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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 635523

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 []	Kevin E. Bell, Data Assessment and Interpretation, R2-12, 373-1629	[] Yes [X] No	08/05/97
	6. Project Title/No./Work Order No. Tank 241-AW-102	7. Bldg./Sys./Fac. No. 241-AW-102	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-SD-WM-ER-363, Rev. 1	10. Related ECN No(s). ECN1-635470	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.

RELEASE STAMP

DATE: AUG 25 1997 STA: 4 RELEASE ID 3

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A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) ECN-635523

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.E. Bell	Kevin E. Bell	8-20-97	PE		
Cog. Mgr. K.M. Hall	Kathleen 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

SEP 1997 RECEIVED OSTI

Tank Characterization Report for Double-Shell Tank 241-AW-102

Kevin E. Bell
Lockheed Martin Hanford, Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: ECN-635523 UC: 2070
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Key Words: Waste Characterization, Double-Shell Tank, DST, Tank 241-AW-102, 241-AW-102, AW-102, AW 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-AW-102. This report supports the requirements of the Tri-Party Agreement Milestone M-44-05.

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Kara L Broz 8/22/97
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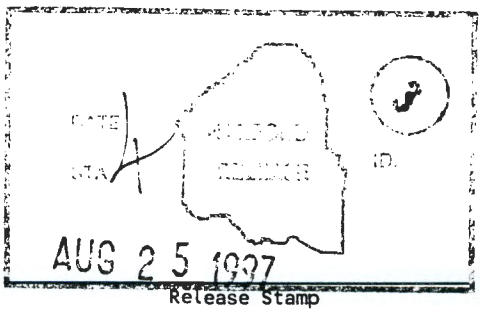

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RECORD OF REVISION	(1) Document Number HNF-SD-WM-ER-363	Page 1

(2) Title
Tank Characterization Report for Double-Shell Tank 241-AW-102

CHANGE CONTROL RECORD

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0	(7) Initially released 09/28/94 on EDT-608073.	B.C. Simpson	C.S. Haller
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		K.E. Bell	Kathleen M. Hall 8/20/97

3.0 BEST-BASIS INVENTORY ESTIMATE

Information about the chemical and/or physical properties of tank wastes is used to perform safety analyses, engineering evaluations, and risk assessments associated with waste management activities, as well as to address regulatory issues. Waste management activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing the wastes into a form that is suitable for long-term storage.

Chemical inventory information generally is derived using two approaches: 1) component inventories are estimated using the results of sample analyses; and 2) component inventories are predicted using a model based on process knowledge and historical information. The most recent model was developed by Los Alamos National Laboratory (LANL) (Agnew et al. 1997). Not surprisingly, information derived from these two different approaches is often inconsistent.

An effort is underway to provide waste inventory estimates that will serve as standard characterization information for the various waste management activities (Hodgson and LeClair 1996). Appendix D contains the complete narrative regarding the derivation of the inventory estimates presented in Tables 3-1 and 3-2.

Table 3-1. Best Basis Inventory Estimates for Nonradioactive Components in Tank 241-AW-102 (May 31, 1997). (2 sheets)

Analyte	Total inventory (kg)	Basis (S, M, or E)[1,2]	Comment
Al	2,730	E	
Bi	204	E	
Ca	567	E	
Cl	408	E	
TIC as CO_3	2,820	S	
Cr	212	E	
F	119,000	E	
Fe	119,000	E	
Hg	1.15	E	
K	265	E	
La	0.120	M/E	

Table 3-1. Best Basis Inventory Estimates for Nonradioactive Components in Tank 241-AW-102 (May 31, 1997). (2 sheets)

Analyte	Total inventory (kg)	Basis (S, M, or E)[1,2]	Comment
Mn	84.1	E	
Na	37,500	E	
Ni	68.7	E	
NO_2	9,260	E	
NO_3	26500	E	
OH	14,300	C	charge balance calculation
Pb	15,500	E	
PO_4	14,700	E	
Si	3,110	S	
SO_4	3,690	E	
Sr	0	M/E	
TOC	1,030	S	
U_{TOTAL}	3,720	S	
Zr	27.1	M/E	

Notes:

[1]S = Sample based, M = HDW model based, and E = Engineering assessment based.

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

[2]M/E values are based on HDW A1-Saltcake composition estimates, a sludge volume of 136 kL and a density of 1.9 g/mL.

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

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	24.6	M/E	
^{14}C	6.50	M/E	
^{59}Ni	0.431	M/E	
^{60}Co	12.8	S	

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

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{63}Ni	43.0	M/E	
^{79}Se	0.0715	M/E	
$^{89/90}Sr$	119,000	S	
^{90}Y	119,000	S	(Derived from $^{89/90}Sr$ value)
^{93}Zr	3.53	M/E	
^{93m}Nb	2.54	M/E	
^{99}Tc	31.8	M/E	
^{106}Ru	0.00188	M/E	
^{113m}Cd	19.5	M/E	
^{125}Sb	44.2	M/E	
^{126}Sn	1.08	M/E	
^{129}I	0.0620	M/E	
^{134}Cs	0.545	M/E	
^{137}Cs	15,500	S	
^{137m}Ba	14,700	S	(Derived from ^{137}Cs value)
^{151}Sm	2,510	M/E	
^{152}Eu	1.03	M/E	
^{154}Eu	147	M/E	
^{155}Eu	60.1	M/E	
^{226}Ra	2.84E-05	M/E	
^{227}Ac	1.68E-04	M/E	
^{228}Ra	0.0620	M/E	
^{229}Th	0.00147	M/E	
^{231}Pa	8.01E-04	M/E	
^{232}Th	0.00775	M/E	
^{232}U	0.165	M/E	
^{233}U	0.638	M/E	
^{234}U	0.217	M/E	

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

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{235}U	0.00879	M/E	
^{236}U	0.00749	M/E	
^{237}Np	0.111	M/E	
^{238}Pu	0.442	M/E	
^{238}U	0.284	M/E	
$^{239/240}Pu$	96.4	S	
^{241}Am	334	S	
^{241}Pu	30.2	M/E	
^{242}Cm	7.75E-05	M/E	
^{242}Pu	1.89E-04	M/E	
^{243}Am	3.88E-04	M/E	
^{243}Cm	1.55E-06	M/E	
^{244}Cm	4.65E-05	M/E	

Notes:

[1]S = Sample based, M = HDW model based, and E = Engineering assessment based.

[2]M/E values are based on HDW A1-Saltcake composition estimates, a sludge volume of 136 kL and a density of 1.9 g/mL.

APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS STANDARD INVENTORY FOR TANK 241-AW-102

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APPENDIX D

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

An effort is under way to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for double-shell tank (DST) 241-AW-102 was performed, and a limited best basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task.

D1.0 CHEMICAL INFORMATION SOURCES

Available waste (chemical) information for tank 241-AW-102 includes the following:

- Statistical report for limited analytical data on two solids grab samples - one obtained in August 1995 and the other in August 1996.
- Solids levels from the 242-A Campaign 96-1 Post Run Document (Guthrie 1996)
- The inventory estimate for this tank generated from the Hanford Defined Waste (HDW) model (Agnew et al. 1997b).

Section D5.0 is a list of references used in this evaluation.

D2.0 COMPARISON OF COMPONENT INVENTORIES

Tank 241-AW-102 is currently used as the feed tank to the 242-A Evaporator. The waste to be processed during 242-A Evaporator operations is initially transferred to tank 241-AW-102. Between evaporator campaigns tank 241-AW-102 receives transfers of miscellaneous waste for temporary storage.

The tank inventory estimates reported in Agnew et al. (1997b) were valid as of January 1, 1994. Four evaporator campaigns have been conducted in the 242-A Evaporator since that

date, therefore the inventory estimates in Agnew et al. (1997a) for supernatants in tank 241-AW-102 are no longer valid. The HDW Model does not identify any TLM solids in this tank. Thus, no current HDW Model results are available to be included in this section.

D3.0 COMPONENT INVENTORY EVALUATION

D3.1 WASTE HISTORY TANK 241-AW-102

Double-shell tank (DST) 241-AW-102 went into service in 1980 and was designated as the 242-A Evaporator feed tank. All waste processed in the 242-A Evaporator since 1980 was first transferred to tank 241-AW-102, so the tank has been emptied and refilled many times since 1981.

For a more complete history of the waste in this tank, see Appendix A.

D3.2 EXPECTED TYPE OF WASTE BASED ON THIS ASSESSMENT

The waste types expected to be present in tank 241-AW-102 are SMMA2 (Agnew et al. 1997b) and sludge (Hanlon 1997). The waste type SMMA2 is a mixture of different concentrated supernatants coming from the 242-A Evaporator that are a blend of other waste types that precipitate some saltcake on cooling.

As of January 1, 1994, Agnew et al. (1997b) identifies the waste in tank 241-AW-102 as 3,710 kL (979 kgal) of SMMA2 supernatant. This waste (minus the solids heel) was processed through the 242-A Evaporator during Campaign 94-1. This makes the HDW Model estimates of limited value in estimating current tank inventories.

Hanlon (1997) lists the tank as containing 136 kL (36 kgal) of solids and 242 kL (64 kgal) of supernatant. The volume of liquids in this tank changes frequently because it is the 242-A Evaporator receiver tank. The Hanlon (1997) estimate of 136 kL solids is used in this document.

D3.3 ASSUMPTIONS USED

The following evaluation provides an engineering assessment of the tank 241-AW-102 contents. For this evaluation, the following assumptions and observations are made.

- The HDW Model information for tank 241-AW-102 is of limited value in developing a best basis tank inventory estimate.
- The waste transfer history for tank 241-AW-102 is too complex for a reliable modeling estimate of the solids heel.
- Analytical data from grab samples offer a limited basis for tank inventory estimates of the tank solids.
- To a first approximation, the solids layer in tank 241-AW-102 is assumed to be comparable to a generic 242-A Evaporator saltcake. This section does not provide inventory estimates for the supernatant liquid.

D3.4 BASIS FOR CALCULATIONS USED IN THIS ENGINEERING EVALUATION

The general approach in this engineering assessment is to use all available information to formulate the best basis estimate of the tank's contents. The sources of information may include analytical data from samples taken from the tank of interest, analytical data from other tanks believed to contain waste types similar to those believed to be in the tank of interest, and data from models created using historical process records. The confidence level assigned to the best basis inventory values then depends on the level of agreement among the various information sources. However, the liquids in tank 241-AW-102 change frequently because this tank is part of ongoing 242-A Evaporator operations. Because this is an active tank with frequent waste transfers, this engineering assessment does not attempt to develop a tank inventory estimate for the supernatant. Rather, it addresses the solids heel.

Based on information in the 242-A Campaign 96-1 post-run document (Guthrie 1996), the solids level in this tank has remained relatively constant since the completion of Campaign 95-1. However, the solids level measurement information reported in Guthrie (1996) indicates that a relative standard deviation of approximately 60 percent is associated with this solids volume estimate.

The HDW model results reported by Agnew et al. (1997b) do not identify a solids layer in tank 241-AW-102, although direct measurements in this tank indicate the solids volume to be 136 kL (36.0 kgal). The solids layer in this tank likely accumulated from solids that separated from 242-A Evaporator slurry feed that was temporarily being stored in the tank. Because of the large volume of waste that has passed through this tank, there is little hope of identifying the origin of the solids heel based on 242-A Evaporator process history. Rather, an empirical

approach was coupled with the limited analytical data available from grab samples taken from this tank in 1995 and 1996 to establish an approximation of a tank inventory.

D3.4.1 Analytical Results From Solids Grab Samples

Two solids grab samples were taken from tank 241-AW-102; the first in August 1995 and the second in August 1996. As can be seen by the information in Table D3-1, the scope of analyses for this sample was limited. The grab-sampling methodology used to collect these samples limits the likelihood that the analytical results would be representative of the complete solids layer. However, these are the only data that are currently available.

Table D3-1. Solids Sample Analytical Results for Tank 241-AW-102.

Radiochemical Analyte	Concentration (uCi/g)	Tank Inventory based on Solids Sample[1] (Ci)	Chemical Components	Concentration (ug/g)	Tank Inventory based on Solids Sample[1] (kg)
^{241}Am	1.86	334	TIC (as CO_3)	3,140 (15,700)	564 (2,820)
^{137}Cs	86.4	15,500	Total carbon (TC)	8,860	1,590
$^{89/90}Sr$	664	119,000	U	20,700	3,720
$^{239/240}Pu$	0.537	96.4	Si	17,300	3,110
Total alpha	2.40	431	TOC (TC-TIC)	5,720	1,030
Total beta	1,140	205,000			
^{60}Co	0.0703	12.6			

Note:

[1]Based on a solids volume of 136 kL and a density of 1.32 g/mL.

D3.4.2 Inventory Estimates Based on Modified Hanford Defined Waste Model Values

Because analytical data and modeling information were limited, the tank inventory estimate for the solids layer was developed by assuming that the solids layer was similar in composition to a generic 242-A Evaporator saltcake. Two generic saltcake compositions were chosen. The first was based on DST saltcake analysis data; the second was based on the HDW model.

A 242-A Evaporator saltcake composition was developed in Herting (1996) using analyses of saltcakes from DSTs 241-AN-102 and 241-AN-107. This saltcake composition (listed as DST SltCk) and calculated inventory estimates for tank 241-AW-102 solids are shown in Table D3-2 for chemical constituents and in Table D3-3 for the radionuclides. (The chemical species are reported without charge designation per the best-basis inventory convention).

Because Agnew et al. (1997b) does not list a global composition for the SMMA2 solids, the A1-Saltcake listed in Agnew et al. (1997a) also was used to develop an inventory estimate for the solids. The A1-Saltcake composition and estimated solids inventory values are listed in Table D3-2 for the chemical constituents and in Table D3-3 for the radionuclides. Analysis-based inventory estimates for the radionuclides reported from the 1995 and 1996 grab samples also are listed in Table D3-3.

Differences in the inventory estimates developed using the two different saltcake compositions can be evaluated by comparing columns 3 and 5 in Tables D3-2 and D3-3. Inventory estimates based on the radioanalytical work do not favor one inventory estimate over the other.

Table D3-2. Estimated Tank Inventory for Chemical Components in the Tank 241-AW-102 Solids Layer[1]. (2 sheets)

Analyte	DST SltCk Data[2] (ug/g)	DST SltCk Inventory Estimate (kg)	A1-SltCk Composition[3] (ug/g)	A1-SltCk Inventory Estimate (kg)	Analysis-Based Inventory Estimate[4] (kg)
Al	13,400	2,730	31,657	8,180	NR
Bi	NR	NR	788	204	NR
Ca	567	116	1,197	309	NR
Cl	2,000	408	2,158	558	NR
Cr	1,040	212	3,826	989	NR
F	1,200	245	1,141	295	NR
Fe	2,200	449	456	118	NR
Hg	NR	NR	4.44	1.15	NR
K	1,300	265	2,186	565	NR

Table D3-2. Estimated Tank Inventory for Chemical Components in the Tank 241-AW-102 Solids Layer[1]. (2 sheets)

Analyte	DST SltCk Data[2] (ug/g)	DST SltCk Inventory Estimate (kg)	A1-SltCk Composition[3] (ug/g)	A1-SltCk Inventory Estimate (kg)	Analysis-Based Inventory Estimate[4] (kg)
Mn	413	84.3	159	41.1	NR
Na	184,000	37,500	232,562	60,100	NR
NH_3	NR	NR	1,289	333	NR
Ni	337	68.7	316	81.7	NR
NO_2	45,400	9,260	75,169	19,400	NR
NO_3	130,000	26,500	263,183	68,000	NR
OH	NR	NR	101,369	26,200	NR
Pb	265	54.1	114	29.5	NR
PO_4	3,830	781	21,059	5,440	NR
Si	NR	NR	2,566	663	3,110
SO_4	18,100	3,690	20,812	5,380	NR
TIC as CO_3[4]	63,500	12,600	19,289	4,980	2,820
TOC	22,100	4,510	7,788	2,010	1,030
U	NR	NR	2,269	586	3,720
Zr	NR	NR	105	27.1	NR
Density (g/mL)	1.5	NA	1.9	n/a	n/a
H_2O (Wt%)	42.3	n/a	22.8	n/a	n/a

Notes:

NR = not reported
n/a = not applicable

[1]Solids volume assumed to be 136 kL.
[2]Herting (1996)
[3]Agnew et al. (1997b)
[4]Analytical-based solids inventory estimates from Table D3-1.

Table D3-3. Comparison of Estimated Tank Inventory Radioactive Components in Tank 241-AW-102 Solids Layer[1].

Analyte	DST SltCk Data[2] (uCi/g)	DST SltCk Inventory Estimate (Ci)	A1SltCk Composition[3] (uCi/g)	A1SltCk Composition Estimate (Ci)	Analysis-based Inventory Estimate[4] (Ci)
^{90}Sr	130	26,500	88.4	22,800	119,000
^{239}Pu[5]	0.085	17.3	0.048	12.4	96.4
^{137}Cs	267	54,500	151	39,000	15,500
^{241}Am	NR	NR	0.030	7.75	334

Notes

[1]Solids volume assumed to be 136 kL.
[2]Herting (1996)
[3]Agnew et al. (1997b)
[4]Analytical-based solids inventory estimates from Table D3-1.
[5]Analytical data reported as $^{239/240}Pu$.

D4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

Information about chemical, radiological, and/or physical properties is used to perform safety analyses, engineering evaluations, and risk assessments associated with waste management activities, as well as regulatory issues. These activities include overseeing tank farm operations and identifying, monitoring, and resolving safety issues associated with these operations and with the tank waste. Disposal activities involve designing equipment, processes, and facilities for retrieving waste and processing it into a form that is suitable for long-term storage.

Chemical and radiological inventory information is generally derived using one of three approaches. Component inventories are estimated using results of sample analyses, component inventories are estimated using the HDW Model based on process knowledge and historical information, or a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material use, and other operating data. The information derived from these different approaches is often inconsistent.

An effort is under way to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and

LeClair 1996). As part of this effort, available information for tank 241-AW-102 was evaluated. The assessment of available chemical information for tank 241-AW-102 included the following:

- An inventory estimate generated by assuming the solids to be comparable with a 242-A Evaporator saltcake formulation that was generated from DST saltcake analytical data (Herting 1996).
- An inventory estimate generated by assuming the solids to be comparable with the A-Saltcake formulation from the HDW model (Agnew et al. 1997b).
- Analytical results from solid samples collected in 1995 and 1996.

Once the best basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. In some cases this approach requires that other analyte (e.g., sodium or nitrate) inventories be adjusted to achieve the charge balance. During such adjustments the number of significant figures is not increased. This charge balance approach was consistent with that used by Agnew et al. (1997b).

Based on this engineering assessment, a best basis inventory was developed for the solids in tank 241-AW-102 using the limited amount of analytical data and by assuming that the solids would be comparable with the DST saltcake formulation reported by Herting (1996).

In this engineering assessment, inventory estimates based on analysis of samples from tank 241-AW-102 were given the highest credence. Where no sample-based information was available, the tank inventory estimates based on DST saltcake analyses were chosen. When no other data were available, tank inventories based on the HDW-model saltcake formulation were used. The best-basis inventory estimates for the chemcal constituents are listed in Table D4-1 and Table D4-2 for the radionuclides.

Best basis inventories listed in Tables D4-1 and D4-2 are estimates only, and should be considered suspect. Core samples of the solids layer in Tank 241-AW-102 are needed for more reliable analyte inventories.

The inventory values reported in Tables D4-1 and D4-2 are subject to change. Refer to the Tank Characterization Database (TCD) 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. 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. 1997b). 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 D4-1. Best Basis Inventory Estimates for Nonradioactive Components in Tank 241-AW-102 (May 31, 1997). (2 sheets)

Analyte	Total inventory (kg)	Basis (S, M, or E)[1,2]	Comment
Al	2,730	E	
Bi	204	E	
Ca	567	E	
Cl	408	E	
TIC as CO_3	2,820	S	
Cr	212	E	
F	119,000	E	
Fe	119,000	E	
Hg	1.15	E	
K	265	E	
La	0.120	M/E	
Mn	84.1	E	
Na	37,500	E	
Ni	68.7	E	
NO_2	9,260	E	
NO_3	26500	E	
OH	14,300	C	charge balance calculation
Pb	15,500	E	
PO_4	14,700	E	
Si	3,110	S	

Table D4-1. Best Basis Inventory Estimates for Nonradioactive Components in Tank 241-AW-102 (May 31, 1997). (2 sheets)

Analyte	Total inventory (kg)	Basis (S, M, or E)[1,2]	Comment
SO_4	3,690	E	
Sr	0	M/E	
TOC	1,030	S	
U_{TOTAL}	3,720	S	
Zr	27.1	M/E	

Notes:

[1]S = Sample based, M = HDW model based, and E = Engineering assessment based.

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

[2]M/E values are based on HDW A1-Saltcake composition estimates, a sludge volume of 136 kL and a density of 1.9 g/mL.

Table D4-2. Best Basis Inventory Estimates for Radioactive Components in Tank 241-AW-102 (May 31, 1997). (2 Sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	24.6	M/E	
^{14}C	6.50	M/E	
^{59}Ni	0.431	M/E	
^{60}Co	12.8	S	
^{63}Ni	43.0	M/E	
^{79}Se	0.0715	M/E	
$^{89/90}Sr$	119,000	S	
^{90}Y	119,000	S	(Derived from $^{89/90}Sr$ value)
^{93}Zr	3.53	M/E	
^{93m}Nb	2.54	M/E	
^{99}Tc	31.8	M/E	
^{106}Ru	0.00188	M/E	
^{113m}Cd	19.5	M/E	
^{125}Sb	44.2	M/E	

Table D4-2. Best Basis Inventory Estimates for Radioactive Components in Tank 241-AW-102 (May 31, 1997). (2 Sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{126}Sn	1.08	M/E	
^{129}I	0.0620	M/E	
^{134}Cs	0.545	M/E	
^{137}Cs	15,500	S	
^{137m}Ba	14,700	S	(Derived from ^{137}Cs value)
^{151}Sm	2,510	M/E	
^{152}Eu	1.03	M/E	
^{154}Eu	147	M/E	
^{155}Eu	60.1	M/E	
^{226}Ra	2.84E-05	M/E	
^{227}Ac	1.68E-04	M/E	
^{228}Ra	0.0620	M/E	
^{229}Th	0.00147	M/E	
^{231}Pa	8.01E-04	M/E	
^{232}Th	0.00775	M/E	
^{232}U	0.165	M/E	
^{233}U	0.638	M/E	
^{234}U	0.217	M/E	
^{235}U	0.00879	M/E	
^{236}U	0.00749	M/E	
^{237}Np	0.111	M/E	
^{238}Pu	0.442	M/E	
^{238}U	0.284	M/E	
$^{239/240}Pu$	96.4	S	
^{241}Am	334	S	
^{241}Pu	30.2	M/E	
^{242}Cm	7.75E-05	M/E	
^{242}Pu	1.89E-04	M/E	

Table D4-2. Best Basis Inventory Estimates for Radioactive Components in Tank 241-AW-102 (May 31, 1997). (2 Sheets)

Analyte	Total Inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{243}Am	3.88E-04	M/E	
^{243}Cm	1.55E-06	M/E	
^{244}Cm	4.65E-05	M/E	

Notes:

[1]S = Sample based, M = HDW model based, and E = Engineering assessment based.

[2]M/E values are based on HDW A1-Saltcake composition estimates, a sludge volume of 136 kL and a density of 1.9 g/mL.

D5.0 APPENDIX D REFERENCES

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