0049677

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 644475

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 []	M. J. Kupfer, LMHC, H5-49, 376-6631	[] Yes [x] No	9/01/98
	6. Project Title/No./Work Order No. Tank 241-B-102	7. Bldg./Sys./Fac. No. NA	8. Approval Designator NA
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-405, Rev. 0C	10. Related ECN No(s). NA	11. Related PO No. NA

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)	NA	NA Design Authority/Cog. Engineer Signature & Date	NA Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

This ECN compiles all reconciliation changes made to the Best-Basis Inventory in FY 1998 and should replace Appendix D, Evaluation to Establish Best-Basis Inventory for Single-Shell Tank 241-B-102, of the Tank Characterization Report. The reconciliation process involved correction of errata, reassessment of data outlyers, verification of uranium isotopic distribution and other alpha isotope distribution, and removal of "less than" values, etc. Changes were made to both text and tables. The inventory estimates of several waste components were revised.

14a. Justification (mark one)

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

14b. Justification Details

Tank waste inventory estimates are being provided as standard source term for the various waste management activities. FY 1997 evaluation of available information for all 177 underground storage tanks was performed and published in TCRs, preliminary TCRs, or revisions to existing TCRs. In FY 1998, a reconciliation process is being performed to update the best-basis inventories. This process ensures that the latest inventory estimates are available as a consistent source-term to support the activities of TWRS disposal and other users.

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

Central Files	B1-07	K. M. Hodgson	R2-11
DIMC	H6-15	M. J. Kupfer	R3-75
DOE Reading Room	H2-53	M. D. LeClair (3)	R3-75
TCSRC	R1-10	J. M. Conner	R2-11
K. M. Hall	R2-12		

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SEP 18 1998

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A-7900-013-1

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1. ECN (use no. from pg. 1): 644475

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	[]	Other	[X]
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
NA		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. M. J. Kupfer	M J Kupfer	9-14-98	PE		
Cog. Mgr. K. M. Hodgson	K. M. Hodgson	9-15-98	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other J. M. Conner R2-11	J M Conner	9-14-98	Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

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

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COGEMA Engineering Corporation, Richland, WA 99352
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 644475 UC: 721
Org Code: 7A110 Charge Code: N4G3A
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Key Words: TCR, best-basis inventory, standard inventory

Abstract: The best-basis inventory provides waste inventory estimates that serve as standard characterization source terms for the various waste management activities. To establish a best-basis inventory for single-shell tank 241-B-102, an evaluation of available information was performed. This work follows the methodology established in *Standard Inventories of Chemicals and Radionuclides in Hanford Site Tank Wastes*, HNF-SD-WM-TI-740, Rev. 0A (Kupfer et al. 1997).

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Christine Willingham 9-18-98
Release Approval Date

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RECORD OF REVISION	(1) Document Number WHC-SD-WM-ER-405	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-B-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 07/31/95 on EDT-613101.	W.I. Winters	J.G. Kristofzski
0-A RS	Incorporate per ECN-623839.	L.M. Sasaki	J.G. Kristofzski
0-B RS	Incorporate per ECN-625690.	S.E. Kelly	J.G. Kristofzski 9/18/95
0C RS	Incorporate per ECN-634632	M.J. Kupfer 8-15-97	K.M. Hodgson 8-15-97
0D RS	Incorporate per ECN-644475	M.J. Kupfer 9-15-98	K.M. Hodgson 9-15-98

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-B-102

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APPENDIX D

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-B-102

An effort is underway 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 single-shell tank 241-B-102 was performed, and a 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

Results from the most recent sampling event for this tank are provided in Section 4.0. One auger sample was obtained in 1994 for safety screening. Analytical determinations from the 1994 sampling event were limited to total alpha, percent water, and differential scanning calorimetry for safety screening.

Component concentrations based on analytical data are available from core samples from tanks 241-B-108 and 241-B-109, which historically contain the same salt cake waste type as tank 241-B-102. The Hanford Defined Waste (HDW) model (Agnew et al. 1997a) also provides tank content estimates in terms of component concentrations and inventories.

D2.0 COMPARISON OF COMPONENT INVENTORY VALUES

Inventories derived from the tank 241-B-102 analytical concentration data and HDW model inventories (Agnew et al. 1997a) are compared in Tables D2-1 and D2-2. (The chemical species are reported without charge designation per the best-basis inventory convention.) Insufficient analyses were performed on the 1994 auger sample to allow a sample-based estimate of tank inventory. The total waste volume is 121 kL (32 kgal). This volume is reported in Hanlon (1997) and is the same as that reported by Agnew et al. (1997a, 1997b). Component inventories were calculated using a solids volume of 106kL (28 kgal) and a solids density of 1.65 g/cc established by the HDW model (Agnew et. al. 1997a). The supernate inventory of 15 kL (4 kgal) was assumed to have a negligible effect on the total analyte inventory.

Table D2-1. Sample-Based and Hanford Defined Waste-Based Inventory Estimates for Nonradioactive Components in Tank 241-B-102.

Analyte[a]	HDW model inventory estimate[b] (kg)	Analyte[a]	HDW model inventory estimate[b] (kg)
Al	712	NO_2	1,210
Bi	343	NO_3	49,700
Ca	348	PO_4	9,010
Cl	289	Pb	256
Cr	33.3	Si	40
F	183	SO_4	1,310
Fe	768	Sr	0
Hg	4.9	TIC as CO_3	2,440
K	58	TOC	14
La	0.001	U_{TOTAL}	6,310
Mn	0.34	Zr	1.28
Na	28,400	H_2O (wt%)	45.4
Ni	46		

HDW = Hanford Defined Waste

[a] No sample-based inventory estimate is available for these analytes

[b] Agnew et al. (1997a).

Table D2-2. Sample-Based and Hanford Defined Waste-Based Inventory Estimates for Radioactive Components in Tank 241-B-102 (Values Decayed to January 1, 1994).

Analyte[a]	HDW model inventory estimate[b] (Ci)
^{137}Cs	4,700
^{90}Sr	1,300
^{238}Pu	0.26
^{239}Pu	14.3
^{240}Pu	2.1
^{241}Am	0.15

HDW = Hanford Defined Waste

[a] No sample-based inventory estimate is available for these analytes

[b] Appendix E of Agnew et al. (1997a), decayed to January 1, 1994.

D3.0 COMPONENT INVENTORY EVALUATION

The following evaluation of tank contents is performed to identify potential errors and/or missing information that would influence the sample-based and HDW model component inventories.

D3.1 CONTRIBUTING WASTE TYPES

The following abbreviations were used to designate waste types:

MW	=	Metal waste from $BiPO_4$ process, operational 1944 to 1956
BSltCk	=	Salt cake from 242-B Evaporator operation, 1951 to 1953
EB	=	Evaporator bottoms. Slurry product from the evaporators. Comparable to BSltCk
CWP	=	PUREX aluminum cladding waste
BL	=	B Plant low-level waste.

D3.1.1 Waste Transaction History

Tank 241-B-102 was initially filled with metal waste (MW) from the B Plant bismuth phosphate process in 1945. The tank was nearly emptied in 1953 when the waste was sluiced for uranium recovery (UR). In 1953, tank 241-B-102 received evaporator bottoms (EB) from the 242-B Evaporator. In 1957, the supernatant was removed for ferrocyanide scavenging at the 244-CR vault. The remaining solids were recorded as 318 kL (84 kgal).

During 1963 through 1975, Plutonium-Uranium Extraction (PUREX) process supernatant cladding waste, B Plant supernatant high-level wastes, B Plant low-level and ion exchange wastes, and other SST supernatants were routed through tank 241-B-102 with observed reductions in the measured solids level to a final 106 kL (28 kgal). Also reported is 15 kL (4 kgal) of supernatant (Hanlon 1997). The effect of passing supernatants through tank 241-B-102 was to dissolve the soluble components of salt cake leaving behind a fraction enriched in aluminum, iron, etc., and the simultaneous deposition of insoluble sludges contained in the B Plant high-level and low-level wastes.

Based on this process history, the solids expected in tank 241-B-102 include salt cake solids (EB or BSltCk) from the 242-B Evaporator (that have been partially redissolved and overlaid with sludges from PUREX cladding waste) and B Plant high-level and low-level wastes on top of the salt cake. Additional detail relevant to the waste transfer history is provided in Section 2.0 of this report.

D3.1.2 Predicted Current Waste Types and Volumes

Information concerning the waste types presently contained in tank 241-B-102 is inconsistent. The HDW model (Agnew et al. 1997b) predicts the following waste types.

Waste Type	Waste Volume - kL (kgal)
MW	11 (3)
BSltCk	91 (24)
CWP2	4 (1)
Supernatants	15 (4)
Total	121 (32)

The Sort on Radioactive Waste Type (SORWT) model (Hill et al. 1995) lists EB, CW, and BL as the primary, secondary, and tertiary waste types, respectively. Hill et al. (1995), Hanlon (1997), and Agnew et al. (1997b) report the total waste volume as 121 kL (32 kgal). Hill et al. reports that the waste consists entirely of sludge. Hanlon credits 38 kL (10 kgal) to salt cake, 68 kL (18 kgal) to sludge, and 15 kL (4 kgal) to supernatants. Agnew et al. (1997b) credits 91 kL (24 kgal) to salt cake, 15 kL (4 kgal) to sludge, and 15 kL (4 kgal) to supernatants.

D3.2 BASIS FOR ASSESSING INVENTORIES IN 241-B-102

BSltCk, the abbreviation used by Agnew et al. (1997a), is representative of salt waste supernatants that were evaporated and concentrated in the 242-B Evaporator and subsequently solidified in the tank. Agnew et al. provides a single average composition for the BSltCk defined waste. However, historical records (Anderson 1990, Agnew et al. 1997b) indicate that supernatants from the first cycle Bismuth Phosphate process (1C waste), as well as supernatants from the UR process were evaporated in 242-B and transferred to several tanks in the B Tank Farm. The chemical compositions of the dilute supernatants from these processes differed. Because the supernatants were not all blended together before evaporation, the salt cake compositions resulting from evaporation of these wastes are also expected to differ as a function of position within a tank, and as a function of which tank was used as a receiver at a particular time.

Because of the complicated waste supernatant transfer history of feed to the 242-B Evaporator and the lack of a flowsheet basis for the waste, it is difficult to perform an independent assessment to estimate the salt cake composition that can be compared to the model-based BSltCk composition. However, waste samples from a limited number of B Tank Farm tanks expected to contain BSltCk have been analyzed and reported. The composition data for tanks 241-B-108 (Schreiber 1997) and 241-B-109 (Benar 1997) are summarized in Table D3-1. The analytical results for these tanks were evaluated at the core segment level to identify the areas representing BSltCk. Tank 241-B-109 is represented by data from Core 170. Core 169 data are not shown since this core primarily contains cladding waste based on the relative amount of Al and Na in this core. The analytical results for tank 241-B-109 were averaged based on the weight of a full core segment. The full core segment weight was derived by correcting for the reported segment volume percent recovery.

To provide a common basis for comparison of the data in Table D3-1 the reported water mass was removed from the results, i.e., the results are all compared on a water-free basis. The HDW model composition for BSltCk (also on a water-free basis) is included in Table D3-1 for comparison.

Table D3-1. Composition of 242-B Evaporator Salt Cake (Water-Free Basis). (2 Sheets)

Analyte	241-B-108[a] (μg/g)	241-B-109[b] (μg/g)	Average (μg/g)	HDW model BSltCk[c] (μg/g)
Al	38,000	40,380	39,200	432
Bi	<3,100	6,808	4,950	3,818
Ca	<2,990	<2,950	<2,970	2,894
Cr	<327	1,420	870	290
Fe	<1,490	5,908	3,700	6,666
K	1,900	NR	1,900	599
La	<1,490	<1,475	<1,480	0.00
Mn	<299	<295	<295	0.00
Na	344,130	417,902	381,000	295,250
Ni	NR	5,544	NR	500
Pb	<2,990	<3,023	<3,010	0.00
Si	<2,010	2,236	2,120	1,170
Sr	<299	<295	<295	0.00
U	2,070	<14,750	<8,410	NR
Zr	<299	<295	<295	13.9
CO_3^{2-}	10,400	NR	10,400	11,480
Cl^-	1,430	1,495	1,460	3,030
F^-	62,440	79,614	71,030	1,979
NO_3^-	115,710	219,962	167,800	547,100
NO_2^-	19,200	7,907	13,550	11,150
PO_4^{3-}	171,650	125,628	148,640	95,690
SO_4^{2-}	207,130	316,880	262,000	12,770

Table D3-1. Composition of 242-B Evaporator Salt Cake (Water-Free Basis). (2 Sheets)

Analyte	241-B-108[a] (μg/g)	241-B-109[b] (μg/g)	Average (μg/g)	HDW model BSltCk[c] (μg/g)
H_2O	33.7%	37.66%	18.5%	45.4%
Radionuclide[d] (μCi/g)				
^{137}Cs	23.7	NR	23.7	49
^{90}Sr	3.3	NR	3.3	12.5
$^{239/240}Pu$	NR	NR	NR	0.053
Total Alpha	6.11 E-03	2.78 E-02	1.70 E-02	NR

HDW = Hanford Defined Waste
NR = Not reported
[a] Schreiber (1997); data from upper half of segment 1 from cores 172 and 173 are not included since these partial segments contain primarily cladding waste
[b] Benar (1997); core 170. Core 169 data are not shown since this core contained primarily cladding waste
[c] Agnew et al. (1997a), radionuclides decayed to January 1, 1994
[d] Sample radionuclides reported as of the analyses date.

As shown in Table D3-1, the concentration of components in tank 241-B-108 agree quite well with those for tank 241-B-109 (core 170).

Transfer records (Agnew et al. 1997a) indicate that tank 241-B-109 was the last tank to receive 242-B Evaporator bottoms. The records indicate that 1C supernate and probably UR supernate were transferred to tank 241-B-109. The high concentrations of F^-, SO_4^{2-}, and PO_4^{3-} in tanks 241-B-108 and 241-B-109 may reflect precipitation of those components from highly concentrated residual liquors that resulted from the final pass through the 242-B Evaporator.

The analyte concentrations for core 170 from tank 241-B-109 are considered an appropriate basis for estimating the inventory of chemical components for the fraction of BSltCk waste in tank 241-B-102.

Similar cores are also available from other B Farm tanks, including tanks 241-B-104 (Field 1996) and 241-B-106 (McCain 1996). Cores from tank 241-B-104 mostly represent 2C waste from the $BiPO_4$ process, judging from the high Bi, comparable amounts of Cr and Fe, and waste transaction records for the B-104/B-105 cascade. These cores therefore do not appear to be useful references for BSltCK. Two cores were also extracted form tank 241-B-

106. These cores based on analyte composition appear to represent a combination of UR and 2C or 1C waste. The uppermost UR layer is enriched in Fe and U, while the lower 2C (or 1C) layer contains high levels of Bi (and comparable amounts of Cr and Fe). Fe and Bi should not be present in high concentration in supernate wastes from the 242-B evaporator. These cores by virtue of unique analyte profiles for UR and 2C (or 1C) waste were not considered to be reliable reference standards for BSltCK.

Analyses for tank 241-B-102 samples were limited to safety screening requirements. Analyses useful for the best-basis inventory are water content and total alpha measurements. No analyte analyses were performed on samples from tank 241-B-102. The concentrations of analytes are estimated using the average concentrations on a water-free basis for the two 241-B Evaporator salt cake tanks presented in Table D3-1. The analyte concentrations are adjusted for a water content of 18.5 wt%. The value of 18.5 wt% is the average of the water results for the tank 241-B-102 sample. The inventories of analytes are calculated using a solids volume of 106 kL (28 kgal) and a solids density of 1.65 g/cc established by the HDW model (Agnew et al. 1997a). Safety screening samples were not analyzed for sludge density. It is assumed that inventory contributions from 15 kL (4 kgal) of supernatant are negligible and equal to zero in the engineering assessment.

Sample data is not currently available for mercury and total organic carbon. The Change Control Board (CCB) has determined that the mercury inventory should be 0.73 kg (Simpson 1998). La and Mn are also assumed to be absent from this waste because there is no evidence of 224 waste being added to this tank and La and Mn are considered to have low solubility in the supernates introduced to this tank.

Radionuclide analysis for tank 241-B-102 sample was limited to total alpha measurements. The total alpha determination was less than 0.36 μCi/g. Because the analytical results are based on a "less than" value, the best basis inventory will be derived from the BSltCk total alpha estimate. The HDW model (Agnew et al. 1997a) inventories are used for all other radionuclides.

D3.3 COMPARISON OF INVENTORY ESTIMATES

Estimated inventories from this evaluation are compared with the HDW model-based inventories (Agnew et al. 1997a) in Table D3-2. The inventories from this evaluation differ significantly from the HDW inventories.

Table D3-2. Engineering Assessment-Based and Hanford Defined Waste-Based Inventory Estimates for Nonradioactive Components in Tank 241-B-102.

Analyte	Engineering assessment inventory estimate (kg)	HDW model inventory estimate[a] (kg)	Analyte	Engineering assessment inventory estimate (kg)	HDW model inventory estimate[a] (kg)
Al	5,590	712	NO_2	1,930	1,210
Bi	750	343	NO_3	23,900	49,700
Ca	<423	348	PO_4	21,200	9,010
Cl	208	289	Pb	<430	256
Cr	124	33.3	Si	302	40
F	10,120	183	SO_4	37,350	1,310
Fe	527	768	Sr	<42	0
Hg	0.73	4.9	TIC as CO_3	1,480	2,440
K	270	58	TOC	NR	14
La	<210	0.001	U_{TOTAL}	<1,200	6,310
Mn	<42	0.34	Zr	<42	1.28
Na	54,310	28,400	H_2O (wt%)	18.5	45.4
Ni	NR	46			

HDW = Hanford Defined Waste
NR = Not reported
[a] Agnew et al. (1997a).

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 assessment 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 wastes. Disposal activities involve designing equipment, processes, and facilities for retrieving wastes and processing them into a form that is suitable for long-term storage/disposal.

Chemical and radiological inventory information are generally derived using three approaches: (1) component inventories are estimated using results of sample analyses, (2) component inventories are estimated using the HDW model-based on process knowledge and historical information, or (3) a tank-specific process estimate is made based on process flowsheets, reactor fuel data, essential material usage, and other operating data. The information derived from these different approaches is often inconsistent.

An effort is underway to provide waste inventory estimates that will serve as the standard characterization for the various waste management activities (Hodgson and LeClair 1996). As part of this effort an evaluation of chemical information for tank 241-B-102 was performed, including the following:

- Data from one 1994 auger sample (Section 4.0)
- An inventory estimate generated by the HDW model (Agnew et al. 1997a)
- Comparing total waste concentrations with similar 241-B Tank Farm tank samples.

Based on this evaluation, a best-basis inventory was developed for tank 241-B-102 (Tables D4-1 and D4-2). The evaluation used the sample-based analytical data from tanks 241-B-108 and 241-B-109, which historically contain the salt cake waste type similar to that of tank 241-B-102, to define the best-basis inventory for the following reasons:

- No methodology is available to fully predict 242-B Evaporator salt cake from process flowsheets or historical records.
- Waste transfer records are not complete and not always accurate.
- The solubility data in Agnew et al. (1997a) for several chemical components in BSltCk are not consistent with the sample-based data for tanks 241-B-108 and 241-B-109.

The inventories shown in Table D4-1 are categorized as engineering assessment-based rather the sample-based. Analytical data from two other BSltCk tanks were used when sample data was lacking and thus were the primary basis used for deriving the inventories in Table D4-1.

The inventories of analytes are calculated using a solids volume of 106 kL (28 kgal) and a solids density of 1.65 g/cc established by the HDW model (Agnew et al. 1997a). It is assumed that inventory contributions from 15 kL (4 kgal) of supernatant are negligible and equal to zero in the engineering assessment. HDW model bases were used as best-basis where there were poor (or no) sample bases. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. This charge balance approach is consistent with that used by Agnew et al. (1997a).

Thermal modelling results for this tank (97 BTU/hr.) are consistent with the thermal heat loads predicted from the estimated ^{90}Sr and ^{137}Cs inventories (84.5 BTU/hr.).

The inventory values reported in Tables D4-1 and D4-2 are subject to change. Refer to the Tank Characterization Database (TCD) (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. 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 HDW Rev. 4 model results (Agnew et al. 1997a). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. 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 Estimate for Nonradioactive Components in Tank 241-B-102 (Effective May 31, 1997). (2 Sheets)

Analyte	Total Inventory (kg)	Basis (S, M, C, or E)[1]	Comment
Al	5,590	E	Based on Bsltck in tanks B-108 and B-109
Bi	705	E	Based on Bsltck in tanks B-108 and B-109
Ca	423	E	Upper bounding limit. Based on Bsltck in tanks B-108 and B-109
Cl	202	E	Based on Bsltck in tanks B-108 and B-109
TIC as CO_3	1,480	E	Based on Bsltck in tanks B-108 and B-109
Cr	124	E	Based on Bsltck in tanks B-108 and B-109
F	10,100	E	Based on Bsltck in tanks B-108 and B-109
Fe	527	E	Based on Bsltck in tanks B-108 and B-109
Hg	0.73	E	Simpson (1998)
K	270	E	Based on Bsltck in tanks B-108 and B-109
La	0	E	
Mn	0	E	
Na	54,300	E	Based on Bsltck in tanks B-108 and B-109
Ni	46	M[	Analytical value affected by Ni crucible
NO_2	1,930	E	Based on Bsltck in tanks B-108 and B-109
NO_3	23,900	E	Based on Bsltck in tanks B-108 and B-109
OH_{TOTAL}	10,400	C	Based on Bsltck in tanks B-108 and B-109
Pb	430	E	Upper bounding value. Based on Bsltck in tanks B-108 and B-109

Table D4-1. Best-Basis Inventory Estimate for Nonradioactive Components in Tank 241-B-102 (Effective May 31, 1997). (2 Sheets)

Analyte	Total Inventory (kg)	Basis (S, M, C, or E)[1]	Comment
PO_4	21,200	E	Based on Bsltck in tanks B-108 and B-109
Si	302	E	Based on Bsltck in tanks B-108 and B-109
SO_4	37,400	E	Based on Bsltck in tanks B-108 and B-109
Sr	42	E	Upper bounding value. Based on Bsltck in tanks B-108 and B-109
TOC	14	M	No sample basis
U_{TOTAL}	1,200	E	Upper bounding limit. Based on Bsltck in tanks B-108 and B-109
Zr	42	E	Upper bounding limit. Based on Bsltck in tanks B-108 and B-109

[1]S = Sample-based
M = Hanford Defined Waste model-based, Agnew et al. (1997a)
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.

Table D4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-B-102, Decayed to January 1, 1994 (Effective May 31, 1997). (3 Sheets)

Analyte	Total Inventory (Ci)	Basis (S,M,or E)[1]	Comment
^{3}H	0.617	M	
^{14}C	0.134	M	
^{59}Ni	0.0619	M	
^{60}Co	0.0805	M	
^{63}Ni	5.59	M	
^{79}Se	0.0153	M	
^{90}Sr	616	E	Based on Bsltck in tanks B-108 and B-109
^{90}Y	616	E	Referenced to ^{90}Sr.
^{93m}Nb	0.0593	M	
^{93}Zr	0.0733	M	
^{99}Tc	0.759	M	
^{106}Ru	1.10E-05	M	
^{113m}Cd	0.244	M	
^{125}Sb	0.327	M	
^{126}Sn	0.0229	M	
^{129}I	0.00145	M	
^{134}Cs	0.00344	M	
^{137m}Ba	4,170	E	Referenced to ^{137}Cs.
^{137}Cs	4,410	E	Based on Bsltck in tanks B-108 and B-109
^{151}Sm	56	M	
^{152}Eu	0.0157	M	
^{154}Eu	1.15	M	
^{155}Eu	1.16	M	
^{226}Ra	4.65E-06	M	
^{227}Ac	6.44E-04	M	
^{228}Ra	0.00139	M	
^{229}Th	1.20E-04	M	

Table D4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-B-102, Decayed to January 1, 1994 (Effective May 31, 1997). (3 Sheets)

Analyte	Total Inventory (Ci)	Basis (S,M,or E)[1]	Comment
^{231}Pa	9.68E-04	M	
^{232}Th	9.95E-05	M	
^{232}U	0.00298	E/M	E based U adjusted to HDW model isotope distributions.
^{233}U	0.0115	E/M	E based U adjusted to HDW model isotope distributions.
^{234}U	0.396	E/M	E based U adjusted to HDW model isotope distributions.
^{235}U	0.0177	E/M	E based U adjusted to HDW model isotope distributions.
^{236}U	0.00305	E/M	E based U adjusted to HDW model isotope distributions.
^{237}Np	0.00354	M	
^{238}Pu	0.0333	E/M	Engineering based total alpha adjusted to HDW model distribution
^{238}U	0.401	E/M	E based U adjusted to HDW model isotope distributions.
^{239}Pu	1.82	E/M	Engineering based total alpha adjusted to HDW model distribution
^{240}Pu	0.267	E/M	Engineering based total alpha adjusted to HDW model distribution
^{241}Am	0.0196	E/M	Engineering based total alpha adjusted to HDW model distribution
^{241}Pu	2.52	E/M	Engineering based total alpha adjusted to HDW model distribution
^{242}Cm	5.05E-05	E/M	Engineering based total alpha adjusted to HDW model distribution
^{242}Pu	7.3E-06	E/M	Engineering based total alpha adjusted to HDW model distribution
^{243}Am	4.09E-07	E/M	Engineering based total alpha adjusted to HDW model distribution
^{243}Cm	3.45E-06	E/M	Engineering based total alpha adjusted to HDW model distribution

Table D4-2. Best-Basis Inventory Estimate for Radioactive Components in Tank 241-B-102, Decayed to January 1, 1994 (Effective May 31, 1997). (3 Sheets)

Analyte	Total Inventory (Ci)	Basis (S,M,or E)[1]	Comment
^{244}Cm	2.14E-04	E/M	Engineering based total alpha adjusted to HDW model distribution

[1]S = Sample-based
M = Hanford Defined Waste model-based, Agnew et al. (1997a)
E = Engineering assessment-based.

D5.0 APPENDIX D REFERENCES

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