ENGINEERING CHANGE NOTICE

1. ECN 653819

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 []	Scott D. Estey, Data Assessment and Interpretation, R2-12, 373-2461	[] Yes [X] No	05/26/99
	6. Project Title/No./Work Order No. Tank 241-T-109	7. Bldg./Sys./Fac. No. 241-T-109	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-559, Rev. 0-B	10. Related ECN No(s). ECNs: 644459, 636879	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:
2-1, 2-2, 4-1, 4-2, 5-1, and 5-2

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.

RELEASE STAMP

DATE: 6.4.99

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

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-653819

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] 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.	S.D. Estey S.D. Estey	6/4/99	PE		
Cog. Mgr.	K.M. Hall	6/4/99	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		
			DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
			ADDITIONAL		

S

Tank Characterization Report for Single-Shell Tank 241-T-109

Scott D. Estey
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-653819 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
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Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-T-109, Tank T-109, T-109, T Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

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RECORD OF REVISION	(1) Document Number WHC-SD-WM-ER-559	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-T-109

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 09/24/96 on EDT 617544.	T. M. Brown	J. G. Kristofzski
0A RS	Incorporate per ECN-644459.	M. J. Kupfer	K. M. Hodgson
		8-27-97	K.M. Hodgson 8-27-97
0B RS	Incorporate per ECN-636879.	M.J. Kupfer	K.M. Hodgson
		9-2-98	K.M. Hodgson 9-8-98
0-C RS	Incorporate per ECN-653819.	S.D. Estey	K. M. Hallday
		S.D. Estey 6/4/99	6/9/99

A-7320-005 (08/91) WEF168

2.0 RESPONSE TO TECHNICAL ISSUES

Two technical issues have been identified for tank 241-T-109 (Brown et al. 1995). They are:

- Does the waste pose or contribute to any recognized potential safety problems?
- Is the waste inventory generated by a model based on process knowledge and historical information (Agnew et al. 1996b) representative of the current tank waste inventory?

The TCP (Conner 1995b) provides the types of sampling and analysis used to address the above issues. Data from the recent analysis of two auger samples and tank vapor space flammability measurements, as well as available historical information, provided the means to respond to these two issues. This response is detailed in the following sections. See Appendix B for sample and analysis data for tank 241-T-109.

2.1 SAFETY SCREENING

The data needed to screen the waste in tank 241-T-109 for potential safety problems is documented in *Tank Safety Screening Data Quality Objective*, Rev. 2 (Dukelow et al. 1995). These potential safety problems are exothermic conditions in the waste; flammable gases in the waste and/or tank headspace; and criticality conditions in the waste. Each of these conditions is addressed separately below. Because tank 241-T-109 is not a Watch List tank, the safety screening DQO was the only safety-related DQO associated with the sampling effort.

2.1.1 Exothermic Conditions (Energetics)

The first requirement outlined in the safety screening DQO (Dukelow et al. 1995) is to ensure that there are not enough exothermic constituents (organic or ferrocyanide) in tank 241-T-109 to cause a safety hazard. Because of this requirement, energetics in the tank 241-T-109 waste were evaluated. The safety screening DQO required that the waste sample profile be tested for energetics every 24 cm (9.5 in.) to determine if the energetics exceed the safety threshold limit. The threshold limit for energetics is 480 J/g on a dry weight basis. Results obtained using differential scanning calorimetry indicated that no exotherms were apparent for any of the three samples (95-AUG-40, 95-AUG-41 upper, and 95-AUG-41 lower) (Conner 1995a). Note that auger sample 95-AUG-40 was not subdivided into an upper and lower sample because of the low recovery. Thus, the requirement of testing energetics for every 24 cm (9.5 in.) of the sample profile was met only for one of the two samples. However, per subsequent analysis (Reynolds et al. 1999), this analysis data was determined to be sufficient to permit adequate safety screening.

Historically, there is no evidence that any exothermic agent should exist in this waste. Waste transfer records indicate that the major waste type expected to be in the tank is T1 saltcake, with a small possibility that some first-concentration-cycle waste from the bismuth phosphate process may be in the bottom of the tank (Agnew et al. 1996a). Neither of these waste types is expected to have organic or ferrocyanide constituents. Analysis of a sample taken in 1974 (Sant 1974) also showed no evidence of exotherms (see Appendix B).

2.1.2 Flammable Gas

Vapor phase measurements, taken in the tank headspace prior to the auger samples in August 1995 and again in May 1996, indicated that no flammable gas was detected (0 percent of the lower flammability limit). Data from these vapor phase measurements are presented in Appendix B.

2.1.3 Criticality

The safety threshold limit is 1 g ^{239}Pu per liter of waste. Assuming that all alpha is from ^{239}Pu and assuming a density of 1.55 g/mL, 1 g/L of ^{239}Pu is equivalent to 40 μCi/g of alpha activity. The auger samples were analyzed in accordance with an earlier revision of the safety screening DQO (Babad et al. 1995) which did not require density measurements. Because density was not measured, the density estimated by Agnew et al. (1996b) was used. Waste samples were tested for total alpha activity for each auger sample. Concentrations in all samples were well below this limit. Additionally, as required by the DQO, the upper limit of the one-sided 95 percent confidence interval for these results was less than 1 g/L. The method used to calculate confidence limits is contained in Appendix C.

2.2 HISTORICAL EVALUATION

The purpose of the historical evaluation is to determine whether the model based on process knowledge and historical information (Brevick et al. 1995, Agnew et al. 1996b) predicts tank inventories that are in agreement with current tank inventories. If the historical model can be shown to accurately predict the waste characteristics as observed through sample characterization, then there is a possibility that the amount of total sampling and analysis needed may be reduced. Data requirements for this evaluation are documented in *Historical Model Evaluation Data Requirements*, Rev. 0-A (Simpson and McCain 1995).

A "gateway" analysis is a quick check to ensure that the data obtained from sampling support the remainder of the historical evaluation analysis. Failure of the gateway analysis indicates that the model waste composition estimate is not comparable to the sample data and that the tank is not a good tank on which to perform the historical DQO. If the gateway analysis fails, the remainder of the sampling and analysis for the historical DQO will not be applied to the tank. If the gateway analysis passes, then further analyses will be performed on the

4.0 RECOMMENDATIONS

All analytical results for the safety screening DQO were well within the safety notification limits. Sufficient safety screening has been performed on this tank (Reynolds et al. 1999). The gateway analysis for the historical DQO failed, indicating that no further sampling and analysis of tank 241-T-109 will be performed to support this DQO. Further evaluation of the available data will be performed at a later time to determine why the gateway analysis failed. The sampling and analysis activities performed for tank 241-T-109 have met all requirements for all of the applicable DQO documents. Furthermore, a characterization best-basis inventory was developed for the tank contents.

Table 4-1 summarizes the status of TWRS Program review and acceptance of the sampling and analysis results reported in this tank characterization report. All DQO issues required to be addressed by sampling and analysis are listed in column one of Table 4-1. The second column indicates whether the requirements of the DQO were met by the sampling and analysis activities performed and is answered with a "yes" or a "no." The third column indicates concurrence and acceptance by the program in TWRS that is responsible for the DQO that the sampling and analysis activities performed adequately meet the needs of the DQO. A "yes" or "no" in column three indicates acceptance or disapproval of the sampling and analysis information presented in the TCR. If the results/information have not yet been reviewed, "N/R" is shown in the column. If the results/information have been reviewed, but acceptance or disapproval has not been decided, "N/D" is shown in the column.

Table 4-1. Acceptance of Tank 241-T-109 Sampling and Analysis.

Issue	Evaluation performed	TWRS Program acceptance
Safety Screening DQO	Yes	Yes
Historical Evaluation DQO	Yes	Yes

Note:
N/R = Not reviewed

Table 4-2 summarizes the status of TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. The evaluations specifically outlined in this report are the best-basis inventory evaluation, the gateway analysis, and the evaluation to determine whether the tank is safe, conditionally safe, or unsafe. Column one lists the different evaluations performed in this report. Columns two and three are in the

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-T-109.

Issue	Evaluation performed	TWRS Program acceptance
Best basis inventory	Yes	N/R
Historical "gateway" analysis	Yes	Yes
Safety categorization (tank is safe)	Yes	Yes

Note:
N/R = Not reviewed

same format as Table 4-1. The manner in which concurrence and acceptance are summarized is also the same as that in Table 4-1.

One final comment regarding the safety screening DQO needs to be made. The one-sided confidence intervals that were used to determine whether or not ^{239}Pu is below the DQO stated threshold limit were performed solely on each individual sample as required by the DQO.

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DISTRIBUTION SHEET

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Tank Characterization Report for Single-Shell Tank 241-T-109, WHC-SD-WM-ER-559, Rev. 0-C		ECN No. ECN-653819

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