ENGINEERING CHANGE NOTICE	Page 1 of 2	1. ECN № 623843 Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	L. M. Sasaki/Characterization Plans, Coordination and Reports/R2-12/373-1027	[] Yes [X] No	09/01/95
	5. Project Title/No./Work Order No. Tank 241-BX-105	6. Bldg./Sys./Fac. No. N/A	7. Approval Designator N/A
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-406, Rev. 0	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Results of tank vapor sampling are being incorporated into the document.

13a. Justification (mark one)

Criteria Change	[]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[X]

13b. Justification Details

Tank vapor flammability assessment is required to satisfy the safety screening requirements for this tank.

14. Distribution (include name, MSIN, and no. of copies)

See attached distribution sheet.

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OFFICIAL RELEASE BY WHC
DATE AUG 31 1995
15
Sta #19

A-7900-013-2 (11/94) GEF095

A-7900-013-1

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ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1)
ECN-623843

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

20. Approvals

Signature		Date	Signature	Date
OPERATIONS AND ENGINEERING			ARCHITECT-ENGINEER	
Cog. Eng. L.M. Sasaki	L M Sasaki	8/31/95	PE	
Cog. Mgr. J.G. Kristofzski	John Krist	8/31/95	QA	
QA			Safety	
Safety			Design	
Environ.			Environ.	
Other			Other	
			DEPARTMENT OF ENERGY	
			Signature or a Control Number that tracks the Approval Signature	
			ADDITIONAL	

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SUPPORTING DOCUMENT

1. Total Pages 89 (JCB 8/31/95)

2. Title

Tank Characterization Report for Single-Shell Tank 241-BX-105

3. Number

WHC-SD-WM-ER-406

4. Rev No.

0-A

5. Key Words

Waste Characterization, Single-Shell Tank, BX-105, Tank Characterization Report, BX Farm, Waste Inventory, TPA Milestone M-44

6. Author

Name: Leela M. Sasaki

L M Sasaki
Signature

Organization/Charge Code 75310/N4162

7. Abstract

N/A

8. RELEASE STAMP

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DATE AUG 31 1995

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RECORD OF REVISION

(1) Document Number: WHC-SD-WM-ER-406

Page A

(2) Title
Tank Characterization Report for Single-Shell Tank 241-BX-105

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) Initially released 08/07/95 on EDT-613108.	B.W. Hall	J.G. Kristofzski
0-A RS	Incorporate per ECN-623843.	L.M. Sasaki L.M. Sasaki	J.G. Kristofzski John Kristofzski 8/31/95

A-7320-005 (08/91) WEF168

The highest total alpha result from the 1994 auger subsamples was 0.589 μCi/g. The highest plutonium concentration measured in the 1986 solids composites was 0.474 μCi/g. These values are well below the established criterion of 1 g/L specified in the Tank Safety Screening data quality objective (DQO) (by a factor of 70 or more). Assuming all the plutonium is the ^{239}Pu isotope, and using an average measured solids density of 1.69 g/mL, the 1 g/L limit converts to 36.4 μCi/g. The total alpha values exceed the 100 nCi/g TRU designation limit and thus the tank should be considered as containing TRU waste.

The flammable gas concentration measurement in the tank vapor space was 0 percent of the lower flammability limit, which satisfies the safety screening criterion.

Based on the 1986 core sample data, the heat generation rate for the tank is estimated to be 327 W (1,120 Btu/h). This is far below the 40,000 Btu/h criterion for distinguishing a high heat load tank from a low heat load tank (Hanlon 1995).

Based on the information summarized above, the waste in tank 241-BX-105 does not appear to pose any immediate safety concerns. Although the waste exceeds the TRU limit, no immediate safety concern are created. The TRU limit is an operational segregation rule which plays a larger role during transfer and mixing of waste streams. It is recommended, if future samples are taken, that additional analyses be considered to provide better estimates of lateral and vertical heterogeneity and reduce the uncertainty in fuel and water content measurements.

screening data quality objectives (Babad and Redus 1994). The 1994 data therefore only include thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and total alpha results. The 1986 data are used, where pertinent, to augment conclusions drawn from the 1994 results concerning safety screening issues. The 1986 data is not used alone to evaluate the safety screening objectives.

although enough insoluble phosphate may exist to affect pumpability. The boron and ^{99}Tc species were found to be 100 percent water soluble. The potassium and ^{60}Co species were found to be relatively water soluble, ranging from 51.5 to 59.4 percent and 19.3 to 51.9 percent, respectively.

The remaining metals and radionuclides were found to be relatively insoluble. The chromium data indicate that chromium is present as the Cr(III) rather than the soluble Cr(VI) species.

Table 5-5. Safety Screening DQO Decision Variables and Criteria for Tank 241-BX-105.

Safety issue	Primary decision variable	Decision critera threshold	Analytical value
Ferrocyanide/ Organic	Total Fuel Content	481 J/g (115 cal/g)	No exotherms observed
Organic	Percent Moisture	17 wt %	12.6 wt %[a]
Criticality	Total Alpha	34.4 µCi/g (1 g/L)[b]	0.589 µCi/g[c]
Flammable Gas	Flammable Gas	25% LFL	0% LFL

[a]Represents the average of the TGA results from both risers 2 and 6.

[b]Although the actual decision criterion listed in the DQO is 1g/L, total alpha is measured in µCi/g rather than g/L. To convert the notification limit for total alpha into a number more readily usable by the laboratory, it was assumed that all alpha decay originates from ^{239}Pu. Using the average bulk density value from Table 4-3 of 1.79 g/ml, the decision criterion may be converted to 34.4 µCi/g as shown:

$$\left(\frac{1\ g}{L}\right)\left(\frac{1\ L}{10^3\ mL}\right)\left(\frac{1}{density}\frac{mL}{g}\right)\left(\frac{0.0615\ Ci}{1\ g}\right)\left(\frac{10^6\ \mu Ci}{1\ Ci}\right) = \frac{61.5}{density}\frac{\mu Ci}{g} \quad (1)$$

[c]Highest result from 1994 data.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The TGA analyses on the 1994 auger samples indicate that the water content of the waste are below the safety screening criteria of 17 wt%. However, the DSC analyses on the auger samples did not show any measureable exothermic activity. Thermocouple temperature measurements in the tank and estimates of heat generation do no indicate any excessive heat sources. TOC results for the sludge analyzed in 1986 do not indicate that a large fuel source is present. Even though the water content is low, the absence of fuel indicates that the potential for runaway reactions in the tank is unlikely.

The total alpha results from 1994 and the plutonium results from 1986 indicate that the plutonium concentration is well below the safety screening criticality criteria. However, the results indicate that the plutonium and americium concentrations are above the TRU classification limit of 100 nCi/g. The large range in results between risers indicates a potential for large variability in the plutonium concentration in the waste.

The flammable gas concentration measurement in the tank vapor space was 0 percent of the lower flammability limit, which satisfies the safety criterion.

The 1986 analyses indicate that the sludge contains relatively large amounts of sodium, aluminum, chromium, iron, phosphorus, silicon and NO_3. There is limited analytical data on the concentration of other anions besides nitrate. High concentrations of sodium, NO_3, and phosphates are expected in the tank based on its fill history, which includes metal waste from the bismuth phosphate process employed at B Plant in the 1940's and 1950's and uranium recovery waste in 1956. The high aluminum and NO_3 concentration is also expected based on the receipt of PUREX cladding waste in the 1960's. The major radioisotopes in the waste are $^{239/240}Pu$, ^{241}Am, ^{90}Sr, and ^{137}Cs. Like the plutonium, several of these isotopes show a large range in concentration between samples taken from the two risers on opposite sides of the tank. The variability in the analyte concentrations between risers indicates that the tank waste may exhibit lateral, as well as vertical, heterogeneity.

Sample recovery from risers 1 and 2 in 1986 and 1994, respectively, were poor. Sampling another riser to improve waste recovery, to better evaluate the variability of the waste composition in the tank, and to verify the wt% water results of the 1994 auger samples should be considered. If possible, future samples should be taken from the center riser on the tank. Samples to date were taken near the perimeter of the tank, where the waste composition may be substantially different than near the center. For example, it is likely that the waste near the edges is drier based on the in-tank photographs. Sampling near the center will also allow samples to be taken of the heel material at the bottom of the dish. Extensive anion analysis and TOC analysis should be performed on any archived or future samples to provide a more accurate estimate of the waste composition. Measures should be taken in any future core sampling to minimize the potential for contamination due to NPH hydrostatic fluid.

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DISTRIBUTION SHEET

To	From	Page 1 of 4
Distribution	Characterization Plans, Coordination and Reports	Date 09/01/95
Project Title/Work Order		EDT No. ~~EDT-613108~~
Tank Characterization Report for Single-Shell Tank 241-BX-105, WHC-SD-WM-ER-406, Rev. 0-A		ECN No. ECN-623843

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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