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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 643803

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 []	Jim G. Field, Data Assessment and Interpretation, R2-12, 376-3753	[] Yes [X] No	07/17/98
	6. Project Title/No./Work Order No. Tank 241-T-105	7. Bldg./Sys./Fac. No. 241-T-105	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-369, Rev. 2	10. Related ECN No(s). ECNs: 635536, 643788	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 was generated in order to make editorial changes and change PO_4 inventory.

AUG 1998 RECEIVED EDMC

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

Changes required to make editorial corrections and change total inventory for PO_4.

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

See attached distribution.

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DATE: JUL 20 1998 HANFORD RELEASE

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

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-643803

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. J.G. Field	J G Field	7/17/98	PE		
Cog. Mgr. K.M. Hall	Katalen M. Hall	7/17/98	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

S

HNF-SD-WM-ER-369, Rev. 2-A

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

Jim G. Field
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

EDT/ECN: ECN-643803 UC: 2070
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Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-T-105, Tank T-105, T-105, T Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: This document summarizes the information on the historical uses, present status, and the sampling and analysis results of waste stored in Tank 241-T-105. This report supports the requirements of the Tri-Party Agreement Milestone M-44-15B.

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(2) Title
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HNF-SD-WM-ER-369
Revision 2A

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

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S. R. Wilmarth
Lockheed Martin Hanford Corp.

Date Published
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Prepared for the U.S. Department of Energy
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LIST OF TERMS

1C	first cycle decontamination waste
1C2	1C waste produced from 1950 to 1956
2C	second cycle decontamination waste
2C1	2C waste produced from 1944 to 1949
AES	atomic emission spectroscopy
ASTM	American Society for Testing and Materials
BL	B Plant low-level waste
Btu/hr	British thermal units per hour
Ci	curie
Ci/L	curies per liter
CI	confidence interval
cm	centimeter
c/s	counts per second
CW	$BiPO_4$ process aluminum cladding waste
DQO	data quality objective
DSC	differential scanning calorimetry
ft	feet
g	gram
g/cm^3	grams per cubic centimeter
g/L	grams per liter
g/mL	grams per milliliter
GEA	gamma energy analysis
HDW	Hanford defined waste
HTCE	historical tank content estimate
IC	ion chromatography
ICP	inductively coupled plasma spectroscopy
in.	inch
IX	ion exchange waste
J/g	joules per gram
kg	kilogram
kg/L	kilograms per liter
kgal	kilogallon
kL	kiloliter
kW	kilowatt
LFL	lower flammability limit
LL	lower limit

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Table B3-7. 95 Percent Two-Sided Confidence Interval for the Mean Concentration for Solid Segment Data. (2 sheets)

Analyte	Method	$\hat{\mu}$	df	LL	UL	Units
Copper[1]	ICP:A	1.82E+02	1	0.00E+00	1.92E+03	µg/g
Fluoride	IC:W	4.73E+02	1	1.86E+01	9.28E+02	µg/g
Gross alpha	ALPHA:F	5.05E-01	3	1.60E-01	8.50E-01	µg/g
Iron	ICP:A	2.29E+04	3	6.38E+02	4.51E+04	µg/g
Lanthanum[1]	ICP:A	<4.49E+01	n/a	n/a	n/a	µg/g
Lead	ICP:A	5.69E+02	3	1.96E+02	9.42E+02	µg/g
Lithium[1]	ICP:A	4.18E+01	3	0.00E+00	1.10E+02	µg/g
Magnesium	ICP:A	8.99E+02	3	4.05E+02	1.39E+03	µg/g
Manganese	ICP:A	9.82E+03	3	0.00E+00	2.12E+04	µg/g
Molybdenum[1]	ICP:A	5.22E+01	3	1.42E+01	9.03E+01	µg/g
Neodymium[1]	ICP:A	<1.14E+02	n/a	n/a	n/a	µg/g
Nickel	ICP:A	9.11E+01	3	3.88E+01	1.43E+02	µg/g
Nitrate	IC:W	2.29E+04	3	1.51E+04	3.07E+04	µg/g
Nitrite	IC:W	3.28E+04	3	2.14E+04	4.42E+04	µg/g
Oxalate[1]	IC:W	<1.58E+03	n/a	n/a	n/a	µg/g
Phosphate	IC:W	2.84E+03	3	1.45E+03	4.23E+03	µg/g
Phosphorus	ICP:A	1.47E+03	3	1.03E+03	1.90E+03	µg/g
Potassium[1]	ICP:A	5.14E+02	3	1.15E+02	9.12E+02	µg/g
Samarium[1]	ICP:A	<1.02E+02	n/a	n/a	n/a	µg/g
Silicon	ICP:A	4.67E+03	3	0.00E+00	1.17E+04	µg/g
Silver[1]	ICP:A	2.89E+01	3	2.59E+00	5.53E+01	µg/g
Sodium	ICP:A	6.39E+04	3	4.13E+04	8.65E+04	µg/g
Strontium	ICP:A	1.75E+02	3	1.04E+02	2.46E+02	µg/g
Sulfate	IC:W	9.45E+03	3	6.63E+03	1.23E+04	µg/g
Sulfur	ICP:A	2.88E+03	3	1.78E+03	3.97E+03	µg/g
Thallium[1]	ICP:A	<2.02E+02	n/a	n/a	n/a	µg/g
Titanium[1]	ICP:A	4.58E+01	3	1.55E+01	7.60E+01	µg/g
Uranium[1]	ICP:A	7.26E+03	1	0.00E+00	6.11E+04	µg/g
Vanadium[1]	ICP:A	<7.18E+01	n/a	n/a	n/a	µg/g
Zinc	ICP:A	3.03E+02	1	0.00E+00	2.12E+03	µg/g
Zirconium[1]	ICP:A	5.59E+01	3	2.08E+01	9.10E+01	µg/g

Note:

[1]A "less than" value was used in the calculations.

B3.4.2 Liquid Data

A nested analysis of variance model was fit to the 1997 core sample liquid data. The 1993 data were not included in this analysis because core 54 drainable liquids were believed to be mostly hydrostatic head fluid (Silvers and Sasaki 1993) and were not analyzed; little drainable liquid was recovered in core 53 samples. Table B3-8 gives the mean, degrees of freedom, and confidence interval for each constituent.

Three variance components were used in the calculations. The variance components represent concentration differences between risers, laboratory samples, and analytical replicates. The model is:

$$Y_{ijk} = \mu + R_i + L_{ij} + A_{ijk},$$
$$I=1,2,\ldots,a;\ j=1,2,\ldots,b_i;\ m=1,2,\ldots,n_{ij};$$

where

Y_{ijk}	=	concentration from the kth analytical result of the jth sample of the ith riser
μ	=	the mean
R_i	=	the effect of the ith riser
L_{ij}	=	the effect of the jth sample from the ith riser
A_{ijk}	=	the analytical error
a	=	the number of risers
b_i	=	the number of samples from the ith riser
n_{ij}	=	the number of analytical results from the ij^{th} sample.

The variables R_i, and L_{ij} are random effects. These variables, as well as A_{ijk}, are assumed to be uncorrelated and normally distributed with means zero and variances $\sigma^2(R)$, $\sigma^2(L)$, and $\sigma^2(A)$, respectively.

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-T-105 (Effective April 1, 1998).

Analyte	Total Inventory (kg)	Basis (S, M, C or E)[1]	Comment
Al	26,100	S	
Bi	3,350	S	
Ca	410	S	
Cl	208	S	
TIC as CO_3	9,430	S	
Cr	374	S	
F	250	S	
Fe	9,430	S	
Hg	8.28	E	Per change package 7 (Simpson 1998)
K	259	S	
La	20.20	S	
Mn	4,040	S	
Na	34,500	S	
Ni	40.2	S	
NO_2	18,220	S	
NO_3	12,700	S	
OH_{TOTAL}	69,400	C	Charge balance spreadsheet
Pb	237	S	
PO_4	1,610	S	ICP analysis
Si	1,920	S	
SO_4	5,260	S	IC analysis
Sr	72.5	S	
TOC	1,890	S	
U_{TOTAL}	3,010	S	
Zr	23.4	S	

Note:

[1]S = Sample-based (see Appendix B), M = HDW model-based, E = engineering assessment, and C = calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3.

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-T-105. Decayed to January 1, 1994 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	4.94	S	
^{14}C	0.41	S	
^{59}Ni	0.00480	M	
^{60}Co	15.7	S	
^{63}Ni	0.435	M	
^{79}Se	0.00357	M	
^{90}Sr	115,000	S	
^{90}Y	115,000	S	Based on ^{90}Sr activity
^{93}Zr	0.0169	M	
^{93m}Nb	0.0142	M	
^{99}Tc	153	S	
^{106}Ru	1.88E-09	M	
^{113m}Cd	0.0426	M	
^{125}Sb	274	S	
^{126}Sn	0.00538	M	
^{129}I	2.22E-04	M	
^{134}Cs	22.7	S	
^{137}Cs	13,300	S	
^{137m}Ba	12,600	S	Based on 0.946 of ^{137}Cs activity
^{151}Sm	13.2	M	
^{152}Eu	0.00586	M	
^{154}Eu	737	S	
^{155}Eu	869	S	
^{226}Ra	8.76E-07	M	
^{227}Ac	4.49E-06	M	
^{228}Ra	2.25E-11	M	
^{229}Th	4.37E-09	M	
^{231}Pa	9.88E-06	M	
^{232}Th	4.74E-12	M	
^{232}U	2.29E-05	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes

Table D4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-T-105. Decayed to January 1, 1994 (Effective April 1, 1998). (2 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{233}U	1.06E-06	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{234}U	0.989	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{235}U	0.0437	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{236}U	0.00983	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{237}Np	7.28E-04	M	
^{238}Pu	0.422	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{238}U	1.01	S/M	Based on ICP U sample result ratioed to HDW estimates for U isotopes
^{239}Pu	99.1	S/M	Based on alpha sample result ratioed to HDW estimates for alpha isotopes
^{240}Pu	6.68	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{241}Am	99.7	S	
^{241}Pu	10.6	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{242}Cm	0.287	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{242}Pu	4.41E-05	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{243}Am	7.07E-04	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{243}Cm	0.00588	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes
^{244}Cm	0.0168	S/M	Based on total alpha sample result ratioed to HDW estimates for alpha isotopes

Note:

[1]S = sample-based (see Appendix B), M = HDW model-based (Agnew et al. 1997a), E = engineering assessment-based.

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