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0050804

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 653803

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Andrew M. Templeton, Data Assessment and Interpretation, R2-12, 373-5589	[] Yes [X] No	05/26/99
	6. Project Title/No./Work Order No. Tank 241-TX-107	7. Bldg./Sys./Fac. No. 241-TX-107	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-584, Rev. 0-B	10. Related ECN No(s). ECNs: 163504, 647962	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change   13b. Design Baseline Document? [] Yes [X] No

This ECN has been generated in order to update the document to reflect results of recent data/information evaluation.

Replace pages:

5-3 through 5-6, and 7-1 through 7-4

14a. Justification (mark one)

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

14b. Justification Details

A tank characterization report page change revision is required to reflect the results of recent evaluation of data/information pertaining to adequacy of tank sampling for safety screening purposes (Reynolds et al. 1999, Evaluation of Tank Data for Safety Screening, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington).

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

See attached distribution.

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A-7900-013-2 (05/96) GEF095

A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): ECN-653803

16. Design Verification Required	17. Cost Impact — ENGINEERING		17. Cost Impact — CONSTRUCTION		18. Schedule Impact (days)	
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. 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 13. Enter the affected document number in Block 20.

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	[]		[]

20. 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		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. A.M. Templeton	[signature]	6/7/99	PE		
Cog. Mgr. K.M. Hall	[signature]	6/7/99	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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Tank Characterization Report for Single-Shell Tank 241-TX-107

Andrew M. Templeton
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-653803 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
B&R Code: EW 3120074 Total Pages: 76

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-TX-107, Tank TX-107, TX-107, TX Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

DATE: HANFORD RELEASE
STA: 4 ID: 2
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6/8/99

Release Approval Date Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number WHC-SD-WM-ER-584	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-TX-107

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 06/12/96 on EDT 616015.	L. M. Sasaki	J. G. Kristofski
0A RS	Incorporate per ECN-163504.	M. J. Kupfer	K. M. Hodgson
		M J Kupfer 8-19-97	K. M. Hodgson 8-25-97
RS 0B	Incorporate per ECN-647962.	M.J. Kupfer	K.M. Hodgson
		M J Kupfer 8-3-98	K.M. Hodgson 9-16-98
0-C RS	Incorporate per ECN-653803.	A.M. Templeton	K.M. Hall for
		[illegible]	[illegible] 6/7/99

A-7320-005 (08/91) WEF168

and total alpha activity results. The ANOVA generates a p-value which is compared with a standard significance level ($\alpha = 0.05$). If a p-value is below 0.05, there is sufficient evidence to conclude that the sample means are significantly different from each other.

The results of the ANOVA indicated that there may be significant differences between the two augers for the weight percent water data (p-value = 0.051) because the p-value is right at the threshold level. However, the total alpha activity data (p-value = 0.398) did not exhibit horizontal differences. This information, coupled with the visual description of the samples, suggests that the tank contents may be uniform horizontally. Additional analytical results are needed to determine horizontal uniformity of the tank.

5.4 COMPARISON OF TRANSFER HISTORY WITH ANALYTICAL RESULTS

The Agnew (1996) predictions (Table 2-4) for weight percent water and total alpha activity can be compared with the analytical results of the 1996 auger sampling event. This comparison is presented for informational purposes only. The HTCE values have not been validated and thus should be used with caution. Large differences exist between the analytical results and the HTCE estimates. The analytical result for weight percent water was 22.2 percent, as compared to the Agnew (1996) estimate of 73.7 percent. The HTCE estimate of 73.7 percent water is consistent with the fact that liquid was present in the sampling tray (see Section 5.1.1); this agreement is an additional reason for believing that the sample had dried out prior to the TGA analysis. (Because the waste was distributed as a thin coating on the auger samplers, moisture may have evaporated from the samples while they were exposed to the hot cell environment.)

The Agnew value for total alpha activity was assumed to be the same as plutonium, because no other alpha emitters were given. The analytical result for total alpha activity was 4.52 μCi/g, while the HTCE plutonium estimate was 0.00894 μCi/g. The plutonium concentration may have been underestimated by the HTCE. According to Agnew et al. (1996), a number of transfers of HEDTA destruction waste were made between tank 241-TX-118 and tank 241-TX-107 during 1975 and 1976. During this time, tank 241-TX-118 was also receiving high-plutonium Z Plant waste. While the TLM indicates that tank 241-TX-107 contains no Z Plant waste, some carryover of plutonium from tank 241-TX-118 to tank 241-TX-107 may have occurred during this period.

5.5 EVALUATION OF PROGRAM REQUIREMENTS

The two auger samples retrieved from tank 241-TX-107 in January 1996 were taken to meet the requirements of the safety screening DQO (Dukelow et al. 1995) and to determine whether this tank has been appropriately categorized for safety issues. A discussion of the specific requirements of this DQO and a comparison of the analytical data to defined concentration limits is presented in this section.

5.5.1 Safety Evaluation

Data criteria identified in the safety screening DQO are used to assess the safety of the waste in tank 241-TX-107. For a safety assessment, vertical profiles of the waste from at least two widely spaced risers is suggested as optimum. Although the optimum was not met, the tank was sufficiently sampled to satisfy the requirements of safety screening (Reynolds et al. 1999). However, sample 96-AUG-001 could not be divided into half-augers as required by the DQO. Of the five primary analyses required by the DQO, three have decision criteria thresholds which, if exceeded, could warrant further investigation to ensure tank safety. These three analyses include DSC to evaluate the fuel content, a determination of the total alpha activity to evaluate the criticality potential, and a measurement of the flammability of the tank headspace gases. Table 5-1 lists the applicable safety issues, decision variables and thresholds, and the mean analytical results from the 1995 sampling event.

The safety screening DQO established a notification limit of -480 J/g (dry weight basis) for the DSC analyses (Dukelow et al. 1995). No exothermic reactions were observed in any of the tank 241-TX-107 samples.

The potential for criticality can be assessed from the total alpha activity data. The safety screening notification limit is 1 g/L, or 41 μCi/g as specified in the SAP (Bell 1996). The calculated overall mean was 4.52 μCi/g, well below the 41 μCi/g limit. The statistical calculation of a 95 percent upper confidence limit for the two sample/duplicate pairs yielded results of 15.41 μCi/g and 3.77 μCi/g, both of which were also below the DQO limit. The 41 μCi/g limit is based on an assumed density of 1.5 g/mL; the limit would be lower for wastes with densities above 1.5 g/mL. Although densities were not measured for the tank 241-TX-107 auger samples, the total alpha results are low enough that the lack of density measurements is not a concern (the bulk density would have to be 4 g/mL for the 95 percent confidence limit to reach the DQO limit).

Although density measurements were not made, this had no impact on results, except that total alpha inventory was not determined.

The flammability of the gas in the tank headspace is an additional safety screening DQO consideration. The notification limit for flammable gas concentration is 25 percent of the LFL. The analytical result was 0 percent of the LFL (see Section 4.4), satisfying the DQO limit.

Table 5-1. Safety Screening Data Quality Objective Decision Variables and Criteria.

Safety Issue	Primary Decision Variable	Decision Criteria Threshold	Mean Analytical Result
Ferrocyanide/organics	Total fuel content	-480 J/g	No exothermic reactions
Criticality	Total alpha activity	41 μCi/g	4.52 μCi/g
Flammable gas	Flammable gas	25 % of the LFL	0 % of the LFL

Another factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. No estimate of the tank heat load was possible from the analytical data because the primary heat-producing radionuclides were not evaluated. However, (Brevick 1995a) estimates a heat load of 57.7 W (197 Btu/hr). Another estimate, based on the tank headspace temperature, was 292 W (998 Btu/hr) (Kummerer 1994). Both of these estimates are well below the limit of 11,700 W (40,000 Btu/hr) that separates high- and low-heat load tanks (Bergmann 1991).

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7.0 REFERENCES

Agnew, S. F., 1996, *Hanford Tank Waste Chemical and Radionuclide Inventories: HDW Model Rev. 3*, LA-UR-96-858, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. Corbin, K. Jurgensen, and B. Young, 1995, *Tank Layer Model (TLM)*, LA-UR-94-4269, Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico.

Agnew, S. F., P. Baca, R. Corbin, T. Duran, and K. Jurgensen, 1996, *Waste Status and Transaction Record Summary for the Northwest Quadrant of the Hanford 200 Area*, WHC-SD-WM-TI-669, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Alstad, A. T., 1993, *Riser Configuration Document for Single-Shell Waste Tanks*, WHC-SD-RE-TI-053, Rev. 9, Westinghouse Hanford Company, Richland, Washington.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.

Barnes, D. A., 1993, *Waste Storage Tank & Leak Detection Criteria*, WHC-SD-WM-TI-357, Rev. 1K, Westinghouse Hanford Company, Richland, Washington.

Bell, K. E., 1996, *Tank 241-TX-107 Auger Sampling and Analysis Plan*, WHC-SD-WM-TSAP-072, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Bergmann, L. M., 1991, *Single-Shell Tank Isolation Safety Analysis Report*, WHC-SD-WM-SAR-006, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Brevick, C. H., L. Gaddis, E. Johnson, 1995a, *Historical Tank Content Estimate for the Northwest Quadrant of the Hanford 200 West Area*, WHC-SD-WM-ER-351, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Brevick, C. H., L. Gaddis, and W. Pickett, 1995b, *Supporting Document for the Northwest Quadrant Historical Tank Content Estimate Report for TX-Tank Farm*, WHC-SD-WM-ER-321, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

DeLorenzo, D. S., A. T. DiCenso, D. B. Hiller, K. W. Johnson, J. H. Rutherford, D. J. Smith, and B. C. Simpson, 1994, *Tank Characterization Reference Guide*, WHC-SD-WM-TI-648, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Dukelow, G. T., J. W. Hunt, H. Babad, and J. E. Meacham, 1995, *Tank Safety Screening Data Quality Objective*, WHC-SD-WM-SP-004, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Ecology, EPA, and DOE, 1996, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Hanlon, B. M., 1996, *Waste Tank Summary Report for Month Ending February 29, 1996*, WHC-EP-0182-95, Westinghouse Hanford Company, Richland, Washington.

Kummerer, M., 1994, *Topical Report on Heat Removal Characteristics of Waste Storage Tanks*, WHC-SD-WM-SARR-010, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Leach, C. E., and S. M. Stahl, 1993, *Hanford Site Tank Farm Facilities Interim Safety Basis*, WHC-SD-WM-ISB-001, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Lipnicki, J., 1996, *Waste Tank Risers Available for Sampling*, WHC-SD-WM-TI-710, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Perez, L. R., 1975, *Analysis of Tank Farm Samples*, (internal memorandum to R. L. Walser, September 10), Atlantic Richfield Hanford Company, Richland, Washington.

Public Law 101-510, 1990, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation," Section 3137 of *National Defense Authorization Act for Fiscal Year 1991*.

Raphael, G. F., 1996, *45-Day Safety Screening Results and Final Report for Tank 241-TX-107, Auger Samples 96-AUG-001 and 96-AUG-002*, WHC-SD-WM-DP-172, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Reynolds, D. A., W. T. Cowley, J. A. Lechelt, B. C. Simpson, and C. DeFigh-Price, 1999, *Evaluation of Tank Data for Safety Screening*, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

Rodenhizer, D. G., 1987, *Hanford Waste Tank Sluicing History*, SD-WM-TI-302, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Vitro Engineering Corporation, 1985, *Piping Waste Tank Isolation 241-TX-107*, drawing H-2-73125, Rev. 2, ICF-Kaiser Hanford Company, Richland, Washington.

Welty, R. K., 1988 *Waste Storage Tank Status and Leak Detection Criteria,* SD-WM-TI-356, Rev. 0, 2 volumes, Westinghouse Hanford Company, Richland, Washington.

Wheeler, R. E., 1975a, *Analysis of Tank Farm Samples*, (internal memorandum to R. L. Walser, September 26), Atlantic Richfield Hanford Company, Richland, Washington.

Wheeler, R. E., 1975b, *Analysis of Tank Farm Samples*, (internal memorandum to R. L. Walser, October 27), Atlantic Richfield Hanford Company, Richland, Washington.

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