0050192

ENGINEERING CHANGE NOTICE

1. ECN 643865

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	01/15/99
	6. Project Title/No./Work Order No. Tank 241-AX-102	7. Bldg./Sys./Fac. No. 241-AX-102	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-472, Rev. 1	10. Related ECN No(s). ECNs: 623838, 625689, 640678, 643857	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

The ECN is to revise the inventory basis and comments for several analytes and makes minor editorial changes. This ECN will also change the status of the organic complexants safety issue to "closed".

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

The change is required to revise values consistent with best basis inventory input to the tank characterization basis. This change will also update the report to reflect December 1998 changes for the organic complexants safety issue as well as incorporate editorial corrections.

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

See attached distribution.

RELEASE STAMP

DATE: JAN 21 1999

STA: 4

HANFORD RELEASE

ID. 2

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-643865

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	1/15/99	PE		
Cog. Mgr. K.M. Hall	Kathleen M. Hall	1/19/99	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other J.W. Cammann	JW Cammann	1/18/99	Other		
R.J. Cash			DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
			ADDITIONAL		

S

Tank Characterization Report for Single-Shell Tank 241-AX-102

Jim G. Field
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-643865 UC: 2070
Org Code: 74B10 CACN/COA: 102217/EI00
B&R Code: EW 3120074 Total Pages: 146

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-AX-102, Tank AX-102, AX-102, AX 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-AX-102. This report supports the requirements of the Tri-Party Agreement Milestone M-44-15C.

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JAN 21 1999
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RECORD OF REVISION	(1) Document Number HNF ~~WHC~~-SD-WM-ER-472	Page A

(2) Title
Tank Characterization Report for Single-Shell Tank 241-AX-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 08/09/95 on EDT-612678.	J.P. Sederburg	J.G. Kristofzski
RS 0-A	Incorporate per ECN-623838.	L.M. Sasaki L.M. Sasaki	J.G. Kristofzski 8/31/95 JK 9/18/95
0-B RS	Incorporate per ECN-625689.	L.M. Sasaki 9/18/97	J.G. Kristofzski 9-15-97
0C RS	Incorporate per ECN-640678	R. J. Kupfer	K.M. Hodgson
RS 1	Incorporate per ECN-643857.	J.G. Field 12/18/98	K.M. Hall 12/18/98
1-A RS	Incorporate per ECN-643865.	J.G. Field 1/15/99	K.M. Hall 1/19/99

A-7320-005 (08/91) WEF168

Table 1-2 gives an overall description of tank 241-AX-102. The tank has a maximum storage capacity of 3,785 kL (1,000 kgal), and presently contains an estimated 114 kL (30 kgal) of complexant concentrate waste. The tank was on the Watch List for the organics issue (Public Law 101-510), but was removed in December 1998 (Owendoff 1998).

Table 1-2. Description of Tank 241-AX-102. (2 sheets)

TANK DESCRIPTION	
Type	Single-shell
Constructed	1963-1964
In service	1965
Diameter	22.9 m (75 ft)
Operating depth	9.91 m (32.5 ft)
Capacity	3,785 kL (1,000 kgal)
Bottom shape	Flat
Ventilation	Passive
TANK STATUS (October 1, 1998)	
Waste classification	Concentrated complexant waste
Total waste volume[1]	114 kL (30 kgal)
Supernatant volume	0 kL (0 kgal)
Saltcake volume	87.1 kL (23 kgal)
Sludge volume	26.5 kL (7 kgal)
Drainable interstitial liquid volume	0 kL (0 kgal)
Waste surface level (10/1/98)	28.07 cm (11.05 in.)
Temperature (10/1/97 to 10/1/98)	21.9 °C (71.4 °F) to 26.3 °C (79.3 °F)
Integrity	Assumed leaker
Watch List[2]	None
Flammable gas facility group	3
SAMPLING DATES	
Auger samples	February 1995
Grab samples	February 1998
Vapor samples	June 1995

Table 1-2. Description of Tank 241-AX-102. (2 sheets)

SERVICE STATUS	
Declared inactive	1980
Interim stabilization	September 1988
Intrusion prevention	December 1982

Note:

[1]Not the same as Hanlon (1998); total waste volume is based on ENRAF[1] surface level measurements, tank photos and sample results. The ENRAF™ gauge was installed in September 1998.

[2]Removed from the Organic Watch List December, 1998 (Owendoff 1998)

[1] ENRAF is a trademark of ENRAF Corporation, Houston, Texas.

2.2 ORGANIC COMPLEXANTS

The data required to support the organic complexants issue are documented in *Memorandum of Understanding for the Organic Complexant Safety Issue Data Requirements* (Schreiber 1997). Energetics by DSC, TOC by furnace oxidation, thermogravimetric analysis for sample moisture, and propagating reactive system screening tool (PRSST) tests were conducted to address the organic complexants issue. Verification analyses by ion chromatography (IC) and capillary zone electrophoresis (CZE) were also performed.

Because auger samples failed the TOC and DSC screening, grab samples for propagation testing were taken in 1998. Dried samples were tested with the PRSST. None of the dried samples exhibited propagating exothermic reactions. The CZE tests showed that ethylene-diamine-tetraacetic acid (EDTA) and n(2-hydroxyethyl)ethylenediaminetriacetic acid (HEDTA) were present in waste samples.

To assess the safety margin between the waste fuel concentration and the concentration required for propagation, dried waste samples were spiked with additional fuel (sodium HEDTA) and reanalyzed at zero percent moisture using the PRSST. The tests showed that additional fuel was required for the samples to propagate. The TOC dry weight of samples used for propagation tests was 4.8 percent (6.3 percent with sodium HEDTA added). As a result of propagation tests, tank 241-AX-102 is classified as "safe" for the organic complexants safety issue (Meacham et al. 1998). Additional detail on grab sample results is included in Appendix B.

The organic complexant safety issue was closed in December 1998 (Owendoff 1998).

2.3 ORGANIC SOLVENTS SAFETY SCREENING

The data required to support the organic solvent screening issue are documented in *Data Quality Objective to Support Resolution of the Organic Solvent Safety Issue* (Meacham et al. 1997). The DQO requires that tank headspace samples 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 solvents cannot occur.

Vapor samples taken in June 1995 showed that the concentration of total nonmethane organic hydrocarbon in tank 241-AX-102 was 10.86 mg/m^3, with an estimated organic solvent pool size of 0.92 m^2 (Huckaby and Sklarew 1997). This is near the limit of 1 m^2. However, the Organic Program has determined that even if an organic solvent pool does exist, the consequences of a fire or ignition of organic solvents is below risk evaluation guidelines for all of the tanks (Brown et al. 1998). The organic solvent safety issue is expected to be closed in 1999.

2.4 OTHER TECHNICAL ISSUES

2.4.1 Hazardous Vapor Screening

Vapor samples were taken to address *Data Quality Objective for Tank Hazardous Vapor Safety Screening* (Osborne and Buckley 1995). However, hazardous vapor screening is no longer an issue because headspace vapor (sniff) tests are required for the safety screening DQO (Dukelow et al. 1995), and the toxicity issue was closed for all tanks (Hewitt 1996).

2.4.2 Tank Waste Heat Load

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 sample events was not possible because radionuclide analyses were not required. However, the heat load estimate based on the tank process history was 1.33 kW (4,540 Btu/hr) (Agnew et al 1997) and the heat load estimate based on the tank headspace temperature was 2.16 kW (7,385 Btu/hr) (Kummerer 1995). Both of these estimates are well below the limit of 11.7 kW (40,000 Btu/hr) that separates high- and low-heat-load tanks (Smith 1986).

2.5 SUMMARY

The results of all analyses performed to address potential safety issues showed that primary analyte(s) exceeded safety decision threshold limits for TOC and DSC. However, PRSST analyses concluded that the potential for a propagating reaction is low. Therefore, the tank is classified as safe for the organic complexants issue. Total alpha results were below notification limits.

Vapor analyses were used to address the flammable gas safety screening issue and the organic solvents issue. The concentration of flammable gas in the tank headspace was 0.3 percent of the LFL, below the notification limit of 25 percent of the LFL. The organic pool size for this tank was estimated to be 0.92 m^2. This is near the limit of 1 m^2. However, the Organic Program has determined that even if an organic solvent pool does exist, the consequences of a fire or ignition of organic solvents is below risk evaluation guidelines for all of the tanks (Brown et al. 1998) The organic solvent safety issue is expected to be closed in 1999.

no sample based information was available. The inventory values reported in Tables 3-1 and 3-2 are subject to change. Refer to the Tank Characterization Database (LMHC 1998) for the most current inventory values.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1998), 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, 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. 1998, Section 6.1 and in Watrous and Wootan 1997. Model-generated values for radionuclides in any of Hanford Site's 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.

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-AX-102. (Effective October 1, 1998) (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Al	3,260	M/E	AN tanks and adjusted HDW
Bi	21.3	M/E	AN tanks and adjusted HDW
Ca	285	S/E	AN tanks and 1974 sludge sample
Cl	124	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
TIC as CO_3	11,400	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Cr	143	M/E	AN tanks and adjusted HDW
F	34.2	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Fe	4,060	S/E	AN tanks and 1974 sludge sample
Hg	0	E	Simpson (1998)
K	178	M/E	AN tanks and adjusted HDW
La	0	E	No process history of La

Table 3-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-AX-102. (Effective October 1, 1998) (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Mn	370	S/E	AN tanks and 1974 sludge sample
Na	28,500	M/E	AN tanks and adjusted HDW
Ni	211	M/E	AN tanks and adjusted HDW
NO_2	5,080	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
NO_3	34,600	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
OH_{TOTAL}	9,150	C	Calculated from charge balance
Pb	34.7	M/E	AN tanks and adjusted HDW
PO_4	317	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Si	1,110	S/E	AN tanks and 1974 sludge sample
SO_4	638	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Sr	2.60	M/E	AN tanks and adjusted HDW
TOC	7,210	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
U_{TOTAL}	249	S/E	AN tanks and 1974 sludge sample
Zr	72.4	M/E	AN tanks and adjusted HDW

Notes:

TIC = total inorganic carbon

[1]S = sample based, M = Hanford defined waste model (Agnew et al. 1997a), E = engineering assessment-based, 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 3-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994. (Effective October 1, 1998) (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	22.7	M/E	
^{14}C	3.80	M/E	
^{59}Ni	3.30	M/E	
^{60}Co	405	S/E/M	HDW model SMM and 1977 sludge data
^{63}Ni	341	M/E	
^{79}Se	12.0	M/E	
^{90}Sr	3.10E+05	S/E	AN tank saltcake and 1977 sludge data
^{90}Y	3.10E+05	S/E	Referenced to ^{90}Sr
^{93m}Nb	34.8	M/E	
^{93}Zr	52.3	M/E	
^{99}Tc	27.8	M/E	
^{106}Ru	1.41	M/E	
^{113m}Cd	262	M/E	
^{125}Sb	4,730	S/E/M	HDW model SMM and 1977 sludge data
^{126}Sn	19.0	M/E	
^{129}I	0.0536	M/E	
^{134}Cs	0.384	M/E	
^{137m}Ba	44,100	S/E	Referenced to ^{137}Cs
^{137}Cs	46,600	S/E	AN tank saltcake and 1977 sludge data
^{151}Sm	34,700	M/E	
^{152}Eu	49.9	M/E	
^{154}Eu	60.9	S/E/M	HDW model SMM and 1977 sludge data
^{155}Eu	1,750	S/E/M	HDW model SMM and 1977 sludge data
^{226}Ra	0.000533	M/E	
^{227}Ac	0.00255	M/E	
^{228}Ra	0.0248	M/E	
^{229}Th	0.000578	M/E	

Table 3-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994. (Effective October 1, 1998) (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{231}Pa	0.000443	M/E	
^{232}Th	0.00252	M/E	
^{232}U	0.118	S/E/M	Based on 1977 data and AN tank U_{TOTAL} and HDW model isotopic ratios
^{233}U	0.451	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{234}U	0.0927	S/E/M	Based on 1977 data and AN tank U_{TOTAL} and HDW model isotopic ratios
^{235}U	0.00371	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{236}U	0.00303	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{237}Np	0.0967	M/E	
^{238}Pu	21.3	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{238}U	0.0831	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{239}Pu	78.2	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{240}Pu	58.2	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{241}Am	3,210	M/E	
^{241}Pu	1,470	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{242}Cm	4.29	M/E	
^{242}Pu	0.0104	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.

Table 3-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994. (Effective October 1, 1998) (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{243}Am	0.359	M/E	
^{243}Cm	0.524	M/E	
^{244}Cm	21.7	M/E	

Note:

[1]S = sample-based, M = Hanford defined waste model-based (Agnew et al. 1997), and E = engineering assessment-based.

4.0 RECOMMENDATIONS

The results of analyses performed to address the safety screening DQO showed that total alpha and flammable gas analyses did not exceed safety decision threshold limits. The TOC and DSC results exceeded the notification limits for energetics and the organic complexants issue. However, the moisture content in the tank is greater than 17 percent, and no propagation was observed in PRSST tests. As a result, energetics is not a problem, and the tank is classified as "safe" for the organic complexants issue. Vapor samples showed that the estimated organic pool size was near the safety limit of 1 m^2. However, the Organic Program has determined that even if an organic solvent pool does exist, the consequences of a fire or ignition of organic solvents is below risk evaluation guidelines for all of the tanks (Brown et al. 1998). The organic solvents issue is expected to be closed in 1999.

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 tank characterization report. All issues required to be addressed by sampling and analysis are listed in column 1 of Table 4-1. Column 2 indicates by "yes" or "no" whether issue requirements were met by the sampling and analyses performed. Column 3 indicates concurrence and acceptance by the program in PHMC/TWRS that is responsible for the applicable issue. A "yes" in column 3 indicates that no additional sampling or analyses are needed. Conversely, "no" indicates additional sampling or analyses may be needed to satisfy issue requirements.

Table 4-1. Acceptance of Tank 241-AX-102 Sampling and Analysis.

Issue	Sampling and Analyses Performed	TWRS/PHMC Program Acceptance
Safety screening DQO	Yes	Yes
Organic complexants memorandum of understanding[1]	Yes	Yes
Organic solvents DQO[2]	Yes	Yes

Note:

[1]The organic complexants safety issue was closed in December 1998 (Owendoff 1998).

[2]The organic solvents issue is expected to be closed in 1999.

Table 4-2 summarizes the status of PHMC/TWRS Program review and acceptance of the evaluations and other characterization information contained in this report. Column 1 lists the different evaluations performed in this report. Column 2 shows whether issue evaluations have been completed or are in progress. Column 3 indicates concurrence and acceptance with the evaluation by the program in PHMC/TWRS that is responsible for the applicable issue. A "yes" indicates that the evaluation is completed and meets all issue requirements.

Table 4-2. Acceptance of Evaluation of Characterization Data and Information for Tank 241-AX-102.

Issue	Evaluation Performed	TWRS/PHMC Program Acceptance
Safety screening DQO	Yes	Yes
Organic complexants memorandum of understanding[1]	Yes	Yes
Organic solvents DQO[2]	Yes	Yes

Note:

[1]The organic complexants safety issue was closed in December 1998 (Owendoff 1998).

[2]The organic solvents issue is expected to be closed in 1999.

Table D3-2. Comparison of Tank 241-AX-102 Hanford Defined Waste Model Sludge Layer Radionuclide Concentration Estimates with Sampling Data. (2 sheets)

Analyte	HDW Model Composition[1,4]	1977 Sampling Data Composition[2,4]	Adjusted HDW Model Estimate[3,4]
^{113m}Cd (µCi/g)	3.59	nr	6.089
^{125}Sb (µCi/g)	0.136	1.78E+05 (µCi/L)	0.231
^{126}Sn (µCi/g)	0.262	nr	0.444
^{129}I (µCi/g)	1.17E-04	nr	0.000198
^{134}Cs (µCi/g)	0.00105	nr	0.00178
^{137}Cs (µCi/g)	14.5	4.40E+05 (µCi/L)	24.6
^{151}Sm (µCi/g)	476	nr	807
^{152}Eu (µCi/g)	0.701	nr	1.19
^{154}Eu (µCi/g)	53.6	0.0991 (µCi/L)	90.9
^{155}Eu (µCi/g)	34	65,000 (µCi/L)	57.7
^{226}Ra (µCi/g)	7.38E-06	nr	1.25E-05
^{227}Ac (µCi/g)	3.50E-05	nr	5.94E-05
^{228}Ra (µCi/g)	2.93E-10	nr	4.97E-10
^{229}Th (µCi/g)	2.75E-08	nr	4.66E-08
^{231}Pa (µCi/g)	1.10E-06	nr	1.87E-06
^{232}Th (µCi/g)	3.82E-12	nr	6.48E-12
^{237}Np (µCi/g)	1.94E-04	nr	0.000329
Pu_{TOTAL} (µCi/g)	5.95E-04	0.0877 (g/L)	0.00101

Notes:

[1]Agnew et al. (1997)
[2]From post-sluicing grab sample (Starr 1977)
[3]Based on adjustment for percent water as described in text
[4]Decayed to January 1, 1994

The differences in the 1974 sludge sample-based and HDW process-based estimates for density and percent water were assumed to be caused by evaporation of water from the sludge after processing. Therefore, HDW concentrations were adjusted by algebraically calculating how much the concentrations would have changed when the water evaporated. The calculation is as follows, using Na as an example:

Table D3-5. Saltcake, Sludge, and Total Best-Basis Chemical Inventory Estimates for Tank 241-AX-102. (2 sheets)

Component	Saltcake (kg)[1]	Sludge (kg)[2]	Total Best-Basis Inventory (kg)	HDW Inventory (kg)[3]
NO_3	31,200	3,410	34,600	36,600
NO_2	4,570	503	5,080	14,500
CO_3	10,600	849	11,400	3,960
PO_4	257	59.5	317	1,100
Si	177	936	1,110	925
SO_4	543	94.4	638	3,290
Sr	2.6	0	2.6	0
F	34.2	0	34.2	156
Cl	90.9	33.1	124	1,070
U	<208	<41.2	<249	266
Zr	<72.4	0	<72.4	2.08
TOC	7,190	27.9	7,210	2,250

Notes:

[1]Based on a volume of 87.1 kL (23 kgal) and analyte compositions shown in Table D3-4

[2]Based on a volume of 26.5 kL (7 kgal) and Table D3-1 analyte compositions

[3]Agnew et al. (1997) total inventory estimate for tank 241-AX-102

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 HDW 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.

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-AX-102. (Effective October 1, 1998) (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Al	3,260	M/E	AN tanks and adjusted HDW
Bi	21.3	M/E	AN tanks and adjusted HDW
Ca	285	S/E	AN tanks and 1974 sludge sample
Cl	124	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
TIC as CO_3	11,400	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Cr	143	M/E	AN tanks and adjusted HDW
F	34.2	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Fe	4,060	S/E	AN tanks and 1974 sludge sample
Hg	0	E	Simpson (1998)
K	178	M/E	AN tanks and adjusted HDW
La	0	E	No process history of La
Mn	370	S/E	AN tanks and 1974 sludge sample
Na	28,500	M/E	AN tanks and adjusted HDW
Ni	211	M/E	AN tanks and adjusted HDW
NO_2	5,080	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
NO_3	34,600	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
OH_{TOTAL}	9,150	C	Calculated from charge balance

Table D4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-AX-102. (Effective October 1, 1998) (2 sheets)

Analyte	Total Inventory (kg)	Basis (S, M, E, or C)[1]	Comment
Pb	34.7	M/E	AN tanks and adjusted HDW
PO_4	317	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Si	1,110	S/E	AN tanks and 1974 sludge sample
SO_4	638	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
Sr	2.60	M/E	AN tanks and adjusted HDW
TOC	7,210	S/E/M	1995 and 1998 saltcake samples and adjusted HDW
U_{TOTAL}	249	S/E	AN tanks and 1974 sludge sample
Zr	72.4	M/E	AN tanks and adjusted HDW

Note:

[1]S = sample based, M = Hanford defined waste model (Agnew et al. 1997), E = engineering assessment-based, 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 Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994. (Effective October 1, 1998) (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	22.7	M/E	
^{14}C	3.80	M/E	
^{59}Ni	3.30	M/E	
^{60}Co	405	S/E/M	HDW model SMM and 1977 sludge data
^{63}Ni	341	M/E	
^{79}Se	12.0	M/E	
^{90}Sr	3.10E+05	S/E	AN tank saltcake and 1977 sludge data
^{90}Y	3.10E+05	S/E	Referenced to ^{90}Sr
^{93m}Nb	34.8	M/E	
^{93}Zr	52.3	M/E	
^{99}Tc	27.8	M/E	
^{106}Ru	1.41	M/E	
^{113m}Cd	262	M/E	
^{125}Sb	4,730	S/E/M	HDW model SMM and 1977 sludge data
^{126}Sn	19.0	M/E	
^{129}I	0.0536	M/E	
^{134}Cs	0.384	M/E	
^{137m}Ba	44,100	S/E	Referenced to ^{137}Cs
^{137}Cs	46,600	S/E	AN tank saltcake and 1977 sludge data
^{151}Sm	34,700	M/E	
^{152}Eu	49.9	M/E	
^{154}Eu	60.9	S/E/M	HDW model SMM and 1977 sludge data
^{155}Eu	1,750	S/E/M	HDW model SMM and 1977 sludge data
^{226}Ra	0.000533	M/E	
^{227}Ac	0.00255	M/E	
^{228}Ra	0.0248	M/E	

Table D4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994 (Effective October 1, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{229}Th	0.000578	M/E	
^{231}Pa	0.000443	M/E	
^{232}Th	0.00252	M/E	
^{232}U	0.118	S/E/M	Based on 1977 data and AN tank U_{TOTAL} and HDW model isotopic ratios
^{233}U	0.451	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{234}U	0.0927	S/E/M	Based on 1977 data and AN tank U_{TOTAL} and HDW model isotopic ratios
^{235}U	0.00371	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{236}U	0.00303	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{237}Np	0.0967	M/E	
^{238}Pu	21.3	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{238}U	0.0831	S/E/M	Based on 1977 and AN tank U_{TOTAL} and HDW model isotopic ratios
^{239}Pu	78.2	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{240}Pu	58.2	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{241}Am	3,210	M/E	
^{241}Pu	1,470	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.
^{242}Cm	4.29	M/E	
^{242}Pu	0.0104	S/E/M	Based on 1995/1998 saltcake total alpha, 1977 total Pu and HDW model ratios.

Table D4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-AX-102 Decayed to January 1, 1994 (Effective October 1, 1998). (3 sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{243}Am	0.359	M/E	
^{243}Cm	0.524	M/E	
^{244}Cm	21.7	M/E	

Note:

[1]S = sample-based, M = Hanford defined waste model-based (Agnew et al. 1997), and E = Engineering assessment-based.

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