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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 653236

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 []	K. D. Fowler, Process Engineering, R2-11, 373-5930	[X] Yes [] No TF-99-0017, Rev.2	3/16/99
	6. Project Title/No./Work Order No. Determination of Worst Case Projected Source Term in Tank 241-SY-102	7. Bldg./Sys./Fac. No. 241-SY-102	8. Approval Designator NA
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-3749, Rev. 1	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
Complete Revision

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

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
Total revision was needed to incorporate the inclusion of 241-S-102 waste in source term projection.

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

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DATE: MAR 18 1999
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ID: 2

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

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 653236

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
NA		

21. Approvals

Signature	Date	Signature	Date
Design Authority		Design Agent	
Cog. Eng. K. D. Fowler	3/16/99	PE	
Cog. Mgr. N. W. Kirch	3/18/99	QA	
QA		Safety	
Safety		Design	
Environ.		Environ.	
Other G. L. Jones	3/18/99	Other	
		DEPARTMENT OF ENERGY	
		Signature or a Control Number that tracks the Approval Signature	
		ADDITIONAL	

Determination of Worst Case Projected Source Term in Tank 241-SY-102

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

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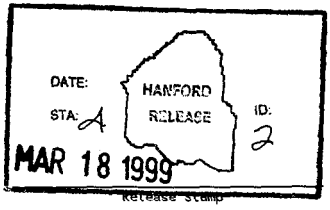
Key Words: Cross-Site, 241-SY-102, source term, W-058

Abstract: This document describes the methodology used to determine the worst case projected source term that could be in double-shell tank 241-SY-102 for the upcoming cross-site waste transfer.

Release Approval 3/17/99 Date



Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number HNF-3749	Page 1

(2) Title

Determination of Worst Case Projected Source Term in Tank 241-SY-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) EDT-610292	NA	NA
1	Total Revision per ECN - 644160		
2 RS	Total Revision per ECN - 653236	[signature]	[signature] 3-18-99

Determination of Worst Case Projected Source Term in Tank 241-SY-102 Waste

1.0 Introduction

This document describes the methodology used to determine the worst case projected source term that could be in double-shell tank 241-SY-102 for the cross-site waste transfer to tank 241-AP-107. The worst case projected source term given in Table 4-1 is the weighted average of the tank waste sources with the addition of sufficient waste from a defined worst source tank to fill the tank to 416 inches.

The projected source term in this document is not intended to represent what will be in tank 241-SY-102. Rather, it is a conservative bounding composition considering that the volume of waste that will be added from each current source is unknown.

2.0 Enabling Assumptions

In order to project the worst case source term for tank 241-SY-102 the following enabling assumptions were used.

- Tank 241-SY-102 would be filled to a maximum of 416 inches prior to the start of the cross-site transfer.
- The only sources of waste into tank 241-SY-102 since September 22, 1998 are tanks 241-S-102, 241-SX-104, 241-SX-106, 241-T-104, 241-T-110 and 1,200 gallons of 222-S Laboratory waste.
- The concentration of analytes of interest in water added to tank 241-SY-102 or to any of the source tanks is 0.
- The concentration of analytes for which no analytical data or Best Basis inventory (Reference 1) value was available was assumed to be 0.
- The concentration of undetected analytes was assumed to be 0.
- The worst source tank is defined as a tank containing the highest concentration from among the source tanks for each analyte. Concentrations in 222-S Laboratory waste are not considered in defining the worst source tank because the volume of this waste is limited to a maximum of 1,200 gallons.

3.0 Tank Waste Material Balance

To perform the worst case source term projection September 22, 1998 was chosen as the starting date because it is the date of the most recent waste sampling event in tank 241-SY-102. Data from these samples were used to determine the baseline composition of the tank. A material balance was done to account for the waste and water added to tank 241-SY-102 between the September 22, 1998 sampling and December 6, 1998.

December 6, 1998 was chosen arbitrarily as the cut off date for assessing current waste source contributions to tank 241-SY-102. The tank ENRAF waste level readings taken from the Surveillance Analysis Computer System (SACS) database were used to calculate the waste volumes using the conversion factor of 2754 gallons per inch.

Table 3-1 shows the volumes from the various sources used in the material balance. The "Check" value at the bottom of the table represents the difference between the volume of documented water and waste sources added to tank 241-SY-102 and the tank waste volume on the cut off date. The value represents approximately 0.02 inch and is not significant for the purpose of this projection.

Table 3-1

Volumes	Date	Gallons
241-SY-102 Waste Level from ENRAF Reading	12/06/98	965194
241-SY-102 Waste Level from ENRAF Reading	09/22/98	844679
Sources		
210-SX-104 (Process Engineering Pu Inventory Database)		23717
241-SX-106 (Process Engineering Pu Inventory Database)		12167
241-T-104 (Process Engineering Pu Inventory Database)		12099
241-T-110 (Process Engineering Pu Inventory Database)		10399
Raw Water (Operations Database)		42093
Rain Water (Process Engineering Pu Inventory Database)		20098
TOTAL (9/22/98 Waste Level + sum of sources)		965252
Check (TOTAL – 12/6/98 Waste Level)		58

4.0 Source Term Determination

In order to reflect that a partial cross-site transfer has occurred, the difference between the March 10, 1999 and the March 14, 1999 ENRAF waste level readings from SACS (406 and 355 inches, respectively) was determined. This volume was used to calculate the percentage of waste removed from the tank and thus, the percentage decrease in each of the source wastes.

The worst case projected source term in tank 241-SY-102 was determined with the assumption that the tank will be filled to 416 inches of waste. For each analyte, the products of the baseline concentration in tank 241-SY-102, one of the source wastes or the defined worst source tank with the fraction of that waste in an assumed full tank 241-SY-102 were added together. These weighted averages represent the worst case projected source term. These values along with the concentrations used to calculate them are given in Table 4-1.

In most cases, data from the September 22, 1998 tank waste samples (Reference 2) were used as the baseline composition of tank 241-SY-102. The concentration of undetected analytes was assumed to be 0. For analytes where no data was available, the Best Basis inventory was used to calculate the concentration. If no Best Basis inventory value was available, the concentration was assumed to be 0. The baseline waste volume for tank 241-SY-102 was calculated from the September 22, 1998 ENRAF waste level reading taken from the SACS database.

For tanks 241-S-102, 241-SX-104, 241-SX-106, 241-T-104, and 241-T-110, analyte concentrations were obtained from the Tank Characterization Database (TCD). For the purpose of this projection, the concentrations of undetected analytes are assumed to be 0. Where no data were available, the Best Basis tank inventory was used to calculate the concentration. Where no Best Basis inventory value was available, the concentration was assumed to be 0.

For 222-S Laboratory waste, analyte concentrations were obtained from the sample data included as an attachment to Reference 1. For the purpose of this projection, the concentrations of unreported analytes and undetected analytes are assumed to be 0.

Table 4-1

	UNIT	SY-102	S-102	SX-104	SX-106	T-104	T-110	222-S	Water	Worst Case Tank	Wt. Average	Bounding Case (Bq/l)
Fraction		6.3E-01	0.0E+00	1.8E-02	9.1E-03	9.0E-03	7.7E-03	8.9E-04	4.6E-02	2.8E-01		
Conversion Vol (l)	l	1.1E+06			2.0E+06	1.7E+06	1.4E+06	7.6E+03				
Max SpG		1.16	1.55	1.49	1.50	1.30	1.11	1.08	1.0	1.55	1.27	
Co-60	Ci/l	2.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-07	0.0E+00	0.0E+00	1.7E-06	6.1E+04
Sr-90 (89/90)	Ci/l	5.0E-06	3.0E-04	6.5E-05	4.2E-04	3.4E-03	5.6E-07	6.7E-04	0.0E+00	3.4E-03	9.9E-04	3.7E+07
Y-90 (from Sr)	Ci/l	5.0E-06	3.0E-04	6.5E-05	4.2E-04	3.4E-03	5.6E-07	6.7E-04	0.0E+00	3.4E-03	9.9E-04	3.7E+07
Cs-137	Ci/l	3.7E-02	8.0E-02	2.3E-01	4.1E-01	8.1E-05	3.6E-06	7.4E-04	0.0E+00	4.1E-01	1.5E-01	5.4E+09
Eu-154	Ci/l	2.0E-07		9.2E-05	6.5E-04	3.5E-07	1.3E-10		0.0E+00	6.5E-04	1.9E-04	7.0E+06
Np-237	Ci/l			8.7E-07	9.4E-07	9.0E-09	5.0E-10		0.0E+00	9.4E-07	7.8E-07	2.9E+04
Pu-238	Ci/l	8.4E-12		2.6E-06	3.2E-06	9.0E-08	2.1E-09		0.0E+00	3.2E-06	9.6E-07	3.6E+04
Pu-239 (239/40)	Ci/l	3.1E-07	3.4E-08	3.8E-08	7.4E-08	9.4E-06	1.7E-07	1.6E-06	0.0E+00	9.4E-06	2.9E-06	1.1E+05
Pu-241	Ci/l	7.2E-10		1.6E-04	2.1E-04	5.1E-05	2.8E-05		0.0E+00	2.1E-04	6.6E-05	2.4E+06
Am-241	Ci/l	2.6E-07	2.8E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-06	0.0E+00	2.8E-07	2.5E-07	9.1E+03
Cm-244	Ci/l	5.0E-11		1.3E-07	3.1E-07	3.2E-08	8.1E-09		0.0E+00	3.1E-07	9.2E-08	3.4E+03
											Sum	5.5E+09
		SY-102	S-102	SX-104	SX-106	T-104	T-110	222-S	Water	Worst Case Tank	Wt. Average	Bounding Case (g/l)
Ammonia (NH3)	g/l	1.2E-01	3.5E-02	7.9E-01	6.1E-02	1.2E+00	8.5E-05	6.3E-03	0.0E+00	1.2E+00	4.3E-01	4.3E-01
Antimony (Sb)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-03	0.0E+00	0.0E+00	2.6E-06	2.6E-06
Arsenic (As)	g/l	0.0E+00	0.0E+00					0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Barium (Ba)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-04	0.0E+00	0.0E+00	4.3E-07	4.3E-07
Beryllium (Be)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-05	0.0E+00	0.0E+00	2.6E-08	2.6E-08
Cadmium (Cd)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-04	0.0E+00	0.0E+00	6.3E-07	6.3E-07
Calcium (Ca)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-02	0.0E+00	0.0E+00	3.0E-05	3.0E-05
Cerium (Ce)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Chromium (Cr+3)	g/l	6.7E-01	4.7E-01	1.1E+00	1.4E-01	3.2E-01	3.5E-02	6.7E-03	0.0E+00	1.1E+00	7.4E-01	7.4E-01
Cobalt (Co)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cyanide (CN)	g/l					7.2E-04		2.6E-04	0.0E+00	7.2E-04	2.1E-04	2.1E-04
Dysprosium (Dy)	g/l								0.0E+00	0.0E+00	0.0E+00	0.0E+00
Lanthanum (La)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-05	0.0E+00	1.2E-03	0.0E+00	1.7E-05	5.8E-06	5.8E-06
Mercury (Hg)	g/l	0.0E+00		0.0E+00	0.0E+00	1.6E-04	0.0E+00	1.5E-05	0.0E+00	1.6E-04	4.7E-05	4.7E-05
Neodymium Nd)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Oxalate (C2O4)	g/l	0.0E+00	5.8E-01	1.1E+00	1.2E+00	1.4E-05	0.0E+00	0.0E+00	0.0E+00	1.2E+00	3.5E-01	3.5E-01
Selenium (Se)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Sodium Hydroxide	g/l	1.1E+01	8.9E+01	9.3E+01	9.0E+01	1.5E+02	7.9E+01	4.3E+01	0.0E+00	1.5E+02	5.3E+01	5.3E+01
Sodium - NaOH	g/l	4.0E+01	1.4E+02	2.0E+02	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E+02	9.2E+01	9.2E+01
Tellurium (Te)	g/l								0.0E+00	0.0E+00	0.0E+00	0.0E+00
Thallium (Tl)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TOC-Oxalate	g/l	0.0E+00	2.4E+00	1.2E+00	3.4E+00	4.7E-01	4.5E-02	4.0E-01	0.0E+00	3.4E+00	1.0E+00	1.0E+00
Uranium (U)	g/l	1.8E-02	0.0E+00	3.0E-01	3.0E-01	1.2E+00	5.0E-02	1.2E-02	0.0E+00	1.2E+00	3.6E-01	3.6E-01
Vanadium (V)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Hydroxide (OH)	g/l	4.8E+00	3.8E+01	4.0E+01	3.8E+01	6.3E+01	3.4E+01	1.8E+01		6.3E+01	2.3E+01	2.3E+01
Na as NaOH (from OH)	g/l	6.5E+00	5.1E+01	5.4E+01	5.2E+01	8.5E+01	4.6E+01	2.5E+01		8.5E+01	3.1E+01	3.1E+01

5.0 References

1. Agnew, S. F., 1997, *Hanford Tank Chemical and Radionuclide Inventories: HDW Model Rev. 4*, " LA-UR-96-3860, dated January 1997.

2. Fuller, R. K, 1998, "Compatibility Interim Results for Tank 241-SY-102 Grab Samples," Letter WMH-9859910 to K. M. Hall, LMHC, dated November 18, 1998.

3. McDowell, A. K., "Waste Transfer Documentation for Shipment 99-01 of 219-S Tank System Laboratory Waste," Letter WMH-9950456 to C. B. Bryan, LMHC.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Process Engineering	Date 3/16/99
Project Title/Work Order		EDT No. NA
HNF-3749, Rev. 2 "Determinaiton of Worst Case Projected Source Term in Tank 241-SY-102		ECN No. 653236

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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