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PAGE COUNT 34

ACCESSION # D197244132

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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 635514

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 []	T. A. Hu, Data Assessment and Interpretation, R2-12, 373-4098	[] Yes [X] No	07/25/97
	6. Project Title/No./Work Order No. Tank 241-U-102	7. Bldg./Sys./Fac. No. 241-U-102	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-618, Rev. 0	10. Related ECN No(s). N/A	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 to include additional explanatory text in the best-basis narrative, and to update the comprehensive radionuclide inventory estimates for the tank.

14a. Justification (mark one)

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

14b. Justification Details

Initial release of this document was deficient.

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

See attached distribution.

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DATE AUG 25 1997 STA. 4 HANFORD RELEASE ID: 3

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A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-635514

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. T.A. Hu	[signature]	8/20/97	PE		
Cog. Mgr. K.M. Hall	Katherine M. Hall	8/20/97	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-U-102

T. A. Hu
Lockheed Martin Hanford, Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: ECN-635514 UC: 2070
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Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-U-102, 241-U-102, U-102, U 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-U-102. This report supports the requirements of the Tri-Party Agreement Milestone M-44-10.

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(2) Title
Tank Characterization Report for Single-Shell Tank 241-U-102

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 01/24/97 on EDT-613495.	T.A. Hu	K.M. Hall	
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		Alex Hu	Kathleen M. Hall	8/20/97

A-7320-005 (08/91) WEF168

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
Al	59,100	S	Extrapolated sludge composition
Bi	100	M	
Ca	680	S	Extrapolated sludge composition
Cl	9,550	S	Extrapolated sludge composition
CO_3	99,200	S	Extrapolated sludge composition
Cr	5,980	S	Extrapolated sludge composition
F	1,350	S	Extrapolated sludge composition
Fe	1,440	S	Extrapolated sludge composition
Hg	8.60	M	
K	3,410	S	Extrapolated sludge composition
La	0.55	S	Extrapolated sludge composition
Mn	635	S	Extrapolated sludge composition
Na	551,000	S	Extrapolated sludge composition
Ni	206	S	Extrapolated sludge composition
OH	213,000	C	Derived from charge balance [2]
NO_2	107,000	S	Extrapolated sludge composition
NO_3	669,000	S	Extrapolated sludge composition
Pb	148	S	Extrapolated sludge composition
PO_4	25,000	S	Extrapolated sludge composition
Si	694	S	Extrapolated sludge composition
SO_4	30,000	S	Extrapolated sludge composition
Sr	117	S	Extrapolated sludge composition
TOC	16,400	S	Extrapolated sludge composition

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
U	2,140	S	Extrapolated sludge composition
Zr	35.3	S	Extrapolated sludge composition

Notes:

[1]S = Sample-based value, E = Engineering assessment-based value, M = HDW model value (Agnew et al. 1996)

[2] C=Calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102 (January 31, 1997). (3 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	335	M	
^{14}C	49.5	M	
^{59}Ni	3.24	M	
^{60}Co	54.9	M	
^{63}Ni	318	M	
^{79}Se	4.92	M	
^{90}Sr	81,000	S	HDW = 1.65E+05 Ci
^{90}Y	81,000	S	Referenced to ^{90}Sr
^{93}Zr	24.1	M	
^{93m}Nb	17.5	M	
^{99}Tc	350	M	
^{106}Ru	9.97E-03	M	
^{113m}Cd	127	M	

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102 (January 31, 1997). (3 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{125}Sb	237	M	
^{126}Sn	7.43	M	
^{129}I	0.674	M	
^{134}Cs	4.09	M	
^{137}Cs	3.07E+05	S	HDW = 3.88E+05
^{137m}Ba	2.90E+05	S	Referenced to ^{137}Cs
^{151}Sm	1.73E+04	M	
^{152}Eu	5.91	M	
^{154}Eu	896	M	
^{155}Eu	352	M	
^{226}Ra	2.33E-04	M	
^{227}Ac	1.40E-03	M	
^{228}Ra	0.226	M	
^{229}Th	5.30E-03	M	
^{231}Pa	6.21E-03	M	
^{232}Th	1.50E-02	M	
^{232}U	1.16	M	
^{233}U	4.44	M	
^{234}U	23.6	M	
^{235}U	1.06	M	
^{236}U	0.181	M	
^{237}Np	1.26	M	
^{238}Pu	2.06	M	
^{238}U	24.1	M	
^{239}Pu	351	E	Derived from total alpha; HDW = 70.8
^{240}Pu	12.0	M	

Table 3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102 (January 31, 1997). (3 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{241}Am	84.3	M	
^{241}Pu	139	M	
^{242}Cm	0.225	M	
^{242}Pu	7.65E-04	M	
^{243}Am	3.00E-03	M	
^{243}Cm	2.09E-02	M	
^{244}Cm	0.203	M	

[1]S = Sample-based
M = Hanford Defined Waste model-based (Agnew et al. 1997)
E = Engineering assessment-based
NR = Not reported.

APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR TANK 241-U-102

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR TANK 241-U-102

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various tank waste management activities (Hodgson and LeClair 1996). As part of this effort, the following evaluation provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-U-102.

D1.0 TANK WASTE INFORMATION SOURCES ASSESSMENT

Available tank waste information for tank 241-U-102 included:

- Data from two push-mode cores samples that were collected in 1996 (see Appendix B, Section B2.0 for data). The core samples provided incomplete core recovery. Only the top 80 percent (about 267 cm [105 in.]) of waste was sampled.

- The inventory estimate for this tank was generated from the Hanford Defined Waste (HDW) model (Agnew et al. 1996). See Appendix A, Section A3.2, for the model estimate.

- The analytical data from tanks 241-S-101 (Kruger et al. 1996), 241-S-104 (DiCenso et al. 1994) and 241-S-107 (Simpson et al. 1996) were used for the composition estimates of reduction and oxidation (REDOX) process waste.

A list of references used in this evaluation is provided in Section D4.0.

D1.1 Waste Transaction Record

Based on process knowledge and the waste transaction record, as discussed in Section A3.2, expected waste types for tank 241-U-102 are metal waste (MW) sludge and SMMT2 and SMMS2 evaporator concentrates saltcake as reported in Agnew et al. (1996). However, a second interpretation of the same waste transfer records (Hill et al. 1995) suggests that the sludge in tank 241-U-102 is REDOX waste and not MW.

Further investigation of the waste transfer record (Agnew et al. 1995) indicates that the MW stored in the tank since 1948 was sluiced out in 1957. The record stated that the total waste volume of the tank was zero by the first quarter of 1957. This event was also documented in Rodenhizer (1987), where it is stated that by February 1957 tank 241-U-102 had been sluiced

of MW and was empty. After the tank was emptied, the transfer record shows that over 1,514 kL (400 kgal) of REDOX high-level waste supernatant were transferred in from tanks 241-SX-102 and 241-SX-111. This waste remained in the tank until the first quarter of 1974. During the period 1957 to 1974, the first non-zero measurement of the solid volume was 155 kL (41 kgal) in the fourth quarter of 1969; the solid volume then changed to 163 kL (43 kgal) in the third quarter of 1971 and remained the same until the evaporator bottom concentrate waste was added to the tank in 1975.

This waste transaction assessment suggests that the bottom 163 kL (43 kgal) of sludge in tank 241-U-102 is REDOX high-level waste generated from 1952 to 1966. For purposes of interpreting the tank data and deriving an overall tank inventory, the bottom 163 kL (43 kgal) of waste are assumed to be REDOX sludge. Future sampling from the sludge layer will help verify this assumption.

D1.2 Analytical Results

Several analytical results, as discussed in Appendix B2, are available for tank 241-U-102. The most interesting results for the inventory construction are those from the 1996 core sampling event, which provide comprehensive analytical results at the half-segment level (about every 24 cm [9 in.] in depth). Unfortunately, because of the hardness of the waste, the vertical core sample was only partially collected because it did not reach the bottom 20 percent of the waste.

The analytical results from the 1996 core sampling represent the top 80 percent of the waste in the tank. Based on the transaction record, these wastes are believed to be evaporator concentrates (saltcake) added on top of the tank's bottom sludge layer from 1976 to the present. The analytical data shows no obvious stratification. The visual record of the sample extrusion results also show no distinguishable layers based on sample appearance. Analytical results from Appendix B data tables were summarized in Table D1-1 for later use in constructing the saltcake inventory. The chemical species are reported without charge designation per the best-basis inventory convention.

Table D1-1. Analytical Results From 1996 Core Sampling in Tank 241-U-102. (2 sheets)

Analyte	Solid Segment Mean	Liquid Segment Mean
METALS	μg/g	μg/mL
Aluminum (Al)	15,100 (fusion)	18,000
Boron (B)	76.8 (acid)	81.0
Cadmium (Cd)	5.94 (acid)	5.49
Calcium (Ca)	295 (acid)	253
Chromium (Cr)	2,720 (fusion)	279
Copper (Cu)	10.3 (acid)	5.26

Table D1-1. Analytical Results From 1996 Core Sampling in Tank 241-U-102. (2 sheets)

Analyte	Solid Segment Mean	Liquid Segment Mean
METALS	**µg/g**	**µg/mL**
Iron (Fe)	499 (acid)	< 20.1
Lead (Pb)	68.4 (acid[1])	< 40.1
Manganese (Mn)	133 (acid)	< 4.0
Molybdenum (Mo)	42.6 (acid)	94.7
Nickel (Ni)	82.4 (acid)	126
Phosphorus (P)	3,880 (acid)	1,720
Potassium (K)	1,520 (acid)	3,770
Silicon (Si)	170 (acid)	109
Silver (Ag)	12.0 (acid)	17.3
Sodium (Na)	259,000 (fusion)	243,000
Sulfur (S)	5,190 (fusion)	3,270
Zinc (Zn)	598 (fusion)	34.2
Zirconium (Zr)	8.22 (acid[1])	< 4.0
ANIONS	**µg/g**	**µg/mL**
Chloride (Cl)	4,160	8,810
Nitrate (NO_3)	310,000	244,000
Nitrite (NO_2)	45,800	104,000
Oxalate	5,120	< 1,070
Phosphate (PO_4)	12,100	3,800
Sulfate (SO_4)	14,600	7,050
RADIONUCLIDES	**µCi/g**	**µCi/mL**
Cesium (^{137}Cs)	154	340
Strontium (^{90}Sr)	40.6[1]	8.83
CARBON	**µg C/g**	**µg C/mL**
Total inorganic carbon (TIC)	9,520	9,360
Total organic carbon (TOC)	7,480	15,100
PHYSICAL PROPERTIES		
Density (g/mL)	1.68	1.38
Weight percent water	34.0	48.4

Note:

[1]Composite samples average.

D1.3 Tank Waste Volume

In the waste tank summary report for the period ending August 31, 1996 (Hanlon 1996), the total tank volume was reported as 1,416 kL (374 kgal) of waste, including 68 kL (18 kgal) of supernatant, 1,185 kL (313 kgal) of saltcake and 163 kL (43 kgal) of sludge. An assessment on the waste level and volume was conducted. For the 1996 April core sampling event, the waste levels under risers 7, 9 and 19 were measured using sludge weight, and was reported in riser preparation work package WS-96-00027. Additional measurements to date were taken from the SACS database measurement. All measurements are summarized in Table D1-2.

Table D1-2. Tank 241-U-102 Waste Level Measurement.

	Sludge Weight	Sludge Weight	Sludge Weight	Manual ENRAF™	Neutron Probe	Manual FIC	FIC
Riser location	7	9	19	8	2	8	8
Measurement date	4/12/96	4/12/96	4/12/96	12/9/96	12/8/96	10/01/95	3/25/96
Waste, cm (in.)	337.8 (133.0)	334.0 (131.5)	334.7 (131.8)	337.3 (132.8)	321.0 (126.4)	332.5 (130.9)	334.3 (131.6)
Supernatant, cm (in.)	7.6 (3)	25.4 (10)	25.4 (10)	n/a	n/a	n/a	n/a

Notes:

The waste level reference is the top of the tank's dished bottom (191 m [628 ft] mean sea level).

FIC = Food Instrument Corporation

Because of the consistency of the measurements between methods and across the tanks, average waste level was derived from these data. The average waste level in the tank is 335 cm (132 in.). The neutron probe measurement is primarily for interstitial liquid level information, and was left out of this average. At an average waste level of 335 cm (132 in.), the volume of waste is 1,419 kL (375 kgal).

The 1989 in-tank photo shows that one third of the waste surface toward the southern side is covered by dry crust, and the rest of the surface is supernatant. As shown in Table D1-2, riser 7 (located over the dry crust area) has 8 cm (3 in.) of supernatant beneath it, and riser 9 and 19 (located over the wet area) has 25 cm (10 in.) of supernatant beneath it. A good estimate of supernatant volume is 68 kL (18 kgal) assuming a linear fall of the supernatant depth from 8 cm (3 in.) to 25 cm (10 in.) symmetrically.

This assessment indicates that the waste levels are consistent throughout the tank. The estimated total waste amount of 1,419 kL (375 kgal), with 68 kL (18 kgal) of supernatant on top of 1,351 kL (357 kgal) of solids, is in agreement with Hanlon (1996).

D2.0 EVALUATION OF COMPONENT INVENTORY VALUES

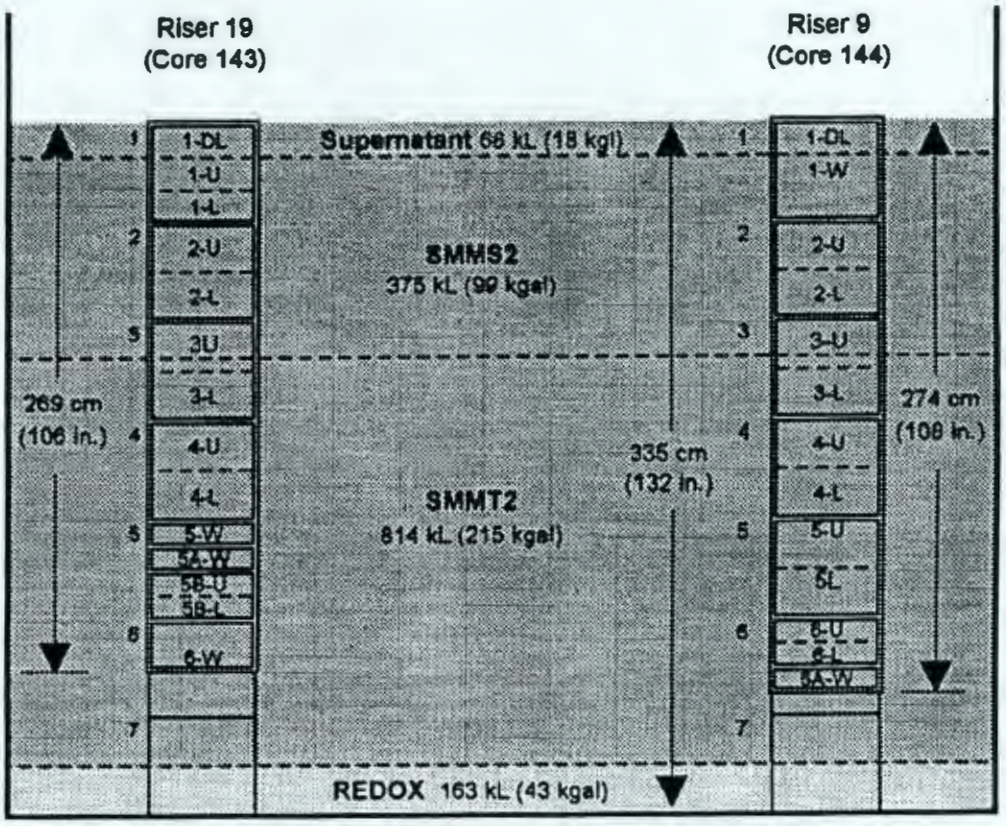
This section will develop an inventory model, evaluate Agnew's model (Agnew et al. 1996) using process knowledge and analytical results, and provide a basis for a best-basis inventory.

D2.1 Tank Inventory Model

Based on above assessment, a conceptual tank inventory model was established from which to construct an inventory. As shown in Figure D2-1, the total waste volume is 1,419 kL (375 kgal), consisting of 68 kL (18 kgal) of supernatant and 1,351 kL (357 kgal) of solids. In terms of waste types in HDW, Rev. 3 (Agnew et. al. 1996), there are 163 kL (43 kgal) of REDOX sludge in the bottom of the tank, and a total of 1,257 kL (332 kgal) of evaporator concentrates (68 kL [18 kgal] of supernatant and 1,189 kL [314 kgal] of solids) above the REDOX sludge layer. In the SMM model (Agnew et. al 1996), this evaporator concentrates solid layer was further divided into SMMS2 saltcake (375 kL [99 kgal]) on the top and SMMT2 (814 kL [215 kgal]) saltcake on the bottom. The SMMS2 saltcake waste was generated from the 242 Evaporator from 1977 until 1980, and the SMMT2 saltcake waste was generated from the 242 T Evaporator from 1955 until 1965.

As shown in Figure D2-1, the 1996 core sampling results represent about 88 percent (1,113 out of 1,257 kL [294 kgal out of 332 kgal]) of the evaporator concentrates saltcake waste layer and 80 percent (averaged 272 cm [107 in.] collected samples out of expected 335 cm [132 in.]) of the total waste in a vertical profile. The missing 20 percent of waste sample is assumed to include part of the saltcake information and all information from the bottom 28 cm (11 in.) of the REDOX sludge layer. The mean densities for the saltcake layer are 1.68 g/mL in solids and 1.38 g/mL in liquid (from the 1996 core sampling event). The saltcake layer inventory will be constructed by using the analytical results from tank 241-U-102. These analytical results will be evaluated against process knowledge and the transaction record to see if any bias or possible error is present in these measurements. The sludge layer inventory will be constructed based on the developed analytical results of REDOX waste from tanks 241-S-101 (Kruger et. al. 1996), 241-S-104 (DiCenso et. al. 1994) and 241-S-107 (Simpson et al. 1996).

Figure D2-1. Tank 241-U-102 Inventory Profile.



Note: 1. Every full segment is 48 cm (19 in.). Due to waste hardness, partial segments were collected starting from the location of segment 5 on core 143 and the location of segment 6 on core 144.
2. HDW model's SMMS2 and SMMT2 layers cannot be differentiated using analytical data.

HDW Model (Agnew et al. 1996)

Evaporator Concentrates
1257 kL (332 kgal) (89%)

REDOX Sludge
163 kL (43 kgal) (11%)

Extrusion Results

Obtained sample segment from 1996 core sampling

Segment not available

1-DL Segment 1, drainable liquid sample

1-W Segment 1, whole solid sample

5B-U Segment 5B, upper half solid sample

6-L Segment 6, lower half solid sample

D2.2 Component Inventory in Saltcake Layer

The transaction record shows that the saltcake layer primarily consists of the evaporator concentrate waste from the 242-S Evaporator and the 242-T Evaporator campaign. These wastes consist of all kinds of wastes from different waste streams. According to the SMM, the primary HDWs in this saltcake layer are the supernatant fractions of CSR (20.4%), R1 (11.3%), CWP1 and CWP2 (8.8%), DW (8.5%), BL (7.9%), T1SltCk (5.9%), CWR1 and CWR2 (4.6%), and P1 and P2 (4.4%). The remaining 28 percent of the total waste is contributed from 26 other types of HDWs. With a linear combination of these pure supernatant waste types, Agnew's SMM model can be used to generate a tank component prediction for the evaporator concentrates.

No obvious stratification structure was observed from the sample appearance or analytical results; thus the SMMS2 and SMMT2 layers are very similar. A comparison of the analyte concentration of SMMS2 saltcake between tank 241-U-102 and tanks 241-S-101, 241-S-102, 241-U-107, and 241-U-109 is presented in Table D2-1. The mean analyte concentrations were derived by averaging the analytical results for the sample segments corresponding to the volume of the SMMS2 saltcake assigned in Agnew's SMM. An average concentration for the analytes from these five tanks is given in the seventh column of the table.

As shown in Table D2-1, the concentrations of most bulk analytes (Al, Na, NO_2, NO_3, PO4) are within a factor of 2, although several analyte concentrations have quite wide ranges. These wide-ranging characteristics may indicate mixing between SMM saltcake layers; they may also be a property of the waste, because the evaporator concentrates are a mixture of several different waste streams and will vary from tank to tank. Overall, the analytical results of SMMS2 from tank 241-U-102 are in the same order of magnitude as other tanks, and are comparable to the mean concentrations of these five tanks.

Because the SMM model is a linear combination of HDWs, there is no direct comparison between analytical results of SMMS2 and individual HDWs. However, SMMS2 analytical results can be compared with the analyte prediction of the tank, which contains only pure SMMS2 waste. The waste in tanks 241-SY-103 and 241-SY-101 was assigned as pure SMMS2 waste (Agnew et.al. 1996). The analyte prediction of these tanks is listed in the last two columns. Table D2-1 shows that the bulk analytes except TOC (Na, Al, NO_3, NO_2, PO_4, SO_4) are quite comparable between the sample average and SY farm tanks.

Another effort was made to evaluate the analytical results of whole saltcake layer with the model generated from the process knowledge. A direct comparison between Agnew's model prediction and 1996 core sampling analytical results was made for the chemical components in this saltcake layer. With the saltcake layer volume and density from the tank inventory model section, a component inventory of saltcake layer derived from core sample results (Table D1-1) and Agnew's prediction (Agnew 1996) are listed in Table D2-2. For the core sample, the mass and volume basis used in the calculation are 1.994E+09 g for solid and 6.804E+07

mL for liquid. For Agnew's prediction, total mass basis of 1.98E+09 g is used in the calculation.

Table D2-1. Comparison of SMMS2 Saltcake Concentrations (μg/g).

Analyte	S-101[1]	S-102[2]	U-102[3]	U-107[4]	U-109[5]	Sample Average	HDW[6] SY-103	HDW[6] SY-101
Al	20,400	8,580	12,100	7,620	9,140	11,700	27,200	31,400
Ag	12.4	18.3	13.3	n/r	n/r	14.7	NR	NR
B	122	n/r	64.7	89.1	n/r	91.9	NR	NR
Ca	264	237	301	298	n/r	275	853	1,050
Cl	4,660	3,020	3,350	2,320	n/r	3,340	4,680	5,550
Cr	11,300	1,820	3,110	2,410	2,340	4,190	1,870	2,240
Fe	444	609	514	799	n/r	591	262	322
Mn	436	40.6	136	323	n/r	234	143	166
Na	172,000	209,000	249,000	201,000	232,000	213,000	171,000	203,000
Ni	121	22.4	75.9	26.8	n/r	61.5	234	288
NO2	58,200	27,700	36,300	25,100	n/r	36,800	68,800	79,400
NO3	184,000	518,000	303,000	481,000	392,000	376,000	201,000	242,000
PO4	8,200	14,100	21,600	12,300	n/r	14,100	5,620	6,760
P	2,190	2,550	7,850	2,720	n/r	3,830	NR	NR
S	6,380	1,320	4,770	721	n/r	3,300	NR	NR
Si	n/r	235	139	198	n/r	191	1,420	1,720
SO4	20,900	8,500	12,800	4,490	n/r	11,700	15,500	18,200
TOC	n/r	1,730	6,680	2,070	1,900	3,100	42,552	80,600
Zn	16.3	16.3	600	29.2	n/r	169	NR	NR
Cs-137	173	n/r	126	76.8	71.8	112	164	189
TIC	n/r	4,080	8,740	2,750	3,750	4,830	3,540	4,220
Oxalate	13,000	3,370	4,900	3,120	n/r	6,090	1.88	2.70

Note: [1]Kruger et. al. (1996)
[2]Eggers et. al. (1996)
[3]See appendix B
[4]Jo et. al. (1996)
[5]Baldwin and Stephens (1996)
[6]Agnew et al. (1996)

Table D2-2. Comparison of Saltcake Layer Inventory Between Analytical Results From 1996 Core Sampling and Agnew's SMM Prediction for the Tank 241-U-102. (2 sheets)

Analyte	Analytical Results From 1996 Core Sampling			Agnew's SMM Model	Model/ Sampling
METALS	**Solid**	**Liquid**	**Total**	**Total**	**Ratio**
	kg	**kg**	**kg**	**kg**	
Aluminum	3.01E+04	1.22E+03	3.13E+04	5.49E+04	1.75
Boron	1.53E+02	5.51E+00	1.59E+02	NR	NA
Cadmium	1.18E+01	3.74E-01	1.22E+01	NR	NA
Calcium	5.88E+02	1.72E+01	6.05E+02	1.89E+03	3.12
Chromium	5.42E+03	1.90E+01	5.44E+03	3.83E+03	0.70
Copper	2.05E+01	3.58E-01	2.09E+01	NR	NA
Iron	9.95E+02	1.37E+00	9.96E+02	5.79E+02	0.58
Lead[2]	1.36E+02	2.73E+00	1.39E+02	2.89E+02	2.08
Manganese	2.65E+02	2.72E-01	2.65E+02	2.79E+02	1.05
Molybdenum	8.49E+01	6.44E+00	9.14E+01	NR	NA
Nickel	1.64E+02	8.57E+00	1.73E+02	5.19E+02	3.00
Phosphorus	7.74E+03	1.17E+02	7.85E+03	NR	NA
Potassium	3.03E+03	2.57E+02	3.29E+03	2.98E+03	0.91
Silicon	3.39E+02	7.42E+00	3.46E+02	2.99E+03	8.63
Silver	2.39E+02	1.18E+00	2.40E+02	NR	NA
Sodium	5.16E+05	1.65E+04	5.33E+05	3.58E+05	0.67
Sulfur	1.03E+04	2.22E+02	1.06E+04	NR	NA
Zinc	1.19E+03	2.33E+00	5.96E+01	NR	NA
Zirconium[2]	1.64E+01	2.72E-01	1.67E+01	1.30E+02	7.80
ANIONS	**kg**	**kg**	**kg**	**kg**	
Chloride	8.30E+03	5.99E+02	8.89E+03	9.83E+03	1.11
Nitrate	6.18E+05	1.66E+04	6.35E+05	4.30E+05	0.68
Nitrite	9.13E+04	7.08E+03	9.84E+04	1.37E+05	1.39
Oxalate	1.02E+04	7.28E+01	1.03E+04	5.41	0.00
Phosphate	2.41E+04	2.59E+02	2.44E+04	1.26E+04	0.52
Sulfate	2.91E+04	4.80E+02	2.96E+04	3.24E+04	1.09
RADIONUCLIDE	**μCi/g**	**μCi/mL**	**Ci**	**Ci**	
Cesium-137	3.07E+05	2.31E+01	3.07E+05	3.32E+05	1.08
Strontium-90	8.10E+04	6.01E-01	8.10E+04	1.59E+05	1.96

Table D2-2. Comparison of Saltcake Layer Inventory Between Analytical Results From 1996 Core Sampling and Agnew's SMM Prediction for the Tank 241-U-102. (2 sheets)

Analyte	Analytical Results From 1996 Core Sampling			Agnew's SMM Model	Model/ Sampling
CARBON	kg C	kg C	kg C	kg C	
TOC	1.49E+04	1.03E+03	1.59E+04	1.88E+04	1.18
TIC	1.90E+04	6.37E+02	1.96E+04	7.46E+03	NA
PHYSICAL					
Density (g/mL)	1.68	1.38	1.66	1.58	0.95
Water (wt%)	34.0	48.4	35.0	34.8	0.99
Volume (kgal)	314	18	332	331	NA

[1]Segment-level data used unless otherwise indicated

[2]Core Composite data used

The ratio of model prediction over analytical results was used as a comparison indicator and listed in the last column of Table D2-1. Results for several analytes (Mn, K, Cl, SO4, Cs-137, TOC, density, and weight percent water) have agreement within 10 percent. Results for other analytes (Al, Cr, Fe, Na, Pb, NO_3, NO_2, PO_4, Sr-90, TOC) agree with each other within a factor of 2, and in most of these predictions are within the 95 percent confidence interval of the analytical results. Results for the remaining analytes (Ca, Ni, Si, Zr, oxalate) have ratios greater than 2 and are outside the 95 percent confidence interval.

For calcium, nickel, silicon and zirconium, Agnew's predictions (Agnew et al. 1996) are all greater than the analytical results. These four analytical results are all measured using an acid digest sample preparation on ICP. They could be biased because the acid method may only partially dissolve these metals in the waste sample. For example, the observed fusion data of calcium were all less than the detection limit 2,000 μg/g because of the high dilution. Therefore, the calcium concentration could be between 295 μg/g (acid data) to 2,000 μg/g (fusion detection limit). This concentration range gives a calcium inventory ranging from 605 kg to 3,600 kg, while the HDW predicted value is 1,890 kg. Similar means are observed for the other analytes.

According to the HDW model, the major source of oxalate is 224 waste. Most of the other HDW wastes do not have oxalate; only a couple of then have oxalate concentrations in the order of 1 ppm. In the SMM model, tank 241-U-102 has a very small percentage of waste from 224 waste or other oxalate-containing waste. Its predicted value is 3 μg/g of oxalate versus an observed 5,120 μg/g. Similar predictions were given on the evaporator concentrate waste in other U Farm tanks; the model predicted 2.5 μg/g and 2.3 μg/g for tank 241-U-105 (1,461 kL [386 kgal] saltcake) and tank 241-U-107 (757 kL [200 kgal] saltcake), and the

observed concentrations are 9,900 μg/g and 3,120 μg/g, which is in the same order as observed in tank 241-U-102.

These observed discrepancies between measured and modeled concentrations of oxalate in these U Farm tanks are similar and consistent. If the model-predicted oxalate concentration is correct, then this observation is a good example of organic degradation with the oxalate being the end product of the degradation. This organic degradation process has been observed in the waste simulants experiment (Camaioni et al. 1996). Camaioni reported that the starting organic compounds, EDTA, HEDTA, and glycolate, exhibit exponential decay functions and the products (oxalate, formate, and carbonate) all increase linearly as the radiation dose increases. An organic speciation effort (Reynolds 1996) is underway to examine organic degradation processes on real waste samples. The other possible contributor for this discrepancy is that the HDW model assumption regarding oxalate concentration is incomplete, which would lead to poor agreement with the analytical results. In the B Farm 200 series tanks (pure 224 waste), for example, the observed oxalate concentrations (Sasaki et al. 1996) were much smaller than the model predicted values. This suggests that the oxalate source term may be misused in the model.

For TIC comparison, there is no direct comparison because the model only calculates CO^3 concentration. To make the two values comparable, the HDW values will be converted to the same basis as the analytical value (CO_3 concentration divided by 5; the ratio of the molecular weight of carbon to carbonate). It is noted that the observed TIC is two times higher than the model estimate, within the typical ratio observed in several other analytes.

Overall, the inventory of the evaporator concentrate waste layer has reasonable agreement between analytical results and HDW model prediction. The bulk analytes Na, Al, NO_3, NO_2, PO_4, SO_4 and water, which account for more than 90 percent of the inventory, agree with each other quite well.

D2.3 Basis for Sludge Layer Calculations

According to the waste transaction record, the bottom sludge layer of REDOX waste was generated from 1952 to 1966. The primary components in this waste stream are aluminum, calcium, chromium, sodium, uranium, nitrate, nitrite, and sulfate. Because no bottom sludge layer samples are available for tank 241-U-102, the analytical results of REDOX waste from other tanks will be used to derive a composition for this 163-kL (43-kgal) REDOX sludge layer.

The available analytical results of REDOX waste from tanks 241-S-101, 241-S-104 and 241-S-107 are listed in Table D2-3. Tank 241-S-104 has mixture of 37 percent R1 waste, 8 percent CWR1 waste, and 55 percent RSltCk. The concentrations quoted for tank 241-S-104 in Table D2-3 are the means from all available core sample segments. Tanks 241-S-101 and 241-S-107 have two and three segments of R1, respectively. The concentrations quoted in

table D2-3 for these two tanks are the averages from these REDOX waste segments. The average concentrations from these three tanks are given in the fifth column. Also listed in the table are the ratios of the concentration between each tank and the average value. Most of the ratios are close to 1; within 20 percent. This degree of agreement suggest the assumption that the concentrations come from the same type of waste. The projected REDOX sludge layer inventory for tank 241-U-102 is derived from the average concentration and is given in the last column. The mass basis used in the sludge layer inventory is 2.7794 E+08 g with a density of 1.71 g/mL, and a waste volume of 163 kL (43 kgal).

The REDOX waste composition from the average of analytical results was evaluated using Agnew's model. A comparison between the averaged sample results and several of Agnew's REDOX wastes (R1, CWR1 and RSltCk) is given in Table D2-4. Poor agreement is shown between the analytical data and model-predicted values. This discrepancy can be attributed to poor source terms, incomplete transfer records, or a wrong assumption on the solubility in Agnew's model.

Table D2-3. The Projected Sludge Inventory for Tank 241-U-102 from the Average of Tanks 241-S-101, 241-S-104 and 241-S-107.

Analyte	Analyte Concentration ($\mu g/g$)				Ratio Between Tanks and Average Value			U-102 Sludge Inventory
	S-104[1]	S-107[2]	S-101[3]	Average	S-104	S-107	S-101	Kg
Al	1.17E+05	5.64E+04	1.27E+05	1.00E+05	1.17	0.56	1.27	2.78E+04
B			6.31E+01	6.31E+01				1.76E+01
Ca	2.47E+02	2.34E+02	3.22E+02	2.68E+02	0.92	0.87	1.20	7.47E+01
Cr	2.35E+03	1.18E+03	2.23E+03	1.92E+03	1.22	0.61	1.16	5.35E+02
Fe	1.72E+03	1.16E+03	1.96E+03	1.61E+03	1.07	0.72	1.21	4.48E+02
Pb	2.96E+01	3.30E+01	3.70E+01	3.32E+01	0.89	0.99	1.11	9.23E+00
Mn	1.15E+03		2.75E+03	1.33E+03	0.86		1.41	3.70E+02
Ni	5.60E+01		9.07E+01	1.18E+02	0.47		1.24	3.28E+01
P	9.32E+01		2.78E+02	1.86E+02	0.50		1.50	5.17E+01
K	3.00E+02	4.57E+02	5.39E+02	4.32E+02	0.69	1.06	1.25	1.20E+02
Si	1.33E+03	1.06E+03	1.36E+03	1.25E+03	1.06	0.85	1.09	3.48E+02
Ag			9.71E+00	9.71E+00			1.00	2.70E+00
Na	1.21E+05	6.04E+04	1.12E+05	9.78E+04	1.24	0.62	1.21	2.72E+04
Sr	4.24E+02	3.78E+02	4.56E+02	4.19E+02	1.01	0.90	1.04	1.17E+02
S	4.72E+02		3.43E+02	4.07E+02	1.16		0.84	1.13E+02
U	6.69E+03	8.69E+03	7.68E+03	7.69E+03	0.87	1.13	1.12	2.14E+03
Zn			2.51E+01	2.51E+01			1.00	6.96E+00
Zr	3.36E+01	1.31E+02	3.60E+01	6.69E+01	0.50	1.96	1.03	1.86E+01
CO_3	4.14E+03			4.14E+03				1.15E+03
Cl	3.20E+03	1.86E+03	2.05E+03	2.37E+03	1.35	0.78	0.87	6.59E+02
F	1.45E+02	1.50E+02	<6.59E+01	<1.2E+02				<3.3E+01
NO_3	1.91E+05	5.76E+04	1.19E+05	1.23E+05	1.56	0.47	1.10	3.42E+04
NO_2	2.59E+04	3.43E+04	3.11E+04	3.04E+04	0.85	1.13	1.02	8.46E+03
PO_4	<2.19E+03	1.63E+03		<1.7E+03				<4.8E+02
SO_4	2.27E+03	1.30E+03	8.97E+02	1.49E+03	1.52	0.87	0.60	4.14E+02
TOC	1.73E+03			1.77E+03	0.93	1.07	1.00	4.81E+02
Density	1.64E+00	1.90E+00	1.77E+00	1.71+00				

Notes:

[1]DiCenso et al. (1994)
[2]Simpson et al. (1996)
[3]Kruger et al. (1996)

Table D2-4. Comparison Between REDOX Waste Analytical Results From Tanks 241-S-101, 241-S-104, 241-S-107 and HDW Prediction.

		Concentration[2] (μg/g)			Ratio (HDW's/Sample Ave)		
Analyte	Sample Ave[1].	R1	CWR1	RSltCk	R1	CWR1	RSltCk
Al	1.00E+05	7.54E+04	1.71E+05	2.47E+04	0.75	1.71	0.25
B	6.31E+01	NR	NR	NR	NA	NA	NA
Ca	2.68E+03	5.80E+03	2.73E+03	2.06E+03	2.16	1.02	0.77
Cr	1.92E+03	3.06E+04	5.98E+01	7.94E+03	15.96	0.31	4.13
Fe	1.61E+03	3.81E+04	5.20E+03	6.39E+02	23.66	3.22	0.40
Pb	3.32E+01	0.00E+00	1.38E+04	2.61E+01	0.00	416	0.79
Mn	1.95E+03	0.00E+00	0.00E+00	2.02E+00	0.00	0.00	0.00
Ni	7.33E+01	2.01E+03	3.37E+01	5.95E+02	27.35	0.46	8.11
P	1.86E+02	NR	NR	NR	NA	NA	NA
K	4.32E+02	2.24E+02	3.24E+01	6.67E+02	0.52	0.08	1.55
Si	1.25E+03	2.25E+02	3.19E+02	2.42E+03	0.18	0.26	1.94
Ag	9.71E+00	NR	NR	NR	NA	NA	NA
Na	1.01E+05	3.68E+04	1.02E+05	1.37E+05	0.36	1.00	1.35
Sr	4.40E+02	0.00E+00	0.00E+00	5.20E-06	0.00	0.00	0.00
S	4.07E+02	NR	NR	NR	NA	NA	NA
U	7.59E+03	NR	2.46E+04	NR	NA	3.24	NA
Zn	2.51E+01	NR	NR	NR	NA	NA	NA
Zr	3.48E+01	0.00E+00	0.00E+00	2.24E-01	0.00	0.00	0.01
CO3	4.14E+03	8.68E+03	4.09E+03	3.31E+03	2.10	0.99	0.80
Cl	2.37E+03	9.34E+02	1.35E+02	2.77E+03	0.39	0.06	1.17
F	1.48E+02	0.00E+00	0.00E+00	5.50E+00	0.00	0.00	0.04
NO_3	1.23E+05	1.47E+03	2.00E+04	2.20E+03	0.01	0.16	0.02
NO_2	3.04E+04	6.06E+04	2.49E+04	5.72E+04	1.99	0.82	1.88
PO_4	1.91E+03	0.00E+00	0.00E+00	3.10E+01	0.00	0.00	0.02
SO_4	1.49E+03	9.92E+02	4.55E+02	2.85E+03	0.67	0.31	1.91
TOC	1.73E+03	0.00E+00	0.00E+00	6.63E+01	0.00	0.00	0.04
density	1.71E+00	1.48E+00	1.77E+00	1.49E+00	0.87	1.04	0.87

Notes: NR = Not reported

[1]Sample ave. is the average sample data of REDOX waste from tanks 241-S-101, 241-S-104 and 241-S-107 listed in Table D2-3.

[2]The data of R1, CWR1 and RSltCk wastes are HDW waste type predictions (Agnew et al. 1996)

D3.0 BEST-BASIS INVENTORY ESTIMATE

To derive a best-basis inventory for tank 241-U-102, an evaluation of tank waste information for the tank was performed that included the following:

- The waste transaction was reviewed. Analysis suggests that the waste type comprising the bottom sludge layer is REDOX instead of MW as reported in Agnew's model.

- The analytical data from two 1996 push-mode core samples of tank 241-U-102 (see Appendix B, Section B2.0) were evaluated. This partial core sample (80 percent of the full core profile) provides analytical results. These sample data correspond to the SMMS2 and SMMT2 saltcake layers described in Agnew's HDW model. No stratification was observed, either in terms of sample appearance or assessment of the analytical results at the subsegment level.

- The tank waste volume was determined by examining the waste level measurements from several risers, the waste transfer history, and the in-tank photos. The data suggested that the waste volume was consistent with the number stated in Hanlon (1996). This assessment indicates that the waste level does not significantly vary throughout the tank.

- Establish a model to calculate a standard inventory (see Figure 3-1). It contains the top 1,257 kL (331 kgal) of evaporator concentrated saltcake waste with a mass basis of 1.98E+09 g for solid and 1.7E+07 mL for liquid, and the bottom 164 kL (43 kgal) of REDOX waste with a mass basis of 1.7E+09 g for the sludge. In the HDW model this saltcake layer was separated into SMMS2 and SMMT2 layers.

- Analytical results and the HDW model were reviewed to derive a saltcake layer composition and inventory. An evaluation of analytical results against SMM model predictions was performed, and a comparison of the SMMS2 layer with tank 241-U-102 and the other four tanks was performed.

- Comparisons with the R sludge concentrations from tank 241-S-101, 241-S-104, 241-S-107 were made to derive a sludge layer composition and inventory. These results were also evaluated against the HDW composition for REDOX waste (R, CWR1 and RSltCk). The average of the analytical results of REDOX waste from these tanks was used to construct the bottom sludge layer composition.

Based on this evaluation, a best-basis total inventory of tank 241-U-102 was developed by adding the evaporator concentrates saltcake inventory (in Table D2-2) and REDOX sludge inventory (in Table D2-3). The best-basis inventory estimate for tank 241-U-102 are presented in Tables D3-1 and D3-2. The inventory values reported in these tables are subject to change. Refer to the Tank Characterization Database (TCD) for the most current inventory values.

In summary, this evaluation shows that the tank 241-U-102 analytical results for evaporator concentrates (saltcake) are similar to the saltcake wastes sampled and analyzed from other tanks with similar process histories. It also shows the analytical results are in reasonable agreement with the SMM model (Agnew et al. 1996) prediction. When the data are compared, the saltcakes (SMMS2 and SMMT2) in the HDW model resemble each other. For the REDOX sludge layer, the projected inventory was derived from the analytical results of tanks 241-S-101, 241-S-104 and 241-S-107. The analytical results of REDOX waste in these tank are consistent and close to one another. However, the REDOX analytical results do not agree with the HDW model's REDOX waste composition.

Table D3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
Al	59,100	S	Extrapolated sludge composition
Bi	100	M	
Ca	680	S	Extrapolated sludge composition
Cl	9,550	S	Extrapolated sludge composition
CO_3	99,200	S	Extrapolated sludge composition
Cr	5,980	S	Extrapolated sludge composition
F	1,350	S	Extrapolated sludge composition
Fe	1,440	S	Extrapolated sludge composition
Hg	8.60	M	
K	3,410	S	Extrapolated sludge composition
La	0.55	S	Extrapolated sludge composition
Mn	635	S	Extrapolated sludge composition
Na	551,000	S	Extrapolated sludge composition

Table D3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-U-102. (2 Sheets)

Analyte	Total inventory (kg)	Basis[1]	Comment
Ni	206	S	Extrapolated sludge composition
OH	213,000	C	Derived from charge balance [2]
NO_2	107,000	S	Extrapolated sludge composition
NO_3	669,000	S	Extrapolated sludge composition
Pb	148	S	Extrapolated sludge composition
PO_4	25,000	S	Extrapolated sludge composition
Si	694	S	Extrapolated sludge composition
SO_4	30,000	S	Extrapolated sludge composition
Sr	117	S	Extrapolated sludge composition
TOC	16,400	S	Extrapolated sludge composition
U	2,140	S	Extrapolated sludge composition
Zr	35.3	S	Extrapolated sludge composition

Notes:

[1]S = Sample-based value, E = Engineering assessment-based value, M = HDW model value (Agnew et al. 1996)

[2] C=Calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3

The total tank inventory consists of two parts: evaporator concentrates (89 percent), based on 1996 core sampling results for tank 241-U-102, and a REDOX sludge layer (11 percent), based on average analytical results for tanks 241-S-101, 241-S-104, and 241-S-107.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr, ^{137}Cs, $^{239/240}Pu$, and total uranium, or (total beta and total alpha) while other key radionuclides such as ^{60}Co, ^{99}Tc, ^{129}I, ^{154}Eu, ^{155}Eu, and ^{241}Am, etc., have been infrequently reported. For this reason it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste

streams, and track their movement with tank waste transactions. (These computer models are described in Kupfer et al. 1997, Section 6.1 and in Watrous and Wootan 1997.) Model generated values for radionuclides in any of 177 tanks are reported in the Hanford Defined Waste Rev. 4 model results (Agnew et al. 1997). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. (No attempt has been made to ratio or normalize model results for all 46 radionuclides when values for measured radionuclides disagree with the model.) For a discussion of typical error between model derived values and sample derived values, see Kupfer et al. 1997, Section 6.1.10.

Table D3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102 (January 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	335	M	
^{14}C	49.5	M	
^{59}Ni	3.24	M	
^{60}Co	54.9	M	
^{63}Ni	318	M	
^{79}Se	4.92	M	
^{90}Sr	81,000	S	HDW = 1.65E+05 Ci
^{90}Y	81,000	S	Referenced to ^{90}Sr
^{93}Zr	24.1	M	
^{93m}Nb	17.5	M	
^{99}Tc	350	M	
^{106}Ru	9.97E-03	M	
^{113m}Cd	127	M	
^{125}Sb	237	M	
^{126}Sn	7.43	M	
^{129}I	0.674	M	
^{134}Cs	4.09	M	
^{137}Cs	3.07E+05	S	HDW = 3.88E+05
^{137m}Ba	2.90E+05	S	Referenced to ^{137}Cs
^{151}Sm	1.73E+04	M	
^{152}Eu	5.91	M	
^{154}Eu	896	M	
^{155}Eu	352	M	
^{226}Ra	2.33E-04	M	
^{227}Ac	1.40E-03	M	
^{228}Ra	0.226	M	
^{229}Th	5.30E-03	M	

Table D3-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-U-102 (January 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{231}Pa	6.21E-03	M	
^{232}Th	1.50E-02	M	
^{232}U	1.16	M	
^{233}U	4.44	M	
^{234}U	23.6	M	
^{235}U	1.06	M	
^{236}U	0.181	M	
^{237}Np	1.26	M	
^{238}Pu	2.06	M	
^{238}U	24.1	M	
^{239}Pu	351	E	Derived from total alpha; HDW = 70.8
^{240}Pu	12.0	M	
^{241}Am	84.3	M	
^{241}Pu	139	M	
^{242}Cm	0.225	M	
^{242}Pu	7.65E-04	M	
^{243}Am	3.00E-03	M	
^{243}Cm	2.09E-02	M	
^{244}Cm	0.203	M	

[1]S = Sample-based
M = Hanford Defined Waste model-based (Agnew et al. 1997)
E = Engineering assessment-based
NR = Not reported.

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