tank Waste Analysis Plan.

Basis for the Estimated Need Date

Current 244-AR Vault Interim Stabilization Project need date to support pumping operations.

Requestor's Signature	Date	Requestor's Manager's Signature	Date
	6/2/03		6/3/03

Responsible Manager Approval

Work Package Number (If Known)	Estimated Evaluation ROM Cost $	CACN
Process as a Simple Modification? ☑ Yes ☐ No	Assigned to (Team Lead) C. H. Mulkey	Date 6/3/03
Responsible Manager's Signature 6/3/03	☒ Approve ☐ Reject	Date

If rejected, explain reason for rejection:

(Once rejected the Responsible Manager returns the request to the Requestor's Manager)

Italicized text items need to be addressed. Standard text items need to be addressed as applicable to the problem/issue described.

ECN - 5 DRAWING / DOCUMENT CHANGE LIST FORM Sheet 1 of ECN – 5 Page 5 of 8	☒ DM ☐ FM ☐ TM	1a. ECN 720640 R 0 1b. Proj. ECN W- -

List of Engineering Drawings/Documents to be Modified (Use the attached checklist for guidance)

Dwg./Doc. Number (Sheet/Page, Rev)	Title/Type	Shared	Existing Change Document Nos.
HNF-SD-WM-EV-053, Rev. 6	Double-Shell Tank Waste Analysis Plan	☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	
		☐	

Submitted to Document Service Center Prior to ECN Release?

☐ Yes ☒ No	Team Lead CH Mulkey	Date 06/02/03

List of Non-Engineering Documents Needed to be Modified

Document Number/Revision, Sheet/Page (If Available)	Document Title	Document Owner (Organization)	Individual Notified	Method	Date Notified
None	N/A	N/A	N/A	N/A	N/A

ECN - 5 DRAWING / DOCUMENT CHANGE LIST FORM Sheet 2 of ECN – 5 Page 6 of 8	☒ DM ☐ FM ☐ TM	1a. ECN 720640 R 0 1b. Proj. ECN W- -

Drawings/Documents to be Modified Checklist			
System Design Description	☐ Yes ☒ No ☐ N/A	Operating Procedure	☐ Yes ☒ No ☐ N/A
Functional Design Criteria	☐ Yes ☒ No ☐ N/A	System/Subsystem Specifications	☐ Yes ☒ No ☐ N/A
Functional Requirements	☐ Yes ☒ No ☐ N/A	Engineering Flow Diagram Drawing	☐ Yes ☒ No ☐ N/A
Operating Specification	☐ Yes ☒ No ☐ N/A	General Arrangement Drawing	☐ Yes ☒ No ☐ N/A
Criticality Specification	☐ Yes ☒ No ☐ N/A	Material Specification	☐ Yes ☒ No ☐ N/A
Conceptual Design Report	☐ Yes ☒ No ☐ N/A	Sampling Plan	☐ Yes ☒ No ☐ N/A
Detailed Design Report	☐ Yes ☒ No ☐ N/A	Inspection Plan	☐ Yes ☒ No ☐ N/A
Equipment Specification	☐ Yes ☒ No ☐ N/A	Radiation Control Procedure	☐ Yes ☒ No ☐ N/A
Procurement Specification	☐ Yes ☒ No ☐ N/A	Spare Parts List	☐ Yes ☒ No ☐ N/A
Construction Specification	☐ Yes ☒ No ☐ N/A	Test Specification	☐ Yes ☒ No ☐ N/A
Vendor Information	☐ Yes ☒ No ☐ N/A	Test Plan	☐ Yes ☒ No ☐ N/A
Operations / Maintenance Manual	☐ Yes ☒ No ☐ N/A	Acceptance Test Procedure	☐ Yes ☒ No ☐ N/A
Safety Analysis / FSAR / SAR / DSA	☐ Yes ☒ No ☐ N/A	Pre-Operational Test Procedure	☐ Yes ☒ No ☐ N/A
Technical Safety Requirement	☐ Yes ☒ No ☐ N/A	Operational Test Procedure	☐ Yes ☒ No ☐ N/A
Master Equipment List	☐ Yes ☒ No ☐ N/A	ASME Coded Item / Vessel	☐ Yes ☒ No ☐ N/A
Safety Equipment List	☐ Yes ☒ No ☐ N/A	Human Factor Consideration	☐ Yes ☒ No ☐ N/A
Radiation Work Permit	☐ Yes ☒ No ☐ N/A	Automated Control Configuration Procedure	☐ Yes ☒ No ☐ N/A
Environmental Requirement	☐ Yes ☒ No ☐ N/A	Computer / Automated Control Software Plan	☐ Yes ☒ No ☐ N/A
Environmental Permit	☐ Yes ☒ No ☐ N/A	Raceway / Cable Schedules	☐ Yes ☒ No ☐ N/A
Seismic / Stress / Structural Analysis	☐ Yes ☒ No ☐ N/A	Work Control Procedure	☐ Yes ☒ No ☐ N/A
Design Report	☐ Yes ☒ No ☐ N/A	Corrective Maintenance Procedure	☐ Yes ☒ No ☐ N/A
Interface Control Drawing	☐ Yes ☒ No ☐ N/A	Process Control Plan	☐ Yes ☒ No ☐ N/A
Calibration Procedure	☐ Yes ☒ No ☐ N/A	Process Control Procedure	☐ Yes ☒ No ☐ N/A
Preventive Maintenance Procedure	☐ Yes ☒ No ☐ N/A	Flow Sheet	☐ Yes ☒ No ☐ N/A
Engineering Procedure	☐ Yes ☒ No ☐ N/A	Purchase Requisition	☐ Yes ☒ No ☐ N/A
Security Plan	☐ Yes ☒ No ☐ N/A	Hazards Analysis	☐ Yes ☒ No ☐ N/A
Emergency Plan	☐ Yes ☒ No ☐ N/A	JCS PM Activity Datasheet	☐ Yes ☒ No ☐ N/A
N/A	☐ Yes ☐ No ☒ N/A	N/A	☐ Yes ☐ No ☒ N/A
N/A	☐ Yes ☐ No ☒ N/A	N/A	☐ Yes ☐ No ☒ N/A

ECN - 6 DESIGN CHECK LIST	☒ DM ☐ FM	1a. ECN 720640 R 0
Sheet 1 of ECN – 6 Page 7 of 8	☐ TM	1b. Proj. ECN W- -

Design Details/Attributes (to be filled out by the change originator) identified in the ECN.			
1. Issue/Problem Statement included	☒ Yes ☐ No ☐ N/A	*21. Basis for Selected Alternative explained, including assumptions*	☐ Yes ☐ No ☒ N/A
2. Safety/Commitment/Programmatic Impacts identified – NEPA Documentation completed	☐ Yes ☐ No ☒ N/A	*22. Potential Component/System Impacts identified and resolved*	☐ Yes ☐ No ☒ N/A
3. System/Equipment/Personnel Impacts identified	☐ Yes ☐ No ☒ N/A	*23. Potential Software Impacts identified and resolved*	☐ Yes ☐ No ☒ N/A
4. Technical Evaluation included	☐ Yes ☐ No ☒ N/A	*24. Potential Safety Impacts are identified and resolved (e.g., energized electrical equipment)*	☐ Yes ☐ No ☒ N/A
5. Compliance w/ Design Basis identified	☐ Yes ☐ No ☒ N/A	*25. Modification is Constructible and can be implemented*	☐ Yes ☐ No ☒ N/A
6. Assumptions/Sources clearly identified	☐ Yes ☐ No ☒ N/A	*26. Design considers Operational Impacts*	☐ Yes ☐ No ☒ N/A
7. Affected Documents and Databases clearly identified	☒ Yes ☐ No ☐ N/A	*27. Contamination Controls are planned*	☐ Yes ☐ No ☒ N/A
8. Inputs Verified	☐ Yes ☐ No ☒ N/A	*28. Pre-Installation/Mockup/Prototype Testing planned*	☐ Yes ☐ No ☒ N/A
9. Required Function(s) / changes clearly identified	☐ Yes ☐ No ☒ N/A	*29. Sketches/Drawings for Tools/Fabricated Components included*	☐ Yes ☐ No ☒ N/A
10. Safety Basis/Commitments/Concerns evaluated	☐ Yes ☐ No ☒ N/A	*30. Hardware Design described*	☐ Yes ☐ No ☒ N/A
11. Application of Industry Standards/Codes explained	☐ Yes ☐ No ☒ N/A	*31. Software/Firmware Design described*	☐ Yes ☐ No ☒ N/A
12. Proper Analytical Techniques employed	☐ Yes ☐ No ☒ N/A	*32. Inspections (per Codes & Standards) / Quality Checks included*	☐ Yes ☐ No ☒ N/A
13. Interfaces evaluated and identified	☐ Yes ☐ No ☒ N/A	*33. Dimensions and Tolerances included*	☐ Yes ☐ No ☒ N/A
14. Material/Component Compatibility evaluated	☐ Yes ☐ No ☒ N/A	*34. Sketches/Drawings for Installation included*	☐ Yes ☐ No ☒ N/A
15. ALARA/Radiological controls/chemical hazards evaluated	☐ Yes ☐ No ☒ N/A	*35. Housekeeping/Personnel Safety Requirements identified*	☐ Yes ☐ No ☒ N/A
16. Human/Machine Interface evaluated	☐ Yes ☐ No ☒ N/A	*36. Walkdown(s) performed/Labeling Correct*	☐ Yes ☐ No ☒ N/A
17. Program impacts evaluated	☐ Yes ☐ No ☒ N/A	*37. Acceptance Test generated and Acceptance Criteria included*	☐ Yes ☐ No ☒ N/A
18. Design Basis Calculations updated	☐ Yes ☐ No ☒ N/A	*38. M&TE Requirements identified*	☐ Yes ☐ No ☒ N/A
19. Alternatives described/evaluated and address resolution of problem	☐ Yes ☐ No ☒ N/A	*39. Training/Qualification of Test Personnel identified*	☐ Yes ☐ No ☒ N/A
20. Impacts on Maintenance and OPS described	☐ Yes ☐ No ☒ N/A	*40. Safety and Hazards Analysis assessed*	☐ Yes ☐ No ☒ N/A

Design Originator (Print/Sign) Charles H Mulkey	***Date*** 06/02/2003

Italicized text items need to be addressed. Standard text items need to be addressed as applicable to the change as described.

ECN - 6 DESIGN CHECK LIST	☒ DM ☐ FM ☐ TM	1a. ECN 720640 R 0
Sheet 2 of ECN – 6 Page 8 of 8		1b. Proj. ECN W- -

Design Check Method (Select method(s) and provide explanation of how to be performed):

☒ Peer Check	☐ Design Check Team*	☐ Other _____

Design Check Explanation:

Design check needs to verify whether the document modification is properly documented, complete, and correct.

* Design check team members other than the originating organization normally should consist of personnel representing: Operations, Maintenance & Reliability Engineering, Maintenance Management, Maintenance Crafts, Safety, and Projects.

Design Check Details

Design inputs correctly identified?	☐ Yes ☐ No ☐ N/A	*Design changes properly documented?*	☐ Yes ☐ No ☐ N/A
Calculations checked and are correct?	☐ Yes ☐ No ☐ N/A	*Test procedures reviewed and are correct?*	☐ Yes ☐ No ☐ N/A
Design assumptions are stated and verified?	☐ Yes ☐ No ☐ N/A	*Is the design change adequate?*	☐ Yes ☐ No ☐ N/A
Design criteria incorporated into the design?	☐ Yes ☐ No ☐ N/A	*Is the design change complete?*	☐ Yes ☐ No ☐ N/A
Interfaces clearly identified in the design?	☐ Yes ☐ No ☐ N/A	*Is the design change correct?*	☐ Yes ☐ No ☐ N/A
EQRG pre-release review required?	☐ Yes ☒ No	EQRG Pre-release Approval	Date

Comments:

Reference TFC-ENG-DESIGN-P-17, Design Verification

Design Checker (Print/Sign)	***Date***
Pamela Powell / Pamela Powell	5/3/03

Italicized text items need to be addressed. Standard text items need to be addressed as applicable to the problem/issue described.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Environmental Field Support	Date June 02, 2003
Project Title/Work Order		EDT No. N/A
HNF-SD-WM-EV-053, Rev. 7, "Double-Shell Tank Waste Analysis Plan"		ECN No. 720640 R0

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
CH2M Hill Hanford Group, Inc.					
DG Baide	S7-70	X			
DL Banning	R2-12	X			
TM Blaak	S5-13	X			
JH Bryce	T4-07	X			
JN Doeler	T4-07	X			
KD Fowler	S5-13	X			
TM Horner	S5-13	X			
PC Miller	R1-51	X			
CH Mulkey (6)	R1-51	H			
TA Wooley	R1-51	X			
Office of River Protection					
ME Burandt	H6-60	X			
LA Huffman	H6-60	X			
JE Rasmussen	H6-60	X			
DOE Reading Room	H2-53	H			

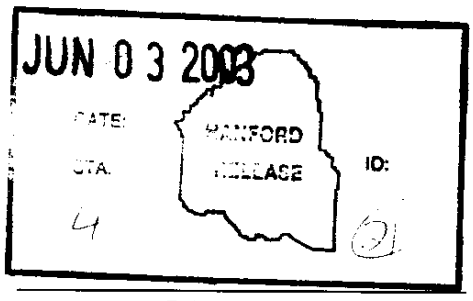
Double-Shell Tank Waste Analysis Plan

C. H. Mulkey
CH2M Hill Hanford Group, Inc.
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-99RL14047

EDT/ECN: 720640-R0 UC:
Cost Center: 7B500 Charge Code:
B&R Code: Total Pages: 61

Key Words: double-shell tank system, waste analysis plan, waste, analysis, waste acceptance criteria, sampling requirements, plan

Abstract: This waste analysis plan contains analytical requirements and waste acceptance criteria pertaining to waste received by the Double-Shell Tank system.



Release Approval Date 6/3/03

Release Stamp

Approved For Public Release

RECORD OF REVISION

(1) Document Number: HNF-SD-WM-EV-053

(2) Title: Double-Shell Tank Waste Analysis Plan

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initial Release EDT 114207	DL Halgren	JA Eacker6/10/91
1	Revise per ECN-153280	CH Mulkey	JA Eacker6/10/91
2	Revise per ECN-608876	CH Mulkey	RD Gustavson 2/15/94
3	Revise per ECN-622548	CH Mulkey	RD Gustavson 9/25/95
4	Revise per ECN-622565	CH Mulkey	D Allison9/25/96
4a	Revise per ECN-644172	CH Mulkey	DJ Carrell 8/27/97
5	Revise per ECN-190925	CH Mulkey	DJ Carrell 9/29/98
6	Revise per ECN-663649	CH Mulkey	MR Riess 7/3/01
7 RS	Revise per ECN-720640 R0	CH Mulkey sep ECN720640 R0 @ 6/3/03	PC Miller pcm 6/3/03

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TERMS

ALARA	as low as reasonably achievable
DOE	U.S. Department of Energy
DQO	data quality objective(s)
DST	double-shell tanks
ECO	Environmental Compliance Officer
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FDH	Fluor Daniel Hanford, Inc.
LDR	land disposal restrictions
M/L	moles per liter
mg/L	milligrams per liter
PUREX	plutonium uranium extraction
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	sampling and analysis plan
SST	single-shell tank
TCP	tank characterization plan
TFC	Tank Farm Contractor
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and disposal
WAC	*Washington Administrative Code*
WAP	waste analysis plan
WSPS	waste stream profile sheet
µg/ml	micrograms per milliliter

DEFINITION OF TERMS

Certify	To attest that information contained in a document (for example, waste stream profile sheets (WSPS)) is correct.
Waste shipper	The person or group who is responsible for transferring the waste to the double-shell tank (DST) system. The Waste shipper is usually the waste generator, but it may be an intermediary.
Tank Farm Contractor	The organization responsible for the operation of the DST system.
Ignitable	A waste that meets one or more criteria of WAC 173-303-090 [5].
Incompatible	Wastes as defined in WAC 173-303-040
Initial verification	The analytical verification through sampling and analysis of the list of analytes that occurs when the WSPS is approved for the first time.
List of analytes	The analytes contained in Section V of the WSPS (Appendix A).
Mixed waste	"a dangerous, extremely hazardous, or acutely hazardous waste that contains a nonradioactive hazardous component and, as defined by 10 CFR 20.1003, source, special nuclear, or by-product material subject to the *Atomic Energy Act of 1954*."
Periodic Verification	The analytical verification through sampling and analysis of analytes that occurs at a set frequency.
Predict	The computer model, which predicts the composition of waste after it, has been processed in the 242-A Evaporator
Reactive	A waste that meets one or more criteria of WAC 173-303-090(7).

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1.0 INTRODUCTION

The Double-Shell Tank (DST) System stores mixed waste until the waste can be treated for final disposal in another treatment, storage, and disposal (TSD) unit. Chapters 2.0 and 4.0 of the *Double-Shell Tank System Part B Dangerous Waste Permit Application* (DOE-RL-RL-90-39) describe the processes and activities associated with waste receipt and storage in the DST system in more detail. This document relies on safety-based data quality objectives (DQOs) to determine the analyses that are needed to address safety issues. The DST system WAP will be revised periodically to ensure it remains current.

1.1 PURPOSE

This waste analysis plan (WAP) establishes sampling and analysis requirements to meet requirements contained in WAC 173-303-300 and -806(4)(a)(ii) for the DST system TSD unit. These regulations require that measures be taken to ensure that the proper waste has been received and that sufficient information is available about the waste to properly manage it.

A series of DQOs were implemented to address safety issues. This WAP uses the analytes from these DQOs as the basis for determining the analytes that are necessary to properly manage mixed wastes within the DST system. Waste stream profile sheets (WSPSs) are used to document the composition of waste entering the DST system.

1.2 SCOPE

This WAP applies to dangerous wastes regulated by WAC 173-303 transferred into the DST system. Transfers generally enter or are transferred within the DST system through pipelines or through the 204-AR Waste Unloading Station. Dangerous waste sent to the DSTs is normally also classified as mixed waste since the waste also contains radioactive constituents that are regualted by the *Atomic Energy Act of 1954 (AEA).*

This WAP does not address sampling and analysis required for designating waste (secondary waste) produced as part of DST operations. This WAP also does not address sampling and analysis for 242-A Evaporator campaigns. Requirements for sampling and analysis for secondary waste and 242-A Evaporator campaigns are covered by other documents. Analyses for the radioactive portion of the waste is also not included in this WAP since radionuclides are not dangerous waste constituents and are regulated under the AEA.

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2.0 UNIT DESCRIPTION

The DST system is a TSD unit on the Hanford Facility. Storage is the principal function of the DST system although the *Double-Shell Tank System Part B Dangerous Waste Permit Application* (DOE-RL-90-39) states that treatment also occurs.

2.1 PROCESS AND ACTIVITIES

The DST system stores waste until other TSD units such as the 242-A Evaporator and the Waste Treatment Plant can treat it. Currently there is no treatment to meet land disposal restriction (LDR) requirements, and there is no disposal of waste in the DST system.

Wastes generally enter the DST system either by pipeline or through the 204-AR Waste Unloading Station. The wastes in the DST system are separated according to operational concerns and to ensure wastes are properly managed. This separation is based on organic content, level of radioactivity, and ability to be treated in downstream TSD units. It has not been feasible to implement a separation strategy based on waste codes because of the varying combinations of waste codes given to incoming waste, limited storage capacity, and DST system design. Because the separation of wastes in the DST system has been independent of waste codes contained in the DST system Part A, Form 3 Permit Application, all wastes currently in the DST system have been assigned the same dangerous waste codes.

Table 2-1 shows 34 tanks in the DST system. The content and level of waste in each tank are tracked and reported in summary reports. The amount of waste received by the DSTs is reported annually to Ecology in the Annual Dangerous Waste Report.

Table 2-1. Tanks in the Double-Shell Tank System.

Tank Number	Location	Design Capacity (gal)	Operation Date (DOE-RL 1991)
There are twenty-four 1,200,000-gal nonaging waste DSTs in four tank farms.			
241-AN Tank Farm #101, 102, 103, 104, 105, 106, 107	200 East Area	1,200,000	September 1981
241-AP Tank Farm #101, 102, 103, 104, 105, 106, 107, 108	200 East Area	1,200,000	October 1986
241-AW Tank Farm #101, 102, 103, 104, 105, 106	200 East Area	1,200,000	August 1980
241-SY- Tank Farm #101, 102, 103	200 West Area	1,200,000	April 1977
There are four aging waste DSTs in two tank farms.			
241-AY Tank Farm #101, 102	200 East Area	1,000,000	101 in April 1971 and 102 in April 1976
241-AZ Tank Farm #101, 102	200 East Area	1,000,000	November 1976
There is one 800-gal tank in a transfer building.			
241-EW-151 Catch Tank	200 East Area Vent Station	800	November 1955
There are five double-contained receiver tanks.			
244 Tanks #BX, TX, U, A, S	200 East Area for BX; 200 West Area for TX, U, A, and S	31,000 for BX, TX, and U 16,280 for A 20,280 for S	1983 for BX December 1987, 1987 for U, S 1975 for A

Part B Dangerous Waste Permit Application (DOE-RL-90-39) contains detailed information on the DSTs.

Treatment performed in the DST system is limited. The only intentional treatment that occurs in the DST system is adjusting waste chemical composition to meet corrosion control specifications and to maintain operable waste temperatures. Section 4.2.5.2 of DOE-RL (1991) contains further description of the treatment that occurs in the DST system. In the DST system, there is no intentional treatment to remove a dangerous waste number or to meet LDR requirements. Permissible dilution of waste constituents occurs during aggregation of different waste streams to allow for centralized treatment of the waste (55 FR 22666). Section 7.3 discusses LDR requirements further.

The DST system also generates solid waste during sampling, maintenance, and operational activities. Typically this equipment has contained or contacted the mixed wastes stored in the

tanks. Because this waste is physically solid, it is not amenable to storage in the DST system and is managed through other waste management pathways on the Hanford Facility.

2.1.1 Waste Acceptance Criteria and Waste Transfers into the Double-Shell Tank System

All waste transfers into the DST system must meet the waste acceptance criteria set forth in this document. The waste acceptance approval process requires an evaluation of the waste stream based on information contained in the WSPSs and the operational parameter sheet. Table 2-2 summarizes the steps of the approval process.

Table 2-3 outlines the information required for the evaluation and acceptance of waste streams. The topics of Sections 2.1.1.1 to 2.1.1.7 correspond to the rows in the information requirement column and explain these requirements in greater detail. The TFC may require the submittal of additional information to address regulatory and operational concerns. The WSPS provides a method for ensuring that receipt of the waste will not conflict with regulatory and safety issues.

Approval for actual waste transfer is given after completion and approval of transfer-specific information and documentation (see Table 2-4). Requirements for each transfer include but are not limited to: 1) Analytical results, 2) treatment of waste to meet DST system corrosion specifications, 3) certification that waste conforms to the information on the approved WSPS, and 4) verification (see Section 6.0) that the waste shipment matches the information on the WSPS.

Table 2-2. Summary of Waste Stream Approval Process.

Step	Action
1	Waste shipper submits a completed WSPS and Operational Parameter Sheet to the TFC.
2	The TFC evaluates the waste for conformance to safety, regulatory, and operational considerations, and notifies the waste shipper of the decision. If the waste acceptance is conditional, the stated additional requirements must be met before final waste acceptance and waste transfer.
3	The Waste shipper submits required additional information.
4	The TFC conducts a compatibility assessment based on the information submitted by the waste shipper.
5	The TFC determines the acceptability of waste for transfer and notifies the waste shipper of the decision about accepting the waste.
6	The waste shipper receives notification of waste acceptability and meets any waste acceptance conditions. This is documented by issuance of a compatibility assessment that recommends receipt of the waste.
7	The waste shipper schedules the waste transfer with the TFC.

Table 2-3. Information Required Before Waste Acceptance Approval for Waste Transfers Into the Double-Shell Tank System. (3 sheets)

Information Requirement	Regulatory Requirement	Rationale
Waste stream profile sheet. The waste shipper completes the WSPS with sufficient analytical information and relevant historical data and background information on waste contents.	WAC 173-303-300 (2) WAC 173-303-380 (1)(a) and (2)	Information required to determine suitability of waste to storage in the DST system. Information will be used to evaluate the waste for safety, regulatory, and operational considerations.
Waste numbers. The waste shipper lists the applicable dangerous waste numbers	WAC 173-303-070 WAC 173-303-380 (2)(a)	Waste entering the DST system can only have waste codes that are listed in the Part A, Form 3, Permit Application.
Certification. The waste shipper provides certification that waste conforms to the information contained in the WSPS.	QA Principles	Verifies that waste characteristics have not changed from those evaluated during the waste stream approval process.
Land Disposal Restrictions applicability. The Waste shipper provides information contained in a	40 CFR 268.7(a) WAC 173-303-140	Tracks applicability of LDR requirements.

Table 2-3. Information Required Before Waste Acceptance Approval for Waste Transfers Into the Double-Shell Tank System. (3 sheets)

Information Requirement	Regulatory Requirement	Rationale
notice and/or certification on applicability of LDRs.	WAC 173-303-380(1)(o)	
Waste transfer documentation. The Waste shipper provides appropriate waste transfer documentation in waste manifests or transfer data sheets that include: • Waste description • Identifying the generator/shipper of the waste • Date(s) of transfer • Authorizing signature for transfer • Volume of transfer including flush volumes • Volume of waste received at the DST system • Material balances • Applicable dangerous waste numbers and LDRs.	WAC 173-303-380 (1)(a) WAC 173-303-380 (2)(b)	Verifies identity of waste as a last check before actual receipt of waste.
Waste compatibility. TFC performs a waste compatibility assessment.	WAC 173-303-395	Helps prevent compatibility problems associated with mixing wastes that could react with each other.
WAP or Sampling Analysis Plan (SAP) on file. The Waste shipper provides their current WAP or sampling plan.	WAC 173-303-300 (5)(e)	Evaluates the acceptability of the data furnished by the Waste shipper.
Verification of waste composition. The TFC requires sampling and analysis at the Waste shipper location to verify that the waste composition matches the information contained on the WSPS.	WAC 173-303-300(1) (5)(d)	Ensures the WSPS accurately represents the waste being shipped.

Table 2-4. Information Required Before Waste Transfers to the Double-Shell Tank System. (2 sheets)

Information Requirement	Regulatory Requirement	Rationale
Waste compatibility assessment by DST contractor as required by safety-based DQOs.	WAC 173-303-395	Helps prevent compatibility problems associated with mixing wastes that could react with each other.
Appropriate waste transfer documentation in waste manifests or transfer data sheets that include information such as: Tanks involved with the transfer Date(s) of transfer Signature authorization for transfer Expected volume of transfer including flush volumes Material balances Change in applicable dangerous waste numbers and LDR requirements Any verification specified in Section 6.0 of this document or which was specified in the approval of the waste stream.	WAC 173-303-380 (1) and (2)	Verifies the identity of the waste as a last check before actual receipt of waste. No manifests are involved in DST transfers since all waste sent to the DST system comes from another Hanford unit.

Table 2-5 summarizes the limits placed on waste transfers. The TFC may require the sampling and analysis of waste transfers at any time to substantiate that waste composition matches the information on the WSPS and/or accompanying transfer papers.

2.1.1.1 Waste Stream Profile Sheet. A WSPS is prepared as part of the preapproval process for a waste transfer. The TFC uses the information in the WSPSs to evaluate safety, programmatic, and operational acceptability and to document information needed to meet regulatory requirements. The WSPSs are required for each incoming waste stream to the DST system, even for a single waste transfer.

Table 2-5. Summary of Double-Shell Tank Waste Acceptance Limits.[1]

Parameter	Limit
Waste stream profile sheet	Must be current
Compatibility	An evaluation must show that the waste is compatible with the waste contained in the receiving DST.
Corrosion control for waste going into a DST	For $[NO_3^-] \leq 1.0$ M 0.01 M$\leq[OH^-] \leq$8 M and 0.011 M $\leq [NO_2^-] \leq$ 5.5 M $[NO_3^-]/([OH^-] + [NO_{2-}]) < 2.5$ For 1.0 M $< [NO_3^-] \leq$ 3.0 M 0.1 M x $[NO_3^-] \leq [OH^-] <$ 10 M $[OH^-] + [NO_2^-] \geq$ 0.4 M x $[NO_3^-]$ For $[NO_3^-] >$ 3.0 M 0.3 $\leq [OH^-]$ 10 M $[OH^-] + [NO_2^-] \geq$ 1.2 M $[NO_3^-] \leq$ 5.5 M
Corrosion control for waste entering 204-AR	7 < pH < 14 and $[Cl^-] <$ 0.01 M for rail tank car $[Cl^-] <$ 0.035 M for tank trailer
Flammable Gas	Source DST and receiver DST (solids depth (in) x SpG)< 148
PCBs	Liquids < 200 ppb Solids < 450 ppm
Organic and Energetic Reaction	Source Exo/Endo <1; No separable organic layer The TOC must be less than 4.5 % dry weight basis if there is no free water. If there is free water the TOC must be less than 20 wt%.
Chemical Compatibility	Incompatible chemical groups cannot be mixed such that the resulting reaction causes a safety problem.
Heat generation	The DST must be kept within established heat load limits.
Waste composition	The waste conforms to the information contained in the approved WSPS.

Table 2-5. Summary of Double-Shell Tank Waste Acceptance Limits.[1]

Parameter	Limit
Waste numbers	Waste numbers assigned to waste stream must be listed in the current version of the DST system Part A, Form 3, Dangerous Waste Permit Application.

Note:
[1]Waste shipments outside these limits may be accepted if there are mitigating measures, which will allow receipt of the waste while still meeting operating limits, regulatory requirements, and safety-based DQO requirements.

The WSPSs are completed by performing a detailed chemical and physical analysis (as defined by WAC 173-303-300 (2)) on a representative waste sample and/or by applying existing knowledge to the same or similar waste. The latter type of information is referred to as process knowledge and must be documented as specified in the WSPS instructions. The Waste shipper has the responsibility of ensuring that information used to complete the WSPS represents the waste to be shipped, that analyses are according to the sampling and analysis plan which is submitted as part of the approval process, and that only representative samples are taken.

The WSPSs expire one year from the date of approval. Approval is obtained by the TFC issuing a compatibility assessment, which recommends and/or approves the waste transfer. The date on which the compatibility assessment is issued determines the approval date.

Continuing waste transfers must have the WSPS renewed or resubmitted annually. With each waste shipment, the Waste shipper must provide written certification that the composition of the waste matches the information on the WSPS. If a WSPS has not been approved or the certification has not been received by the TFC, the waste cannot be accepted into the DST system.

The regulatory requirements, which are met by using the WSPS, include those for general waste analysis and documentation of LDR requirements. The first requirement, "General Waste Analysis," [WAC 173-303-300(2)] requires the facility owner or operator obtain an analysis of a dangerous waste that is sufficiently detailed that the waste can be managed. The TFC uses the WSPS to meet this requirement (see Appendix A). The LDR documentation requirement is met by requiring identification of LDR information in the WSPS.

2.1.1.2 List of Applicable Waste Numbers. The requirement for waste numbers helps prevent accepting a waste that has not been approved for storage in the DST system. As part of the waste acceptance process, waste numbers listed on the WSPS will be compared to those listed on the DST system Part A Form 3 Permit Application (DOE-RL 1988). Wastes with one or more numbers that are not included on the Part A Form 3 Permit Application will not be accepted into the DST system.

2.1.1.3. Certification that Waste Conforms to Waste Stream Profile Sheet. The Waste shipper certification that the waste stream conforms to a WSPS is used to document that waste composition has not changed from the information contained on the WSPS. If certification is not provided, then the TFC will not approve the waste shipment . If a change to the waste stream has occurred, a new WSPS must be submitted and approved or the old WSPS modified, before waste can be transferred to the DST system. It should be noted that this is not a federal LDR certification. The certification must be made using the format specified by the TFC

2.1.1.4 Certification Regarding Land Disposal Restrictions Applicability. This section documents the LDR standards (WAC 173-303-140 and 40 CFR Part 268.40) that apply to the waste. Also, this section is used to supply information on the applicability of LDR requirements when the waste is transferred to another TSD unit. See Section 7.3 of this document for additional information on LDR. The Waste shipper must supply the required LDR information in the format specified by the TFC . When an incoming waste meets a particular federal LDR requirement, a LDR certification will be required of the Waste shipper.

2.1.1.5 Waste Transfer Documentation. The Waste shipper must supply documentation with each waste transfer. This information is documented in waste transfer data sheets that are used to track waste transfers into and within the DST system and is discussed further in Section 2.8 of DOE-RL (1991). The waste transfer data documentation must include the following information at minimum:

- waste description
- identification of the waste generator
- date(s) of transfer
- authorizing signature for transfer
- volume of transfer including flush volumes
- material balances
- applicable dangerous waste numbers and LDRs.

2.1.1.6 Waste Compatibility. Before transferring any waste stream from the Waste shipper to the DST system, the waste is evaluated for potential compatibility problems by the TFC. The information and limits, which are necessary to ensure safe handling of waste, are documented in a compatibility assessment that is specific for each waste stream. The compatibility assessment evaluates the waste transfer by considering the maximum and minimum values in the WSPS. Criteria for other programs and issues also may be considered during the acceptance evaluation.

Transfers within the DST system are handled in a similar manner in that a compatibility assessment is conducted before each transfer. However, WSPSs are not filled out for DST-to-DST system transfers. The compatibility assessments help ensure that no unforeseen problems will result from a waste transfer.

2.1.1.7 Double-Shell Tank Customer's Waste Analysis Documentation on File. Having a copy of the Waste shipper's documentation governing characterization activities of incoming waste identifies the sampling and analysis results the Waste shipper has agreed to supply. It also indicates the quality of analytical data used to fill out the WSPSs and comply with verification requirements. The Waste shipper's WAP or SAP should meet applicable regulatory

requirements. The waste analysis should ensure that data taken for compatibility assessments and verification meet the requirements specified for DST waste compatibility.

2.1.1.8 Verification of Waste Composition. Some sampling and analysis is required to ensure that information in the WSPSs accurately represent the actual waste composition. The extent of this verification will depend on the particular waste stream but must meet the specification contained in Section 6.0 of this document. Sampling and analysis results will be included as part of each particular waste stream approval. However, additional sampling and analysis can be required at any time by the TFC.

2.1.2 Waste Storage and Transfer Within the Double-Shell Tank System

Changes in stored waste and transfers of waste within the DST system are discussed in the subsections below.

2.1.2.1 Waste Storage. Even without considering the effects caused by waste transfers, the waste in the DSTs changes over time. The changes can be caused by many factors including radiolysis, evaporation, and salt formation. Sampling and analysis specified in safety-based DQOs are used to determine whether these changes have caused the tank to become a potential safety problem.

2.1.2.2 Waste Transfers within the Double-Shell Tank System. Compatibility of mixing wastes together is the primary concern associated with DST-to-DST system transfers from an operational point-of-view. The latest version of the safety-based DQO pertaining to compatibility is the basis for determining when a compatibility assessment is needed. The compatibility DQO identifies parameters needed to ensure mixing of incompatible wastes will not result in a condition that would jeopardize the health and safety of personnel and equipment. The results of the compatibility assessment are documented before all transfers. The compatibility assessment also may consider other requirements in the evaluation. If the assessment deems that sampling and analysis is necessary, analytical results must be obtained and evaluated by the TFC before the transfer.

2.1.3 Waste Transfers Out of the Double-Shell Tank System

Currently waste transfers out of the DST system are limited to the 242-A Evaporator where water and volatile constituents are separated from the resulting concentrated waste. The resulting concentrated waste (portion that did not evaporate) is returned to the DST system for further storage. Sampling and analysis of these activities are not covered by this WAP but are covered by the waste analysis plan for the 242-A Evaporator.

The final treatment of the DST waste is anticipated to be vitrification or some other approved treatment. Before transferring waste to another TSD unit, waste analysis will be conducted, as required, to meet all regulatory requirements and to ensure that DST waste meets the receiving TSD units waste acceptance criteria.

2.2 DANGEROUS WASTE MANAGED IN DOUBLE-SHELL TANKS

The types of waste received by DSTs can be separated into two primary groups: legacy waste generated during the operation of facilities such as the PUREX Plant and B Plant and waste generated from ongoing Hanford Site cleanup activities.

Legacy waste was generated when the Hanford Site was operated as part of the National Defense Operation. Waste from past operations was stored in single-shell tanks (SSTs) and some DSTs. Waste in SSTs will be transferred to DSTs as the SSTs are stabilized, and/or waste is retrieved. Waste from cleanup operations is primarily a dilute aqueous waste generated by unit closures, laboratories, and various other activities.

All waste in the DST system has currently been assigned the same hazardous waste numbers. When waste enters the DST system, it is automatically assigned the same waste numbers as the waste already in the tanks. Because there is no specific treatment in the DST system to decharacterize waste, or to remove, immobilize, or destroy toxic constituents, waste leaving the DST system must be treated at another TSD unit to meet LDR requirements for waste numbers that appear on the DST system Part A Form 3 Permit Application.

2.3 DESCRIPTION OF DOUBLE-SHELL TANK SYSTEM

The DST System is defined by M-48-01 (DOE 2001) and will be further defined in updated versions of the document, *Double Shell Tank Transfer System Modifications Project E-525 Pre-Conceptual Decisions Summary* (CHG 2003a) which will contain descriptions and diagrams defining the DST System. Table 2-1 of this document and provide further descriptions. The information in Table 2-1 includes tank numbers, locations, design capacities, and operational dates.

The DST system provides interim and long-term storage of waste. Eventually, the waste stored in the DST system will be retrieved and treated, as necessary, for final disposal.

3.0 WASTE ANALYSIS PARAMETERS

This section provides the selection of analytical parameters based on the Washington State "Dangerous Waste Regulations" (WAC 173-303-300[5][a]) and the U.S. Environmental Protection Agency (EPA) *Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual* (EPA 1994).

3.1 CRITERIA FOR PARAMETER SELECTION

The WSPS summarizes information needed for regulatory purposes and for the proper management of waste. In addition to providing a general description of the waste, the focus of the information collected for regulatory purposes is to ensure the DST system is permitted to accept waste and to meet LDR requirements.

Regulatory information is based on acceptable knowledge of the waste. Sampling and analysis is not required except for verification parameters. Verification parameters are specified in the list of analytes (Section V of the WSPS).

3.1.1 Waste Identification

The first step in evaluating the acceptability of a waste is to obtain a general description of the waste and to identify the waste numbers and regulatory requirements that apply to the waste. The WSPS provides the format for documenting and reporting this information. These requirements include ensuring the acceptance of wastes that meet DST system permit requirements and reporting the information required by WAC 173-303-380. The applicability of LDR requirements is also collected.

3.1.2 Identification of Incompatible Wastes

One important aspect of operating the DST system is to ensure that incompatible wastes are managed pursuant to WAC 173-303-395(1). For the purposes of this document, wastes are considered compatible if, when mixed, they do not: 1) generate extreme heat or pressure, fire or explosion, or violent reaction; 2) produce uncontrolled toxic mists, dusts, or gases in sufficient quantities to threaten human health; 3) produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions; 4) damage the structural integrity of the device or facility containing the waste; or 5) through other like means threaten human health or the environment (WAC 173-303-395[1][b]). Incompatible waste must be managed pursuant to WAC 173-303-395(1), since otherwise, waste is unsuitable for placement in a particular device or facility because it may corrode or decay the containment materials, or it is unsuitable for mixing with another waste because the mixture might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, fumes, mists, or gases, or flammable fumes or gases (WAC 173-303-040).

3.1.3 Operational Considerations

Sufficient information must be available to ensure that incoming waste streams meet waste acceptance limits. The DST operational issues primarily relate to the segregation and compatibility of the waste within the DST system. These specifications are limits and controls imposed upon a process or operation that, if violated, could jeopardize the proper management of waste or damage equipment. Operating specifications have been established from operating experience, process knowledge, tests, and calculations and are specified in waste transfer operating procedures. Some parameters are qualitative and directly applicable to maintaining the integrity of the tanks within the DST system. Section 4.0 of the *Double-Shell Tank System Dangerous Waste Permit Application* (DOE-RL 1991) contains additional information on operational considerations and specifications.

Table 3-1. Rationale for the Selection of Parameters. (3 sheets)

Parameter	Required for DST WAP	Rationale
Ammonia/ammonium	No	Operational parameter used for input into models. It is not a dangerous waste specific constituent.
Aluminum	No	Needed when PREDICT is used to determine complexant status. Complexant status is used as one of the tank segregation criteria.
Americium-241	No	Regulated under the AEA. It is not a dangerous waste specific constituent.
Carbonate	No	Needed when PREDICT is used to determine complexant status. Complexant status is used as one of the tank segregation criteria.
Cesium 137	No	Regulated under the AEA. It is not a dangerous waste specific constituent.
Chloride	Yes, for waste streams entering 204-AR. No, for shipments directly into a DST.	Used to prevent corrosion in the 204-AR Waste Unloading Station piping.
Energetics Total fuel content Exotherm/endotherm ratio	Yes	Used to ensure that waste entering the DST system cannot sustain a propagating reaction. As long as the endotherm is equal to or greater than the exotherm, any exothermic reaction cannot sustain itself.
Fluoride	No	Needed when PREDICT is used to determine complexant status. Complexant status is used as one of the tank segregation criteria.
Gas composition of vapor in the tanks	No	This is used to address flammability issues of vapor in a tank. Because incoming waste and waste transfers should not include the transfer of gas (other than small volumes of entrained gas), this parameter was considered to be not relevant to waste transfers.
Hydroxide	Yes	Minimum levels are needed to prevent tank corrosion.

Table 3-1. Rationale for the Selection of Parameters. (3 sheets)

Parameter	Required for DST WAP	Rationale
Neutron absorbers (iron, manganese, uranium, chromium, nickel, aluminum, sodium, and silicon)	No	Used to address AEA concerns
Moisture, %	Yes	Used to determine whether there is sufficient water to absorb any generated heat so that an exothermic reaction could not be sustained.
Nitrate	Yes	Levels need to be controlled to prevent tank corrosion.
Nitrite	Yes	Levels need to be controlled to prevent tank corrosion.
Organics, total organic carbon	Yes	Used to document the organic composition of the received waste.
Organics, separable	Yes	Used to prevent the accumulation of an unanalyzed organic layer floating on the top of a tank. A floating organic layer could increase the potential for a flammability problem.
PCB	Yes	Used to address TSCA requirements.
pH (or free hydroxide)	Yes	Used to ensure corrosion control specifications are maintained.
Phosphate	No	Needed when PREDICT is used to determine complexant status. Complexant status is used as one of the tank segregation criteria.
Plutonium-239/240	No	Regulated under the AEA. It is not a dangerous waste specific constituent.
Sodium	No	Used to address AEA requirements.
Sodium hydroxide	No	Used to address AEA requirements.
Solids, vol %	Yes	This is a screening parameter used to determine whether the transfer is a liquid or solids transfer. It is also used to address PCB analytical requirements.
Specific gravity	Yes	Used to evaluate the potential for entrapment of gases.

Table 3-1. Rationale for the Selection of Parameters. (3 sheets)

Parameter	Required for DST WAP	Rationale
Strontium-90	No	Regulated under the AEA. It is not a dangerous waste specific constituent.
Sulfate	No	Needed when PREDICT is used to determine complexant status. Complexant status is used as one of the tank segregation criteria.
Uranium	No	Regulated under the AEA. It is not a dangerous waste specific constituent.
Viscosity	No	Used for calculating the Reynolds number that is used in determining pumpability of a waste.
Yitrium-90	No	Regulated under the AEA. It is not a dangerous waste specific constituent.

3.2 PARAMETER SELECTION PROCESS

The requirements for the safe handling, transfer, and storage of wastes managed in the DST system have been identified through the application of the DQO process and according to EPA (1994). TSCA requirements and the results of the DQOs for compatibility and safety screening were used as the basis for determining the data requirements presented in this WAP.

Parameter selection is based on parameters pertaining to accepting wastes from sources outside the DST system and those concerning waste movement within the DST system. The information used to determine waste acceptance criteria for waste from outside the DST system is summarized in Table 2-3, and acceptance limits are shown in Table 2-5. Information required for waste transfers within the DST system is summarized in Table 2-4.

Data needs and sampling and analysis requirements change over time and are triggered by many factors, including: 1) data requirements that become better defined through changes in DQOs and other documents, 2) information that becomes available, 3) changes that occur in regulatory requirements, and 4) waste verification results that show waste composition discrepancies.

The timing to implement changes will depend on the specific change but will be no later than the annual renewal of the WSPS. If a change is significant to the proper handling and/or storage of a waste, implementation of the change will be made before the next shipment of the waste.

3.3 RATIONALE FOR PARAMETER SELECTION

Parameters were selected based on compliance with regulatory requirements and operation of the DST system. *Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual* (EPA 1994) was used as a general guide for identifying the regulatory requirements, although unique conditions at the Hanford Site require significant deviation from the guidelines provided. Mulkey and Miller (1997) and Dukelow et al. (1995) identify the analytes required to address safety issues associated with waste management in the DST system. The rationale for selecting these analytes is included in Table 3-1.

The safety-based DQOs were used to determine what information is required to address safety related issues. The safety screening DQO was designed to sample tanks to determine whether the tank should be on a Watch List, and the compatibility DQO was designed to determine what information is needed to address safety issues associated with waste transfers.

Table 3-1 lists each analyte that was identified in the safety-based DQOs. The table also indicates whether or not the analyte needs to be obtained for the purposes of this document. Analysis for the indicated parameters will ensure the safe handling of the waste. Information on gas composition is not required because the only gas sent to the DST system would be dissolved gas contained within the liquid waste. Parameters are included to address the issue of flammable gas accumulation in the tank waste. Per DOE policy, parameters associated with meeting AEA requirements are not included.

3.4 SPECIAL PARAMETER SELECTION

Wastes accepted in the DST system have been designated as ignitable and reactive wastes but do not typically exhibit these physical properties because of the low concentration of ignitable and/or reactive components. Because of radiolysis, all tank waste release some amount of flammable and/or toxic vapor. However, the amount of gas released is generally quite small and only presents a safe handling concern if the gas is allowed to accumulate. The accumulation is controlled by evaluating solids content and specific gravity to ensure that gas retention remains small. Safety-based DQOs are used to evaluate and prevent problems with safety issues such as flammable gas accumulation, toxic gas generation, and nuclear criticality.

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4.0 SELECTION OF SAMPLING PROCEDURES

This section contains requirements for the sampling methods and procedures that must be used for all analytical requirements specified by this document. Samples not required by this document, such as those for waste retrieval studies, are considered outside the scope of this document and do not have to adhere to these requirements. In addition, sampling and analytical activities pertaining to waste processing in the 242-A Evaporator are beyond the scope of this WAP. The two types of samples required by this document include samples taken by the Waste shipper in support of obtaining and maintaining approval to ship waste to the DST system and samples taken in DSTs in support of safety evaluations and environmental compliance issues associated with waste transfers. The DST sampling will be conducted according to requirements contained in specific sampling and analysis plans (SAPs) or other documents as required by the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1996).

4.1 SAMPLING STRATEGIES

Sampling strategies must ensure a representative sample is obtained. The strategies for obtaining samples are discussed in Sections 4.1.1, 4.1.2, and 4.1.3.

4.1.1 Sampling Strategies Required for Double-Shell Tank Customers

The requirements of this section apply to samples that are taken to fill out the WSPS and for samples required by Section 5.0 of this document. The sampling strategy selected by the Waste shipper should be approved by the TFC.

Sampling strategies must ensure that a representative sample is obtained and be described in the Waste shippers' WAP or equivalent document. The document must state the sampling strategy to be used and substantiate that the strategy will yield representative information. The sampling strategy should maximize data accuracy and minimize errors attributable to incorrectly selected sampling procedures. Section 2.3.1 of *Waste Analysis at Facilities That Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual* (EPA 1994) should be used for guidance in developing the sampling strategy. Specific requirements for the plan include the following: 1) specification of the type and number of samples, 2) the number of samples that must be taken to estimate the variability of the waste's composition, 3) the sampling methods that will be used, and 4) the sample locations that will be used and the rationale for selecting locations. The sampling documents must also ensure that at least two samples are obtained and analyzed for all parameters listed in Section V of the WSPS (see Appendix A).

4.1.2 Sampling Strategies for Samples Taken within the Double-Shell Tank System

Sampling for waste characterization within the DST system is controlled by the issuance of tank-specific SAPs. Additional analytical information may also be obtained by analyses conducted according to other documentation such as a letter of instruction or process memorandum. These alternate methods may be used to satisfy requirements of the compatibility DQO. Specific requirements for the SAPs and other sampling documents include the following: 1) the type and number of samples, 2) sampling methods that will be used, and 3) the sample locations that will be used and the rationale for selecting locations. In some instances, a SAP is not issued, and sampling may be performed according to a letter of instruction or similar document.

4.1.3 Approval of Sampling Strategies

The TFC will review and evaluate the sampling strategies proposed by Waste shippers. The TFC will evaluate the acceptability of strategies to obtain a representative sample and to satisfy the requirements stated in Section 3.1.1. The TFC will make recommendations to the Waste shipper to ensure this strategy will meet DST waste acceptance criteria.

4.2 SELECTION OF SAMPLING EQUIPMENT

The physical and chemical properties of the waste and site-specific issues such as accessibility must be considered when the sampling equipment is selected. The selected equipment should be specified in the pertinent sampling plan. Section 2.3.2 of EPA (1994) describes different types of sampling equipment and includes guidance for equipment selection. If a particular sampling method is specified in regulation, a pertinent DQO or the *Hanford Analytical Services Quality Assurance Plan* (DOE-RL 1994b), that equipment must be used. Sampling equipment must meet applicable regulatory requirements stated in the Washington State "Dangerous Waste Regulations" (WAC 173-303).

4.3 MAINTAINING AND DECONTAMINATING FIELD EQUIPMENT

All equipment used to collect and transport samples must be free of contamination that could alter test results. All equipment used to obtain and contain samples must be clean. Sampling equipment can be used equipment as long as it has been cleaned to remove contamination that could alter analytical results. New equipment can be used as long as it does not contain manufacturing or packaging residues that could affect analytical results. After use, sampling equipment that has come into contact with waste must be cleaned or properly managed as waste.

4.4 SAMPLE PRESERVATION AND STORAGE

Sample preservation must follow procedures set forth for the specific analysis identified in the appropriate tank characterization plan (TCP) or sampling plan. Because of concerns with radioactivity, preservation may not follow the methods stated in *Test Methods for Evaluating Solid Waste* (EPA 1992) but must follow the test methods adopted by the Hanford Site. Analyses performed to meet requirements of this document must have been performed on either new samples or on archived samples that have been preserved and/or stored such that the analytical results would be comparable to that of a fresh sample (mathematical reconstitution of the sample is allowed).

4.5 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

The quality assurance/quality control (QA/QC) procedures will vary according to the particular situation. The QA/QC requirements for sampling will be divided between documentation requirements, such as a chain-of-custody, and sampling and analysis activities. This section addresses sampling QA/QC requirements. Section 5.0 addresses analytical procedures. Quality control procedures for tank sampling will be included in the tank-specific TCPs.

A chain-of-custody procedure is required for all sampling identified by this WAP. At a minimum, the chain-of-custody must include: 1) a description of waste collected, 2) the names and dated signatures of samplers, 3) the date and time of collection and number of containers in the sample, and 4) the names and dated signatures of persons involved in transferring the samples.

The QA/QC for sampling consists primarily of checking for contamination through blanks. These are explained in Section 2.3.5 of EPA (1994). If QA/QC procedures for blanks and duplicates have been specified in a pertinent DQO, sampling, or analysis plan, the procedures specified in the DQO or plan must be followed. If the procedures for blanks and duplicates have not been specified, the following steps should be used for every sampling event.

1. Check for sampling equipment contamination by taking at least one sample of an equipment rinse for each sampling event. In most instances, there is no need to take a sample rinse if new equipment is used because there should be no residue that could affect analytical results.

2. Check for general replicability of results by taking at least one set of field duplicates and by requiring the laboratory to conduct a duplicate spike on at least one sample.

Whenever blanks and/or duplicates are taken, they must be treated as if they are actual samples. This treatment includes, but is not limited to, adding the same amount of preservatives to blanks as is added to the samples and storing the blanks and duplicates in the same manner as samples.

4.6 HEALTH AND SAFETY PROTOCOLS

Safety and health protocol requirements are unit-specific and are incorporated into activity-specific sampling procedures. One important consideration is to keep all exposure as low as reasonably achievable (ALARA). Because each sampling activity may be different, the specific protocols for ALARA and health and safety are not specified in this document, but they are included in the sample-specific procedures written for each sample collection activity. Specific requirements relating to safety and health protocols that are in pertinent DQOs, WAPs, and SAPs must also be followed for all samples required in this document.

5.0 LABORATORY SELECTION AND TESTING AND ANALYTICAL METHODS

This section addresses laboratory selection and testing and analytic methods.

5.1 LABORATORY SELECTION

Laboratory selection is limited as only a few laboratories are equipped to handle mixed waste because of the special equipment and procedures that must be used to minimize personnel exposure. Although preference will be given to a laboratory on the Hanford Site, an offsite laboratory may be used. The laboratory is selected based upon laboratory capability, nature of the sample, timing requirements, and cost. At a minimum, the selected laboratory must provide data with sufficient quality to meet the requirements for making decisions described in the applicable DQOs.

5.2 TESTING AND ANALYTICAL METHODS

Double-shell tank customers will need to conduct analyses to provide information for the WSPSs. The DST contractor may also conduct analyses to determine compatibility, safety, and operating information. Testing and analytical methods will depend on the type of analysis sought and the reason for needing the information.

Analytical methods will be selected from those routinely used by Hanford Site analytical laboratories. These methods are discussed in *Analytical Methods for Mixed Waste Analysis at the Hanford Site* (DOE-RL 1994a) or its successor. All analytical methods must meet pertinent regulatory requirements such as those contained in WAC 173-303.

Double-shell tank customers are expected to obtain analyses to 1) fill out information on the WSPSs if no process knowledge on a particular constituent is available, 2) confirm process knowledge when the validity of the knowledge is suspect, and 3) provide analyses needed for verification as required in Section 6.0 of this document. Table 5-1 shows the analyses that are needed for verification and the test methods. Section 2.4.2 of EPA (1994) describes information that should be considered when selecting analytical methods. The analytical method(s) selected must be identified in the analysis plan submitted to the TFC.

The sampling of waste stored in the DST system will follow the methods specified by pertinent DQOs. If analytical methods have not been specified in a DQO or analysis plan, the TFC has the responsibility for selecting the appropriate method.

Table 5-1. Parameter Test Methods (2 sheets)

Parameter	Test method	Analytical uncertainty (U) or sensitivity (S)or other QA/QC
Chloride (only for samples going to 204-AR)	IC or spectrometric	Laboratory control standard 80-120% Spike Recovery 75-125% Duplicate relative percent difference ≤20% Detection limit 213µg/ml
Energetics	Differential scanning calorimetry supported by thermogravimetric analysis (TGA) results to be reported in cal/g and whether there is a net exotherm.	Laboratory control standard 80-120% Spike Recovery 75-125% Duplicate relative percent difference ≤20%(TGA) ≤30% (DSC)
Hydroxide	Titration	Laboratory control standard 80-120% Duplicate relative percent difference ≤20% Detection limit 0.007M
Moisture, %	TGA	±1.7 % water (U)
Nitrate	Ion chromatography/conductivity	Laboratory control standard 80-120% Spike Recovery 75-125% Duplicate relative percent difference ≤20% Detection limit 620µg/ml
Nitrite	Ion chromatography /conductivity	Laboratory control standard 80-120% Spike Recovery 75-125% Duplicate relative percent difference ≤20% Detection limit 258µg/ml
Organics, separable	Visual	Not specified
pH	Electrode	Not specified

Table 5-1. Parameter Test Methods (2 sheets)

Parameter	Test method	Analytical uncertainty (U) or sensitivity (S)or other QA/QC
Settled Solids, vol %	Not specified	Not specified
Specific gravity	Gravimetric / Volumetric	Not applicable
Total organic carbon (TOC)	Silver catalyzed persulfate oxidation or furnace oxidation	Laboratory control standard 80-120% Spike Recovery 75-125% Duplicate relative percent difference ≤20% Detection limit 80µg/ml
PCB	GC MS	Detection limits should be as low as practical and should not be higher than 20 µg/L for liquids and 5 µg/g for solids

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6.0 WASTE VERIFICATION

Waste verification is directed by the TFC. Waste verification pertains to sampling and analysis activities for incoming wastes or for DST-to-DST system transfers. Waste verification activities ensure the transfer contains waste within the range(s) specified in the list of analytes (Section V of the WSPS).

The potential for compatibility problems is thought to be greatest for mixing incoming waste with waste already in the DST system, but the potential for compatibility problems from mixing different wastes that are already in the DST system also exists. Section 6.1 discusses verification of waste received into the DST system in greater detail. Section 6.2 contains the requirements concerning verification of DST-to-DST system transfers.

6.1 VERIFICATION OF WASTE RECEIVED BY THE DOUBLE-SHELL TANK SYSTEM

The WSPS is used to document the expected waste composition for waste acceptance evaluation. Any information or analytical data that deviates from the WSPS are taken as a signal that something may have changed. In most cases, deviations are expected to be the result of some unforeseen event or are expected to be caused by an analyte being below the minimum value or above the maximum value indicated on the WSPS. Verification for every waste stream consists of initial sampling and analysis of all compounds on the list of analytes and periodic sampling and analysis to verify the waste has not changed.

Table 6-1 contains general requirements for verification, and Table 6-2 contains verification requirements for waste transferred from different types of sources. If discrepancies are found between information contained in the WSPS and verification sampling and analytical results, the discrepancy will be resolved as described in Section 6.1.2.

Initial verification provides confirmation the parameter is within the expected concentration indicated on the WSPS. Periodic reevaluation provides the verification that the composition of the waste has not changed. Periodic reevaluation by sampling and analysis must occur as specified in Table 6-2. For most waste streams, this will be at least annually after the initial verification, but may occur more frequently.

Table 6-1. List of General Requirements For Initial and Periodic Waste Verification Analyses.

Initial verification	1. Unless specified otherwise in Table 6-2, sampling must have been completed within two years of waste shipment. 2. Sampling and analysis must have been completed as quickly as feasible after sampling but in all cases must have been completed prior to such a time that would adversely impact the analytical result. 3. Sampling and analysis do not have to be completed before submitting the WSPS as long as the concentrations can be determined through process knowledge. However, all required analytical data must be completed and submitted to the TFC before actual shipment of the waste. 4. Sampling and analysis results must be within the ranges specified on the WSPS. The WSPS shall be revised to reflect changes if necessary.
Periodic verification	1. Sampling and analysis required for continuing verification that must be submitted to the TFC at the time that the WSPS is renewed unless specified otherwise in Table 6-2. 2. Results of analyses must not be discrepant as defined in Section 6.1.1.

Table 6-2. Minimum Waste Verification Analytical Requirements for Double-Shell Tank System Waste Transfers.

Type of waste stream	Initial verification	Periodic verification
242-A Evaporator slurry to DST system	Sampling and Analysis as required by the latest editions of the Compatibility DQO and 242-A of Section V list of analytes before waste being transferred out of the receiving DST. To fulfill this requirement, the sample can be taken from the slurry as it exits the evaporator or from the receiving slurry tank.	The requirements for initial verification must be repeated for each campaign.
340 Facility, Laboratory Waste, B Plant, PUREX, 189-D loop water, T Plant to DST system	Sampling and Analysis of the entire Section V list of parameters.	Annual sampling and analysis of Section V analytes.
Single-shell tanks to DST system	Sampling and Analysis of the entire Section V list of parameters for each tank within 10 years of beginning the waste shipment. For SSTs that have been identified as caustic deficient, a sample is required within 2 years of waste shipment, unless mitigating actions are taken that address the caustic deficiency.	None for "interim stabilization" activities in which just supernatant or interstitial fluid is transferred. For sluicing operations that occur in stages, verification of the receiving tank after each sluicing stage is acceptable provided that any needed adjustments to the receiving tank are made prior to any subsequent transfers. For any other long-term activity not covered above, analysis of Section V analytes for each tank is required every two years.
Plutonium Finishing Plant waste to DST system	Sampling and Analysis of the entire Section V list of parameters.	Annual sampling and analysis of Section V analytes.
Rainwater/ snowmelt collected in TFC sumps, catch tanks, etc. that do not contain other than trace amounts of other wastes.	Confirmation of the process knowledge that the waste is primarily from precipitation by analysis for pH, electrical conductivity, and specific gravity.	Same as initial verification.
Miscellaneous or unspecified waste streams to DST system	Sampling and Analysis of entire Section V list of parameters for each waste stream.	Annual sampling and analysis of Section V analytes.