ENGINEERING DESIGN FILE

EDF No.: 7540 EDF Rev. No.: 0 Project File No.: N/A

1. Title: Source Term Determination for HFEF SN-174, Remote Handled Transuranic (RH-TRU) Waste Can

2. Index Codes:
   Building/Type: Hot Fuel Examination Facility (HFEF), Bldg. 785 SSC ID: N/A Site Area: MFC

3. NPH Performance Category: _____ or ☒ N/A

4. EDF Safety Category: _____ or ☐ N/A SCC Safety Category: _____ or ☒ N/A

5. Summary:
This EDF documents the source term determined for SN-174. This waste package contains miscellaneous accumulated HFEF main hot-cell metallic irradiated and surface contaminated items such as carbon steel, stainless steel, and poly and plastics materials which mainly originated from zone 2M. This waste is RH-TRU. SN-174 will be removed from the cell and loaded into the HFEF 5-cask and then shipped to the Radioactive Scrap and Waste Facility (RSWF) at MFC for interim storage.

6. Review (R) and Approval (A) and Acceptance (Ac) Signatures:
(See instructions for definitions of terms and significance of signatures.)

	R/A	Typed Name/Organization	Signature	Date
Performer/ Author	N/A	Wendy Gamett/Environmental Compliance	Wendy Gamett	11-16-06
Technical Checker	R	Bruce Adams/Envionmental Compliance	B. Adams	11-20-06
Independent Peer Reviewer (if applicable)	R			
Approver	A	~~Tim Miller~~/Environmental Compliance Paul Smith	Paul J. Smith	1-15-07
Requestor (if applicable)	Ac	Eric Papaioannou/ Assistant Facility Manager	Eric Papaioannou	2/12/07
Doc. Control		Charity Weekley	Charity Weekley	2/22/07

7. Distribution: (Name and Mail Stop) Nisson, Kerry MS 6161; Lee, Charlyss MS 61694; Zahn, Tom MS 6178; Belnap, Reed MS 6178

8. Does document contain sensitive unclassified information? ☐ Yes ☒ No
If Yes, what category:

9. Can document be externally distributed? ☒ Yes ☐ No

10. Uniform File Code: 0250 Disposition Authority:
Record Retention Period: Cutoff when superseded, obsolete or canceled. Destroy 75 years after cutoff.

11. For QA Records Classification Only: ☐ Lifetime ☐ Nonpermanent ☐ Permanent
Item and activity to which the QA Record apply: N/A

12. NRC related? ☐ Yes ☒ No

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Building/Type Hot Fuel Examination Facility (HFEF), Bldg. 785 SSC ID N/A Site Area MFC

13. Registered Professional Engineer's Stamp (if required)

Purpose/Scope

This EDF documents the radiological source-term needed for shipment of a 5-Cask loaded with one SN-can assembly, SN-174, from the Hot Fuel Examination Facility (HFEF) to the Radioactive Scrap and Waste Facility (RSWF) at the Materials and Fuels Complex (MFC). SN-174 is identified by container number MFC060110 in the Integrated Waste Tracking System (IWTS). It is loaded with miscellaneous accumulated HFEF main hot-cell surface contaminated items such as equipment, tools, electrical cords, grinding disks, empty paint cans, plastic and paper materials which mainly originated from zone 2M. This waste is categorized as Remote Handled Transuranic (RH-TRU) waste.

Subject-Specific Data

The source-term is determined using the methodology explained in EDF-7332, *Source Term Determination for the Hot Cell Examination Facility (HFEF) Hot Cell Waste Packages.* Based on the process knowledge and in-cell smear analyses data gathered, the radionuclides are identified and the percent contributions are determined. This data will be used in conjunction with MicroShield to infer a source using an averaged contact radiation reading from SN-174 to determine the curie contents.

Software

- MicroShield, version 6.20, Grove Software, Inc., Copyright 1992-2005
- Engineering and Scientific Analysis Software, MicroShield Tracking number 198549, External Dose Calculations
- Conditions for use of the infer source from dose point exposure rate measurements are as follows:

  1. A reference case must have been run from MicroShield. The reference case represents the geometry and materials of the source and shields, but not the nuclide contents of the source.

  2. An "assayed" source representative of the mix of nuclides in the source. The absolute amount is not required; only the relative quantities, in terms of total activity or concentrations.

  3. MicroShield will build in daughter nuclides if the date of the external measurement is later than the date of the assay.

  4. An external measurement at the same dose point as in the reference case

  5. The dose point photon fluence rate is converted to exposure units of mR/hr for each energy

Calculations

Based upon the sample results and process knowledge, the waste stream has been identified and using MicroShield modeling, the source term has been determined by inferred source from a dose point from SN-174. Refer to Attachment 1 for complete details of MicroShield models.

Conclusions

Refer to the following table and Attachment 1 for the identified source term for SN-174:

SN-174 (MFC060110)

Nuclide	Activity (Ci)	Nuclide	Activity (Ci)
Ac-225	5.26E-11	Pb-210	1.48E-10
Ac-227	5.11E-09	Pb-211	5.11E-09
Ac-228	3.33E-08	Pb-212	5.38E-08
Am-241	2.49E+00	Pb-214	5.15E-10
Am-242	4.40E-09	Pm-147	1.73E-02
Am-242m	4.40E-09	Pr-144	1.36E-02
Am-243	3.08E-11	Pr-144m	1.63E-04
Ba-137m	1.41E-01	Pu-238	1.32E-04
Bi-210	1.48E-10	Pu-239	1.06E-01
Bi-211	5.11E-09	Pu-240	2.29E-02
Bi-212	5.38E-08	Pu-241	6.36E-05
Bi-213	5.26E-11	Pu-242	1.79E-11
Bi-214	5.15E-10	Sm-151	5.23E-03
Ce-144	1.36E-02	Sr-89	3.91E-09
Cm-242	3.62E-09	Sr-90	1.21E-01
Cm-243	1.37E-08	Th-227	5.03E-09
Cm-244	1.06E-08	Th-228	5.38E-08
Cs-134	6.68E-04	Th-229	5.26E-11
Cs-135	1.26E-06	Th-230	2.16E-09
Cs-137	1.50E-01	Th-231	5.26E-07
Eu-152	3.58E-06	Th-234	2.36E-08
Eu-154	2.53E-04	Tl-207	5.11E-09
Eu-155	1.38E-03	Tl-208	1.94E-08
I-129	3.44E-08	U-232	1.02E-08
Na-22	7.54E-07	U-233	5.62E-10
Np-237	7.40E-05	U-234	2.16E-06
Pa-231	2.07E-10	U-235	1.34E-06
Pa-233	2.95E-05	U-236	4.44E-08
Pa-234	1.58E-11	U-237	1.52E-09
Pa-234m	2.36E-08	U-238	6.13E-08
Pb-209	5.26E-11	Y-90	1.21E-01
		Total (Ci):	3.20E+00

Refer to Attachment 1

Refer to Attachment 2 for SN-174 waste container inventory and Attachment 3 for the IWTS container Profile.

References

1. Integrated Waste Tracking System Container Profile, *MFC060110: CH-TRU (Misc. Metals/Plastics/Cellulosics Debris, SAD & SAMs – sample residue)*

2. Integrated Waste Tracking System Material/Characterization Profile, *3799P:RH-TRU TRU (Misc. Metals/Plastics/Cellulosics Debris, SAD & SAMs – sample residue)*

3. SN-174 RH-TRU Waste Can Loading Log

4. Mass Tracking System (MTG) Query: report waste output file, waste container ID: IWC174

5. Radiological Survey Report, HFEF HRA, RWP#5801, Log#10-109 dated 10/14/06, performed by M. Bourne

6. Engineering Design File – 7332, *Source Term Determination for the Hot Fuel Examination Facility (HFEF) Hot Cell Waste Packages*

Attachment 1

MicroShield Model for SN-174

MicroShield 6.20 (0063)
INL

Page : 1
DOS File : EDF-7540 Source Case.ms6
Run Date: November 20, 2006
Run Time: 11:46:53 AM
Duration : 00:00:00

File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: EDF-7540 Source
Description: SN-174 HFEF TRU
Geometry: 10 - Cylinder Surface - External Dose Point

Source Dimensions

Height	59.812 cm	1 ft 11.5 in
Radius	5.875 cm	2.3 in

Dose Points

	X	Y	Z
# 1	6.875 cm	29.91 cm	0 cm
	2.7 in	11.8 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Cyl. Radius	5.875 cm	SN-174	0.443
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.078 cm	Iron	7.86
Top Clad	.078 cm	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Included
Library : Grove

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ac-225	5.2600e-011	1.9462e+000	2.3824e-008	8.8148e-004
Ac-227	5.1100e-009	1.8907e+002	2.3144e-006	8.5634e-002
Ac-228	3.3300e-008	1.2321e+003	1.5082e-005	5.5805e-001
Am-241	2.4940e+000	9.2278e+010	1.1296e+003	4.1795e+007
Am-242	4.4000e-009	1.6280e+002	1.9929e-006	7.3736e-002
Am-242m	4.4000e-009	1.6280e+002	1.9929e-006	7.3736e-002
Am-243	3.0800e-011	1.1396e+000	1.3950e-008	5.1615e-004
Ba-137m	1.4100e-001	5.2170e+009	6.3862e+001	2.3629e+006
Bi-210	1.4800e-010	5.4760e+000	6.7033e-008	2.4802e-003
Bi-211	5.1100e-009	1.8907e+002	2.3144e-006	8.5634e-002
Bi-212	5.3800e-008	1.9906e+003	2.4367e-005	9.0159e-001
Bi-213	5.2600e-011	1.9462e+000	2.3824e-008	8.8148e-004
Bi-214	5.1500e-010	1.9055e+001	2.3326e-007	8.6304e-003
Ce-144	1.3600e-002	5.0320e+008	6.1597e+000	2.2791e+005
Cm-242	3.6200e-009	1.3394e+002	1.6396e-006	6.0664e-002
Cm-243	1.3700e-008	5.0690e+002	6.2050e-006	2.2959e-001
Cm-244	1.0600e-008	3.9220e+002	4.8010e-006	1.7764e-001
Cs-134	6.6800e-004	2.4716e+007	3.0255e-001	1.1194e+004
Cs-135	1.2600e-006	4.6620e+004	5.7068e-004	2.1115e+001
Cs-137	1.5000e-001	5.5500e+009	6.7938e+001	2.5137e+006
Eu-152	3.5800e-006	1.3246e+005	1.6215e-003	5.9994e+001
Eu-154	2.5300e-004	9.3610e+006	1.1459e-001	4.2398e+003
Eu-155	1.3800e-003	5.1060e+007	6.2503e-001	2.3126e+004
I-129	3.4400e-008	1.2728e+003	1.5581e-005	5.7648e-001
Na-22	7.5400e-007	2.7898e+004	3.4150e-004	1.2636e+001
Np-237	7.4025e-005	2.7389e+006	3.3528e-002	1.2405e+003
Pa-231	2.0700e-010	7.6590e+000	9.3755e-008	3.4689e-003
Pa-233	2.9500e-005	1.0915e+006	1.3361e-002	4.9436e+002
Pa-234	1.5800e-011	5.8460e-001	7.1562e-009	2.6478e-004
Pa-234m	2.3600e-008	8.7320e+002	1.0689e-005	3.9549e-001

Nuclide	curies	becquerels	µCi/cm²	Bq/cm²
Pb-209	5.2600e-011	1.9462e+000	2.3824e-008	8.8148e-004
Pb-210	1.4800e-010	5.4760e+000	6.7033e-008	2.4802e-003
Pb-211	5.1100e-009	1.8907e+002	2.3144e-006	8.5634e-002
Pb-212	5.3800e-008	1.9906e+003	2.4367e-005	9.0159e-001
Pb-214	5.1500e-010	1.9055e+001	2.3326e-007	8.6304e-003
Pm-147	1.7300e-002	6.4010e+008	7.8356e+000	2.8992e+005
Pr-144	1.3600e-002	5.0320e+008	6.1597e+000	2.2791e+005
Pr-144m	1.6300e-004	6.0310e+006	7.3826e-002	2.7316e+003
Pu-238	1.3200e-004	4.8840e+006	5.9786e-002	2.2121e+003
Pu-239	1.0578e-001	3.9139e+009	4.7910e+001	1.7727e+006
Pu-240	2.2900e-002	8.4730e+008	1.0372e+001	3.8376e+005
Pu-241	6.3600e-005	2.3532e+006	2.8806e-002	1.0658e+003
Pu-242	1.7900e-011	6.6230e-001	8.1073e-009	2.9997e-004
Sm-151	5.2300e-003	1.9351e+008	2.3688e+000	8.7645e+004
Sr-89	3.9100e-009	1.4467e+002	1.7709e-006	6.5524e-002
Sr-90	1.2100e-001	4.4770e+009	5.4804e+001	2.0277e+006
Th-227	5.0300e-009	1.8611e+002	2.2782e-006	8.4293e-002
Th-228	5.3800e-008	1.9906e+003	2.4367e-005	9.0159e-001
Th-229	5.2600e-011	1.9462e+000	2.3824e-008	8.8148e-004
Th-230	2.1600e-009	7.9920e+001	9.7831e-007	3.6198e-002
Th-231	5.2600e-007	1.9462e+004	2.3824e-004	8.8148e+000
Th-234	2.3600e-008	8.7320e+002	1.0689e-005	3.9549e-001
Tl-207	5.1100e-009	1.8907e+002	2.3144e-006	8.5634e-002
Tl-208	1.9400e-008	7.1780e+002	8.7867e-006	3.2511e-001
U-232	1.0200e-008	3.7740e+002	4.6198e-006	1.7093e-001
U-233	5.6200e-010	2.0794e+001	2.5454e-007	9.4181e-003
U-234	2.1600e-006	7.9920e+004	9.7831e-004	3.6198e+001
U-235	1.3400e-006	4.9580e+004	6.0692e-004	2.2456e+001
U-236	4.4400e-008	1.6428e+003	2.0110e-005	7.4406e-001
U-237	1.5200e-009	5.6240e+001	6.8844e-007	2.5472e-002
U-238	6.1290e-008	2.2677e+003	2.7760e-005	1.0271e+000
Y-90	1.2100e-001	4.4770e+009	5.4804e+001	2.0277e+006

Buildup
The material reference is : Transition

Integration Parameters

Y Direction (axial)	20
Circumferential	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.974e+10	1.254e-12	2.303e-12	1.076e-13	1.975e-13
0.02	5.722e+04	2.477e-09	7.280e-09	8.581e-11	2.522e-10
0.03	2.622e+09	2.353e+01	1.393e+02	2.332e-01	1.380e+00
0.04	1.306e+08	4.266e+01	3.354e+02	1.887e-01	1.483e+00
0.05	3.962e+06	6.477e+00	5.121e+01	1.725e-02	1.364e-01
0.06	3.329e+10	1.387e+05	1.007e+06	2.755e+02	2.000e+03
0.08	2.429e+07	3.039e+02	1.750e+03	4.809e-01	2.770e+00
0.1	1.685e+07	3.970e+02	1.691e+03	6.073e-01	2.587e+00
0.15	5.440e+07	2.884e+03	7.544e+03	4.750e+00	1.242e+01
0.2	6.910e+05	5.608e+01	1.135e+02	9.898e-02	2.004e-01
0.3	5.915e+05	8.044e+01	1.337e+02	1.526e-01	2.536e-01
0.4	1.135e+05	2.174e+01	3.281e+01	4.237e-02	6.392e-02
0.5	4.323e+05	1.074e+02	1.525e+02	2.107e-01	2.993e-01
0.6	4.732e+09	1.450e+06	1.975e+06	2.830e+03	3.855e+03

DOS File : EDF-7540 Source Case.ms6
Run Date: November 20, 2006
Run Time: 11:46:53 AM
Duration : 00:00:00

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.8	2.694e+07	1.147e+04	1.473e+04	2.181e+01	2.802e+01
1.0	3.732e+06	2.046e+03	2.540e+03	3.771e+00	4.682e+00
1.5	5.975e+06	5.163e+03	6.083e+03	8.687e+00	1.023e+01
2.0	3.895e+06	4.619e+03	5.279e+03	7.143e+00	8.163e+00
3.0	7.164e+02	1.315e+00	1.459e+00	1.784e-03	1.979e-03
TOTALS:	8.066e+10	1.616e+06	3.023e+06	3.154e+03	5.928e+03

Attachment 2

SN-174 Waste Can Inventory

SN-174 RH-TRU WASTE CAN LOADING LOG (IWC dwg# W0147-0560-ED , OWC dwg# W0147-0033-DD)

WTS Material Profile: 3799P, Container ID: MFC060110 | **IWC SN-CAN VOLUME: 0.101 m³** | **OWC SN-CAN ASSY VOLUME: 0.1538 m³**

ITEM No.	ITEM DESCRIPTION	DATE	INIT	ORIGIN ZONE	SPM Acct. No.	ACCOUNTABLE FISSILE										Smear Data (avg)		WT.
						Total U	^{235}U		Total Pu	^{239}Pu		^{237}Np		^{241}Am		$\beta\gamma$	α	
						grams	grams	Curies	grams	grams	Curies	grams	Curies	grams	Curies	mR/hr	dpm	grams
1	M-148: polishing cloths, electrical cable, plastics (poly bags & bottles, HDPE), grinding disk, paper towels, epoxy resin, saw blade (steel)	11/22/2005	CR	2-M		0.00E+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	70	50,000	2,740.0
2	M-161: plastics (poly bags, bottles, HDPE smears), weights & wood box, polishing cloths, teri-towels, marker pen (dry), aluminum piece, cloth rags, end fitting (stainless steel)	11/22/2005	CR	2-M		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			1,387.0
3	2-M Bag # 2004-2: rags, poly bottles & bags, metal lid (steel), 2 sieves, polishing cloths, misc. weights, pieces of Formica, misc. tools (SST), metal strip (Al)	3/4/2005	EM	2-M		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			3,364.0
4	2-M Bag # 2004-3: rags, coils w/ amphenol connector, TC connector, plastics (poly bags & bottles), electrical cable, rags.	8/5/2006	EM	2-M		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			2,930.0
5	2-M Bag # 2005-1: polishing cloths, teri-towels, PVC bag, cloth rags, poly, Tygon tubing	8/5/2006	EM	2-M		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			8,850.0
6	MISPIEWASTE (sample debris from AL)	8/5/2006	EM	4-D	230-080-61681 61943	6.59E-01	5.38E-01	1.16E-06	2.0E+00	1.7E+00	1.05E-01	1.05E-01	7.4E-05	7.25E-01	2.5E+00			100.0
7	Waste Bag # 4: RERTR grinding disks on Lexan base, polishing cloths, teri-towels, poly bottles, poly bottles w/ hardened epoxy, 3 SAM containers (steel), paper cups.	8/5/2006	EM CB	2-M		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			3,492.0

SN-174 RH-TRU WASTE CAN LOADING LOG (IWC dwg# W0147-0560-ED , OWC dwg# W0147-0033-DD)

WTS Material Profile: 3799P, Container ID: MFC060110 | **IWC SN-CAN VOLUME: 0.101 m^3** | **OWC SN-CAN ASSY VOLUME: 0.1538 m^3**

ITEM No.	ITEM DESCRIPTION	DATE	INIT	ORIGIN ZONE	SPM Acct. No.	ACCOUNTABLE FISSILE										Smear Data (avg)		WT.
						Total U	^{235}U		Total Pu	^{239}Pu		^{237}Np		^{241}Am		$\beta\gamma$	α	
						grams	grams	Curies	grams	grams	Curies	grams	Curies	grams	Curies	mR/hr	dpm	grams
8	Waste Bag # 4a: grinding disks on Lexan base, paper, hardened epoxy/resin, plastics (poly, PVC).	8/5/2006	EM JJ	2-M		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			8,000.0
9	Waste Bag # 5: grinding disks on Lexan base, polishing cloths, hardened epoxy/resin, plastics (poly bags & bottles, slave boot).	8/5/2006	EM JJ	2-M		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			5,910.0
10	Waste Bag # 6: polishing cloths, teri-towels, grinding disks, poly bags & bottles, resin, paper cups, Bakelite mount, duct tape, hardened epoxy/resin.	8/5/2006	EM	2-M		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			7,975.0
11	MNT3N Test SADZ225	8/5/2006	EM	2-M	223-080-60987 61802	7.40E-02	4.30E-02	9.29E-08	6.00E-03	6.00E-03	3.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00			25.0
12	MNT2N Test SADZ225	8/5/2006	EM	2-M	223-080-60987 61802	7.40E-02	4.30E-02	9.29E-08	6.00E-03	6.00E-03	3.7E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00			25.0
13	MNT5N 320 Test (cladding hull mount)	8/5/2006	EM	2-M		0.00E+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			25.0
						8.07E-01	6.24E-01	1.35E-06	2.0E+00	1.70E+00	1.06E-01	1.05E-01	7.40E-05	7.25E-01	2.5E+00			

WASTE WT= 44,823 grams / 98.8 lbs

Subtotal Fissile Grams = 2.3270

α Smear Avg = 50,000 dpm/100 cm^2

Container Wt= 238,134 grams

Total Loaded Wt= 282,957 grams / 624 lbs

Derived Density (g/cc) = 0.443

Rad Readings (R/hr @ 1")					
Top	upper	Mid	Lower	Bottom	AVG
4.1	5.5	8	4.5	1.5	**4.72**

Attachment 3

IWTS Container Profile MFC060110: RH-TRU

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Container Information

Container ID: MFC060110 **Additional Container ID:** SN-174

Container Date: 20-Nov-2006 12:00 AM

Waste/Material Characterization Profile: 3799P : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Material Description: RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Waste Type & Action: TRU: RH, to be Treated at the RTF

Site Treatment Plan ID:

Profile Status: ☑ Active ☐ Cancelled

Original Location - Building: ANL785 : ANL Bldg 785, Hot Fuel Examination Facility
Grid-X:
Grid-Y:
Grid-Z:

Current/Last Location - Building: ANL785 : ANL Bldg 785, Hot Fuel Examination Facility
Grid-X:
Grid-Y:
Grid-Z:

Container Type: CM : Metal boxes, cartons, cases (including roll-offs) **Container Size:** 5 FT3 **Net Volume:** 3.57 FT3
Total Weight: 624 LBS **Net Weight:** 98.8 LBS

Container Subtype: CM : HFEF Insert

UN Code: NA

Certification, Review, & Approval

Certified	**Name:** **Date:** **Phone:** **FAX:** **E-Mail:**	
Reviewed	**Name:** **Date:** **Phone:** **FAX:** **E-Mail:**	
Approved	**Name:** **Date:** **Phone:** **FAX:** **E-Mail:**	
Traffic Review	**Name:** **Date:** **Phone:** **FAX:** **E-Mail:**	

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

General and PCB Information

1.	**TID Seal No. (if applicable):**	NA (welded closed)
2.	**Physical Form:**	Solid
3.	**Chemical Form or CAS No.:**	NA
4.	**Container Vented?:**	☐ Yes ☑ No **Vent Type:**
5.	**PCB Capacitors?:**	☐ Yes ☑ No
	a. **Number of Items in Package:**	
	b. **Size of Capacitors:**	☐ Large ☐ Small
	c. **Leaking?:**	☐ Yes ☐ No
6.	**PCB Transformer or Regulators:**	☐ Yes ☑ No
	a. **Dimension:**	
	b. **Name Plate Gallons:**	
	c. **Weight (lbs)/item:**	
7.	**Out of Service Date:**	
8.	**Bulk Lead?:**	☐ Yes ☑ No
	Bulk Lead Type:	
9.	**Other:**	NA
10.	**Other:**	NA
11.	**Other:**	NA
	Contents Physically Verified?:	☐ Yes ☑ No
	Verifier:	
	Date:	
12.	**Generating Program:**	Materials and Fuels Complex
	Charge No. for Treatment/Disposal:	

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Additional Container Information

1. **Additional Description For Materials:**

   HFEF hot-cell misc. process waste items: plastics (poly, HDPE, PVC, Lexan, Tygon tubing); cellulosics (teri-towels, rags, wood); misc. metal tools & pieces (CS, SST, Al); polishing disks & cloths, expoxy resin, electrical cables; empty SAM containers; MNT2N, MTN3N, MNT5N 320 Test (SADZ225) & MISPIEWASTE sample residues.

2. **Additional Packing Description:**

   IWC: carbon steel, gasketed and bolted closed
   OWC: stainless steel, welded closed

3. **Special Handling Instructions and Additional Information:**

   NA

4. **Other:**

   a. **Other** NA

   b. **Other** NA

Composition of Material

Related Chemical Characteristic (Use *Other* Where NA)	Name of Material or Chemical	Carcinogen		Composition
		Yes	No	
Aluminum	Misc. tools or containers	☐	☑	3 wt%
Metal combinations or assemblies	Misc. equipment containing Al, Cu, Fe components	☐	☑	20 wt%
Paper and/or cloth	paper towels and/or cloth rags	☐	☑	30 wt%
Plastic, Halogenated	PVC sheeting, etc.	☐	☑	8 wt%
Plastic, Non-halogenated	Poly bottles and bags, HDPE	☐	☑	15 wt%
Revise "Metallurgical samples"	U or Pu based fuel samples or cladding samples	☐	☑	3 wt%
Steel, Carbon	Misc. Metal	☐	☑	15 wt%
Steel, Stainless	SAD & SAMs, tubing	☐	☑	6 wt%

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Radiological Characteristics

1. **Waste Package:**

   a. **Radiation Dose Rate at Contact with Waste Package:** = 8000 mrem/hr

   Radiation Dose Rate at 30 cm from Waste Package: mrem/hr

   Radiation Dose Rate at One Meter from Waste Package: = 1200 mrem/hr

   b. **Neutron Dose Rate at Contact from Waste Package:** < 0.1 mrem/hr

   Neutron Dose Rate at One Meter from Waste Package: < 0.1 mrem/hr

2. **Are Dose rates for the Shipping Package different from the Waste Package?** ☐ Yes ☑ No

3. **Shipping Package (i.e., shielded cask):**

   a. **Radiation Dose Rate at Contact with Shipping Package:** mrem/hr

   Radiation Dose Rate at 30 cm from Shipping Package: mrem/hr

   Radiation Dose Rate at One Meter from Shipping Package: mrem/hr

   b. **Neutron Dose Rate at Contact from Shipping Package:** mrem/hr

   Neutron Dose Rate at One Meter from Shipping Package: mrem/hr

Nuclide Summary

Nuclides (All Identified): Ac-225 Ac-227 Ac-228 Am-241 Am-242 Am-242m Am-243 Ba-137m Bi-210 Bi-211 Bi-212 Bi-213 Bi-214 Ce-144 Cm-242 Cm-243 Cm-244 Cs-134 Cs-135 Cs-137 Eu-152 Eu-154 Eu-155 I-129 Na-22 Np-237 Pa-231 Pa-233 Pa-234 Pa-234m Pb-209 Pb-210 Pb-211 Pb-212 Pb-214 Pm-147 Pr-144 Pr-144m Pu-238 Pu-239 Pu-240 Pu-241 Pu-242 Sm-151 Sr-89 Sr-90 Th-227 Th-228 Th-229 Th-230 Th-231 Th-234 Tl-207

Nuclides (95% Risk): Am-241

Total Activity (No Decay): 3.204E+00 Curies 1.186E-01 TBq

DOT Total Fissile: 2.328E+00 grams

Radionuclide Worksheet(s)

Source	Nuclide	Nuclide Reported	Total Amount	Non-AM Amount	Act. Metal Amount	Unit	DOT A2	DOT Fissile (grams)
Generator Submission								
	Ac-225		5.260E-11	5.260E-11		Ci	☑	
	Ac-227		5.110E-09	5.110E-09		Ci	☑	
	Ac-228		3.330E-08	3.330E-08		Ci	☑	
	Am-241		2.490E+00	2.490E+00		Ci	☑	
	Am-242		4.400E-09	4.400E-09		Ci	☑	
	Am-242m		4.400E-09	4.400E-09		Ci	☑	
	Am-243		3.080E-11	3.080E-11		Ci	☑	
	Ba-137m		1.410E-01	1.410E-01		Ci	☑	
	Bi-210		1.480E-10	1.480E-10		Ci	☑	

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Radionuclide Worksheet(s)

Source	Nuclide	Nuclide Reported	Total Amount	Non-AM Amount	Act. Metal Amount	Unit	DOT A2	DOT Fissile (grams)
Generator Submission								
	Bi-211		5.110E-09	5.110E-09		Ci	☑	
	Bi-212		5.380E-08	5.380E-08		Ci	☑	
	Bi-213		5.260E-11	5.260E-11		Ci	☑	
	Bi-214		5.150E-10	5.150E-10		Ci	☑	
	Ce-144		1.360E-02	1.360E-02		Ci	☑	
	Cm-242		3.620E-09	3.620E-09		Ci	☑	
	Cm-243		1.370E-08	1.370E-08		Ci	☑	
	Cm-244		1.060E-08	1.060E-08		Ci	☑	
	Cs-134		6.680E-04	6.680E-04		Ci	☑	
	Cs-135		1.260E-06	1.260E-06		Ci	☑	
	Cs-137		1.500E-01	1.500E-01		Ci	☑	
	Eu-152		3.580E-06	3.580E-06		Ci	☑	
	Eu-154		2.530E-04	2.530E-04		Ci	☑	
	Eu-155		1.380E-03	1.380E-03		Ci	☑	
	I-129		3.440E-08	3.440E-08		Ci	☑	
	Na-22		7.540E-07	7.540E-07		Ci	☑	
	Np-237		7.403E-05	7.403E-05		Ci	☑	
	Pa-231		2.070E-10	2.070E-10		Ci	☑	
	Pa-233		2.950E-05	2.950E-05		Ci	☑	
	Pa-234		1.580E-11	1.580E-11		Ci	☑	
	Pa-234m		2.360E-08	2.360E-08		Ci	☑	
	Pb-209		5.260E-11	5.260E-11		Ci	☑	
	Pb-210		1.480E-10	1.480E-10		Ci	☑	
	Pb-211		5.110E-09	5.110E-09		Ci	☑	
	Pb-212		5.380E-08	5.380E-08		Ci	☑	
	Pb-214		5.150E-10	5.150E-10		Ci	☑	
	Pm-147		1.730E-02	1.730E-02		Ci	☑	
	Pr-144		1.360E-02	1.360E-02		Ci	☑	
	Pr-144m		1.630E-04	1.630E-04		Ci	☑	

Integrated Waste Tracking System
Container Profile
INFORMATION ONLY

MFC060110 : RH-TRU (Misc. Metal/Plastics/Cellulosic Debris, SAD & SAMs - sample residue)

Radionuclide Worksheet(s)

Source	Nuclide	Nuclide Reported	Total Amount	Non-AM Amount	Act. Metal Amount	Unit	DOT A2	DOT Fissile (grams)
Generator Submission								
	Pu-238		1.316E-04	1.316E-04		Ci	☑	
	Pu-239		1.058E-01	1.058E-01		Ci	☑	1.705E+00
	Pu-240		2.295E-02	2.295E-02		Ci	☑	
	Pu-241		6.360E-05	6.360E-05		Ci	☑	6.127E-07
	Pu-242		1.790E-11	1.790E-11		Ci	☑	
	Sm-151		5.230E-03	5.230E-03		Ci	☑	
	Sr-89		3.910E-09	3.910E-09		Ci	☑	
	Sr-90		1.210E-01	1.210E-01		Ci	☑	
	Th-227		5.030E-09	5.030E-09		Ci	☑	
	Th-228		5.380E-08	5.380E-08		Ci	☑	
	Th-229		5.260E-11	5.260E-11		Ci	☑	
	Th-230		2.160E-09	2.160E-09		Ci	☑	
	Th-231		5.260E-07	5.260E-07		Ci	☑	
	Th-234		2.360E-08	2.360E-08		Ci	☑	
	Tl-207		5.110E-09	5.110E-09		Ci	☑	
	Tl-208		1.940E-08	1.940E-08		Ci	☑	
	U-232		1.020E-08	1.020E-08		Ci	☑	
	U-233		5.620E-10	5.620E-10		Ci	☑	5.831E-08
	U-234		2.160E-06	2.160E-06		Ci	☑	
	U-235		1.348E-06	1.348E-06		Ci	☑	6.235E-01
	U-236		4.440E-08	4.440E-08		Ci	☑	
	U-237		1.520E-09	1.520E-09		Ci	☑	
	U-238		6.129E-08	6.129E-08		Ci	☑	
	Y-90		1.210E-01	1.210E-01		Ci	☑	