0050781

ENGINEERING CHANGE NOTICE

1. ECN 653818

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 []	Kenny D. Fowler, Data Assessment and Interpretation, R2-12, 373-5930	[] Yes [X] No	05/26/99
	6. Project Title/No./Work Order No. Tank 241-BY-111	7. Bldg./Sys./Fac. No. 241-BY-111	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-687, Rev. 0-B	10. Related ECN No(s). ECNs: 635510, 649441	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:
2-3, 2-4, 4-1,4-2, 5-1 through 5-4, B-69, B-70, B-81, and B-82

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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: MAY 27 1999

HANFORD RELEASE

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ID: 2

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

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-653818

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. K.D. Fowler		5/27/99	PE		
Cog. Mgr. K.M. Hall		5/27/99	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Tank Characterization Report for Single-Shell Tank 241-BY-111

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

EDT/ECN: ECN-653818 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
B&R Code: EW 3120074 Total Pages: 175

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-BY-111, Tank BY-111, BY-111, BY Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

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5/27/99
Release Approval Date

DATE: HANFORD RELEASE
STA: 4 ID: 2
MAY 27 1999
Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number HNF-SD-WM-ER-687	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-BY-111

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 07/15/97 on EDT-617660.	J. Jo	K.M. Hall
0-A RS	Incorporate per ECN-635510.	J. Jo	K.M. Hall
		J. Jo per telecon	Kathleen M. Hall 8/25/97
RS 0-B	Incorporate per ECN-649441.	M.J. Kupfer	K.M. Hodgson
		M.J. Kupfer 9-2-98	K.M. Hodgson 9-9-98
0-C RS	Incorporate per ECN-653818.	K.D. Fowler	K.M. Hall
		K.D. Fowler 5/27/99	K.M. Hall 5/27/99

2.2.2 Toxicity

The vapor screening DQO requires the analysis of ammonia, carbon dioxide (CO_2), carbon monoxide (CO), nitric oxide (NO), nitrous oxide (N_2O), and nitrogen dioxide (NO_2) from a sample. The vapor screening DQO specifies a threshold limit for each of these compounds. Data from the May and November of 1994 vapor sampling event (Huckaby and Bratzel 1995) were used to address the issue of toxicity (see Appendix B). All of the analytes were within the threshold limits, except ammonia. The toxicity issue has been closed for all tanks (Hewitt 1996).

2.3 ORGANIC SOLVENTS

The data required to support the organic solvent screening issue were documented in the in the *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). The DQO requires tank headspace samples to be analyzed for total nonmethane organic compounds to determine whether the organic extractant pool in the tank is a hazard. The purpose of this assessment is to ensure that an organic solvent pool fire or ignition of organic solvent cannot occur.

Vapor samples taken November 16, 1994 showed semivolatile species concentration in tank 241-BY-111 was 7.44 mg/m^3 with an estimated organic solvent pool size of 0.58 m^2 (Huckaby and Sklarew 1997), below the limit of 1 m^2.

The organic solvent safety issue is expected to be closed in 1999.

2.4 OTHER TECHNICAL ISSUES

A factor in assessing tank safety is the heat generation and temperature of the waste. Heat is generated in the tanks from radioactive decay. An estimate of the tank heat load based on the results from the 1996 sample event was not possible because radionuclide analyses were not required. However, the heat load estimate based on the tank process history was 2,560 W (8,750 Btu/hr) (Agnew et al. 1997b). The heat load estimate based on the tank headspace temperature was 1,500 W (5,200 Btu/hr) (Kummerer 1995). Both of these estimates are quite low and are well below the limit of 11,700 W (40,000 Btu/hr) that separates high- and low-heat-load tanks (Smith 1986).

2.5 SUMMARY

The results from all analyses performed to address potential safety issues showed no primary analyte exceeding safety decision threshold limits. Two core samples were attempted, but only 5 to 7 segments of 9 were retrieved. The last 38 to 57 in. of the tank were not sampled because of sampling difficulties. However, sufficient samples were retrieved to address

safety questions. Further sampling for Safety Screening is not necessary (Reynolds et al. 1999). The analyses results are summarized in Table 2-1.

Table 2-1. Summary of Technical Issues.

Issue	Sub-issue	Result
Safety screening	Energetics	All exothermic reactions below 480 J/g. Highest 95% confidence interval upper limit = 381 J/g.
	Flammable gas	Vapor measurement reported 0.3% of lower flammability limit (Combustible gas meter).
	Criticality	All analyses well below 32.7 μCi/g total alpha. Highest 95% confidence interval for upper limit = 2.02 μCi/g.
Hazardous vapor	Flammability	See safety screening - flammable gas
	Toxicity	All analytes were within the threshold limits, except ammonia.
Organic solvent	Solvent pool size	Size of organic pool - 0.26 m^2 (2.8 ft^2)

4.0 RECOMMENDATIONS

All analytical results for the safety screening DQO were well within the safety notification limits. Only partial cores were obtained from the sampling event in 1996. However, the sampling and analysis activities performed for tank 241-BY-111 are sufficient for the applicable DQO document (Reynolds et al. 1999). Using partial core, a characterization best-basis inventory was developed for the tank contents.

Table 4-1 summarizes the Project Hanford Management Contractor (PHMC) TWRS Program review status and acceptance of the sampling and analysis results reported in this TCR. 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. 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. The upper part of the waste was sampled and analyzed in accordance with the safety screening DQO and accepted by the responsible TWRS program. Although the waste at the bottom of the tank was not sampled (see Section B3.1), the safety screening DQO has been sufficiently met (Reynolds et al. 1999).

Table 4-1. Acceptance of Tank 241-BY-111 Sampling and Analysis.

Issue	Sampling and Analysis Performed	TWRS[1] Program Acceptance
Safety screening DQO	Yes	Yes
Hazardous vapor screening DQO	Yes	Yes
Organic solvent	Yes	Yes

Note:
[1]PHMC TWRS Program Office

Table 4-2 summarizes the status of PHMC TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. The evaluations specifically outlined in this report are 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 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. The safety categorization of the tank is listed as "safe" in Table 4-2 because none of the analyses performed on the core samples indicate any safety problems.

Further sampling of tank 241-BY-111 is not required by the safety screening DQO.

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 and DSC were below the DQO stated threshold limit were performed on each individual sample as required by the DQO.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-BY-111.

Issue	Evaluation Performed	TWRS Program Acceptance
Safety categorization (tank is safe)	Yes	Yes
Hazardous vapor screening DQO	Yes	Yes
Organic solvent	Yes	Yes

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Table B2-56. Tank 241-BY-111 Analytical Results: Total Organic Carbon.

Sample Number	Sample Location	Sample Portion	Result	Duplicate	Triplicate	Mean
Solids			µg/g	µg/g	µg/g	µg/g
S96T005166	168: 1	Subsegment A	7,990	8,200		8,095
S96T005167		Subsegment B	11,300	11,600		11,450
S96T005148	168: 2	Lower half	11,600	11,200		11,400
S96T005157	168: 3	Lower half	8,960	9,370		9,165
S96T005301	168: 4	Lower half	7,540	8,000	8,690	8,076.67[QC:d]
S96T005304	168: 5	Lower half	10,000	9,030		9,515
S96T005310	168: 5A	Lower half	3,000	3,420		3,210
S96T005158	168: 6A	Lower half	1,750	2,430	1,680	1,953.33[QC:e]
S96T005321	171: 1	Lower half	1,320	1,120		1,220
S96T005335	171: 3	Lower half	9,820	10,000		9,910
S96T005336	171: 4	Lower half	4,870	3,790		4,330[QC:e]
S96T005342	171: 5	Lower half	5,130	5,150		5,140[QC:c]
S96T005349	171: 6	Upper half	2,120	2,360		1,506.67
S96T005350		Lower half	2,640	2,540		1,740
S96T005383	171: 7	Upper half	4,250	4,350		4,300
S96T005384		Lower half	4,920	4,180		4,550
Liquids			µg/mL	µg/mL	µg/mL	µg/mL
S96T005314	168: 6	Drainable liquid	1,350	1,480		1,415[QC:f]
S96T005346	171: 5	Drainable liquid	1,210	1,250		1,230[QC:f]
S96T005357	171: 6	Drainable liquid	1,140	1,240		1,190[QC:f]

B3.0 ASSESSMENT OF CHARACTERIZATION RESULTS

The purpose of this chapter is to discuss the overall quality and consistency of the current sampling results for tank 241-BY-111.

This section also evaluates sampling and analysis factors that may impact interpretation of the data. These factors are used to assess the overall quality and consistency of the data and to identify any limitations in the use of the data.

B3.1 FIELD OBSERVATIONS

Sample recovery was poor (less than 30 percent for most of the segments) for the risers sampled, and full vertical profiles were not obtained from either riser. However, the sampling and analyses performed were sufficient to address safety questions in the applicable DQO document. Hydrostatic head fluid (HHF) intrusions were negligible.

Nine segments per core were expected to be taken from tank 241-BY-111. However, sampling problems prevented obtaining nine segments from both cores. Six push mode core segments were obtained from riser 4, and seven push more segments were obtained from riser 15. At that depth, the sampling system should have been sampling MW, which is not expected to cause difficulty in sampling.

Because of the incomplete recovery of these core samples, the representativeness of the samples is brought into question. The bottommost 144 cm (57 in.) of core 168 and the bottommost 96 cm (38 in.) of core 171 were not obtained. Although the full depth of the waste was not sampled, the requirements of the safety screening DQO have been met, and further sampling for the DQO is not necessary (Reynolds et al. 1999).

B3.2 QUALITY CONTROL ASSESSMENT

The usual quality control assessment includes an evaluation of the appropriate standard recoveries, spike recoveries, duplicate analyses, and blanks that are performed in conjunction with the chemical analyses. All the pertinent quality control tests were conducted on the 1996 core samples, allowing a full assessment regarding the accuracy and precision of the data. The TSAP (Kruger 1996) established the specific criteria for all analytes. Sample and duplicate pairs that had one or more QC results outside the specified criteria were identified by footnotes in the data summary tables.

The standard and spike recovery results provide an estimate of the accuracy of the analysis. If a standard or spike recovery is above or below the given criterion, the analytical results

b_i	=	the number of segments in the ith core
c_{ij}	=	the number of locations from the jth segment in the ith core
n_{ijk}	=	the number of analytical results from the kth location in the jth segment in the ith core

The variable C_i, S_{ij}, and L_{ijk} are assumed to be random effects. These variables and A_{ijkm} are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(C)$, $\sigma^2(S)$, $\sigma^2(L)$, and $\sigma^2(A)$, respectively. Estimates of $\sigma^2(C)$, $\sigma^2(S)$, $\sigma^2(L)$, and $\sigma^2(A)$ were obtained using REML techniques. This method, applied to variance component estimation, is described in Harville (1977). The statistical results were obtained using statistical analysis package S-PLUS™ (StatSci 1993).

B4.0 APPENDIX B REFERENCES

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DISTRIBUTION SHEET

To	From	Page 1 of 2
Distribution	Data Assessment and Interpretation	Date 05/26/99
Project Title/Work Order		EDT No. N/A
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Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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Tank Characterization Report for Single-Shell Tank 241-BY-111, HNF-SD-WM-ER-687, Rev. 0-C		ECN No. ECN-653818

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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B. C. Simpson	R2-12	X			
R. R. Thompson	R2-12	X			
ERC (Environmental Resource Center)	R1-51	X			
T.C.S.R.C.	R1-10	5			
Lockheed Martin Services, Inc.					
B. G. Lauzon	R1-08	X			
Central Files	B1-07	X			
EDMC	H6-08	X			
Numatec Hanford Corporation					
J. S. Garfield	R3-73	X			
D. L. Herting	T6-07	X			
Pacific Northwest National Laboratory					
A. F. Noonan	K9-91	X			
Scientific Applications International Corporation					
M. D. LeClair	R3-75	X			