

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN **644160**

Proj.
ECN

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. K. D. Fowler, Process Engineering, R2-11, 373-5930	4. USD Required? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No TF-99-0017, Rev.1	5. Date 3/4/99	
	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 <i>rev 0</i>	10. Related ECN No(s). NA	11. Related PO No. NA	

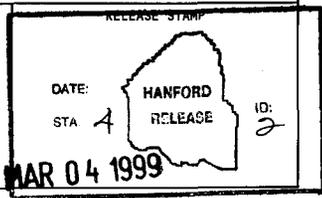
12a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. NA	12c. Modification Work Complete NA Design Authority/Cog. Engineer Signature & Date	12d. Restored to Original Condition (Temp. or Standby ECN only) NA Design Authority/Cog. Engineer Signature & Date
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13a. Description of Change Complete Revision	13b. Design Baseline Document? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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14a. Justification (mark one)			
Criteria Change <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facility Deactivation <input type="checkbox"/>
As-Found <input type="checkbox"/>	Facilitate Const <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

14b. Justification Details
 Total revision was needed to incorporate the inclusion of 222-S Laboratory waste in source term projection.

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



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

644160

16. Design Verification Required <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	17. Cost Impact <table style="width: 100%;"> <tr> <th style="text-align: center;">ENGINEERING</th> <th style="text-align: center;">CONSTRUCTION</th> </tr> <tr> <td>Additional <input type="checkbox"/> \$</td> <td>Additional <input type="checkbox"/> \$</td> </tr> <tr> <td>Savings <input type="checkbox"/> \$</td> <td>Savings <input type="checkbox"/> \$</td> </tr> </table>	ENGINEERING	CONSTRUCTION	Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	18. Schedule Impact (days) Improvement <input type="checkbox"/> Delay <input type="checkbox"/>
ENGINEERING	CONSTRUCTION							
Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$							
Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$							

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	<input type="checkbox"/>	Seismic/Stress Analysis	<input type="checkbox"/>	Tank Calibration Manual	<input type="checkbox"/>
Functional Design Criteria	<input type="checkbox"/>	Stress/Design Report	<input type="checkbox"/>	Health Physics Procedure	<input type="checkbox"/>
Operating Specification	<input type="checkbox"/>	Interface Control Drawing	<input type="checkbox"/>	Spares Multiple Unit Listing	<input type="checkbox"/>
Criticality Specification	<input type="checkbox"/>	Calibration Procedure	<input type="checkbox"/>	Test Procedures/Specification	<input type="checkbox"/>
Conceptual Design Report	<input type="checkbox"/>	Installation Procedure	<input type="checkbox"/>	Component Index	<input type="checkbox"/>
Equipment Spec.	<input type="checkbox"/>	Maintenance Procedure	<input type="checkbox"/>	ASME Coded Item	<input type="checkbox"/>
Const. Spec.	<input type="checkbox"/>	Engineering Procedure	<input type="checkbox"/>	Human Factor Consideration	<input type="checkbox"/>
Procurement Spec.	<input type="checkbox"/>	Operating Instruction	<input type="checkbox"/>	Computer Software	<input type="checkbox"/>
Vendor Information	<input type="checkbox"/>	Operating Procedure	<input type="checkbox"/>	Electric Circuit Schedule	<input type="checkbox"/>
OM Manual	<input type="checkbox"/>	Operational Safety Requirement	<input type="checkbox"/>	ICRS Procedure	<input type="checkbox"/>
FSAR/SAR	<input type="checkbox"/>	IEFD Drawing	<input type="checkbox"/>	Process Control Manual/Plan	<input type="checkbox"/>
Safety Equipment List	<input type="checkbox"/>	Cell Arrangement Drawing	<input type="checkbox"/>	Process Flow Chart	<input type="checkbox"/>
Radiation Work Permit	<input type="checkbox"/>	Essential Material Specification	<input type="checkbox"/>	Purchase Requisition	<input type="checkbox"/>
Environmental Impact Statement	<input type="checkbox"/>	Fac. Proc. Samp. Schedule	<input type="checkbox"/>	Tickler File	<input type="checkbox"/>
Environmental Report	<input type="checkbox"/>	Inspection Plan	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Permit	<input type="checkbox"/>	Inventory Adjustment Request	<input type="checkbox"/>		<input type="checkbox"/>

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 <i>KDF</i>	<u>3-4-99</u>	PE	_____
Cog. Mgr. N. W. Kirch <i>NWK</i>	<u>3-4-99</u>	QA	_____
QA	_____	Safety	_____
Safety	_____	Design	_____
Environ.	_____	Environ.	_____
Other G. W. Gault <i>Gault</i>	<u>3/4/99</u>	Other	_____
	_____		_____
	_____		_____
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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

K. D. Fowler

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

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Org Code: 74B50 Charge Code: 101950
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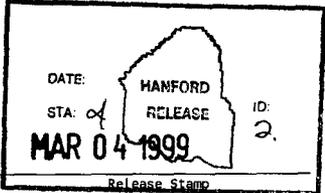
Key Words: Cross-Site, 241-SY-102, source term, W-058

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.

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Release Approval Date 3/4/99



Approved for Public Release

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 upcoming cross-site waste transfer. The worst case projected source term is 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-SX-104, 241-SX-106, 241-T-104, 241-T-110 and a maximum of 2,000 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 2,000 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

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-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

Fraction	UNIT	SY-102	SX-104	SX-106	T-104	T-110	222-S	Water	Worst Source Tank	Wt. Average	Projected bounding case (Bq/l)
Conversion Vol (l)	l	1080000		2036552	1673000	1423000	7570				
Max SpG		1.16	1.49	1.50	1.30	1.11	1.08	1.00	1.50	1.22	
Co-60	Ci/l	2.6E-06	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-07	0	0.0E+00	1.9E-06	7.2E+04
Sr-90 (89/90)	Ci/l	5.0E-06	6.5E-05	4.2E-04	3.4E-03	5.6E-07	6.7E-04	0	3.4E-03	5.7E-04	2.1E+07
Y-90 (from Sr)	Ci/l	5.0E-06	6.5E-05	4.2E-04	3.4E-03	5.6E-07	6.7E-04	0	3.4E-03	5.7E-04	2.1E+07
Cs-137	Ci/l	3.7E-02	2.3E-01	4.1E-01	8.1E-05	3.6E-06	7.4E-04	0	4.1E-01	1.0E-01	3.7E+09
Eu-154	Ci/l	2.0E-07	9.2E-05	6.5E-04	3.5E-07	1.3E-10		0	6.5E-04	1.1E-04	4.1E+06
Np-237	Ci/l	8.7E-07	9.4E-07	9.0E-09	5.0E-10			0	9.4E-07	6.7E-07	2.5E+04
Pu-238	Ci/l	8.4E-12	2.6E-06	3.2E-06	9.0E-08	2.1E-09		0	3.2E-06	5.8E-07	2.2E+04
Pu-239 (239/40)	Ci/l	3.1E-07	3.8E-08	7.4E-08	9.4E-06	1.7E-07	1.6E-06	0	9.4E-06	1.8E-06	6.7E+04
Pu-241	Ci/l	7.2E-10	1.6E-04	2.1E-04	5.1E-05	2.8E-05		0	2.1E-04	4.0E-05	1.5E+06
Am-241	Ci/l	2.6E-07	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-06	0	0.0E+00	2.0E-07	7.3E+03
Cm-244	Ci/l	5.0E-11	1.3E-07	3.1E-07	3.2E-08	8.1E-09		0	3.1E-07	5.5E-08	2.0E+03
									Sum		3.7E+09

Fraction	UNIT	SY-102	SX-104	SX-106	T-104	T-110	222-S	Water	Worst Source Tank	Wt. Average	Projected bounding case (g/l)
Ammonia (NH3)	g/l	1.2E-01	7.9E-01	6.1E-02	1.2E+00	8.5E-05	6.3E-03	0	1.2E+00	3.0E-01	3.0E-01
Antimony (Sb)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-03	0	0.0E+00	5.1E-06	5.1E-06
Arsenic (As)	g/l	0.0E+00					0.0E+00	0	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	4.8E-04	0	0.0E+00	8.3E-07	8.3E-07
Beryllium (Be)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-05	0	0.0E+00	5.0E-08	5.0E-08
Cadmium (Cd)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-04	0	0.0E+00	1.2E-06	1.2E-06
Calcium (Ca)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-02	0	0.0E+00	5.9E-05	5.9E-05
Cerium (Ce)	g/l	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0	0.0E+00	0.0E+00	0.0E+00
Chromium (Cr+3)	g/l	6.7E-01	1.1E+00	1.4E-01	3.2E-01	3.5E-02	6.7E-03	0	1.1E+00	6.9E-01	6.9E-01
Cobalt (Co)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00	0.0E+00	0.0E+00
Cyanide (CN)	g/l				7.2E-04		2.6E-04	0	7.2E-04	1.2E-04	1.2E-04
Dysprosium (Dy)	g/l							0	0.0E+00	0.0E+00	0.0E+00
Lanthanum (La)	g/l	0.0E+00	0.0E+00	0.0E+00	1.7E-05	0.0E+00	1.2E-03	0	1.7E-05	4.8E-06	4.8E-06
Mercury (Hg)	g/l	0.0E+00	0.0E+00	0.0E+00	1.6E-04	0.0E+00	1.5E-05	0	1.6E-04	2.7E-05	2.7E-05
Neodymium (Nd)	g/l	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0	0.0E+00	0.0E+00	0.0E+00
Oxalate (C2O4)	g/l	0.0E+00	1.1E+00	1.2E+00	1.4E-05	0.0E+00	0.0E+00	0	1.2E+00	2.2E-01	2.2E-01
Selenium (Se)	g/l	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0	0.0E+00	0.0E+00	0.0E+00
Sodium Hydroxide	g/l	1.1E+01	9.3E+01	9.0E+01	1.5E+02	7.9E+01	4.3E+01	0	1.5E+02	3.7E+01	3.7E+01
Sodium - NaOH	g/l	4.0E+01	2.0E+02	2.2E+02	0.0E+00	0.0E+00	0.0E+00	0	2.2E+02	7.0E+01	7.0E+01
Tellurium (Te)	g/l							0	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	0.0E+00	0.0E+00	0.0E+00
TOC-Oxalate	g/l	0.0E+00	1.2E+00	3.4E+00	4.7E-01	4.5E-02	4.0E-01	0	3.4E+00	6.0E-01	6.0E-01
Uranium (U)	g/l	1.8E-02	3.0E-01	3.0E-01	1.2E+00	5.0E-02	1.2E-02	0	1.2E+00	2.2E-01	2.2E-01
Vanadium (V)	g/l	0.0E+00	0.0E+00	0.0E+00		0.0E+00	0.0E+00	0	0.0E+00	0.0E+00	0.0E+00
Hydroxide (OH)	g/l	4.8E+00	4.0E+01	3.8E+01	6.3E+01	3.4E+01	1.8E+01		6.3E+01	1.6E+01	1.6E+01
Na as NaOH (from OH)	g/l	6.5E+00	5.4E+01	5.2E+01	8.5E+01	4.6E+01	2.5E+01		8.5E+01	2.1E+01	2.1E+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 Distribution	From Process Engineering	Page 1 of 1 Date 3/3/99
Project Title/Work Order HNF-3749, Rev. 1 "Determinaiton of Worst Case Projected Source Term in Tank 241-SY-102		EDT No. NA ECN No. 644160

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