Appendix A

Waste Profile Sheet and Waste Certification Form

WASTE PROFILE SHEET

WASTE PROFILE SHEET

PART I

A. GENERAL INFORMATION

WASTE PROFILE NO. _____

1. GENERATOR NAME

2. FACILITY ADDRESS/LOCATION

3. 20 X LDR TCLP
Process Knowledge

4. WAG ID & Uniform Waste Stream

5. TECHNICAL CONTACT

6. TITLE

7. PHONE ( )

8. e-mail:

B. 1. NAME OF WASTE _____
2. USEPA/or/STATE WASTE CODE(S) _____
3. PROCESS GENERATING WASTE _____
4. PROJECTED ANNUAL VOLUME/UNITS _____ / _____ 5. MODE OF COLLECTION _____
6. IS THIS WASTE A DIOXIN LISTED WASTE AS DEFINED IN 40 CFR 261.31 ? _____
__ YES __ NO
7. IS THIS WASTE RESTRICTED FROM LAND DISPOSAL (40 CFR 268)? ___ YES ___ NO
HAS AN EXEMPTION BEEN GRANTED? ___ YES ___ NO
DOES THE WASTE MEET APPLICABLE TREATMENT STANDARDS? ___ YES ___ NO

PART II

1. MATERIAL CHARACTERIZATION

COLOR(required)
DENSITY _____ BTU/LB _____
TOTAL SOLIDS _____ ASH CONTENT _____
'ERING: (required) __ MULTILAYERED __
AYERED __ SINGLE PHASE

2. RCRA CHARACTERISTICS

PHYSICAL STATE: __ SOLID __ LIQUID __ SEMI-SOLID
__ GAS __ OTHER

TREATMENT GROUP: __ WASTEWATER __ NON-WASTEWATER

__ IGNITABLE (D001)
FLASH POINT (F) _____
__ HIGH TOC (> 10%)
__ LOW TOC (< 10%)

__ REACTIVE (D003)
__ WATER REACTIVE
__ CYANIDE REACTIVE
__ SULFIDE REACTIVE

__ CORROSIVE (D002)
pH _____
__ CORRODES STEEL

__ TOXICITY CHARACTERISTIC
(SEE PART III)

3. CHEMICAL COMPOSITION (ppm or mg/L)

COPPER _____ PHENOLICS _____
NICKEL _____ TOTAL HALOGENS _____
ZINC _____ VOLATILE ORGANICS _____
CHROMIUM-HEX _____ PCBs _____
(OTHER) _____

NOTE: EXPLOSIVES, SHOCK-SENSITIVE, PYROPHORIC,, AND ETIOLOGICAL WASTE NORMALLY MAY NOT BE ACCEPTED BY THE SSA DESIGNEE WITHOUT SPECIFIC APPROVAL.

4. MATERIAL COMPOSITION

COMPONENT	CONCENTRATION	RANGE
TOTAL _____	100%	

5. SHIPPING INFORMATION

DOT HAZARDOUS MATERIAL? __ YES __ NO
PROPER SHIPPING NAME _____

HAZARD CLASS _____ U.N. OR N.A. NO. _____
ADDITIONAL DESCRIPTION _____
METHOD OF SHIPMENT __ BULK __ DRUM __
OTHER:
CERCLA REPORTABLE QUANTITY (RQ) _____
EMERGENCY RESPONSE GUIDE PAGE
DOT PUBLICATION 5800.4 PAGE NO. _____
EDITION (YR)
SPECIAL HANDLING INFORMATION _____

6. GENERATOR INFORMATION

BASIS FOR INFORMATION
__ CHEMICAL ANALYSIS *(ATTACH RESULTS)*
__ USER *KNOWLEDGE (ATTACH SUPPORTING DOCUMENTS - Explain how and why these documents comply with RCRA requirements.*

I, _____ , HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN AND ALL ATTACHED
(Print or Type Name)
DOCUMENTS IS TO THE BEST OF MY KNOWLEDGE AN ACCURATE REPRESENTATION OF THE WASTE TURNED IN TO THE SSA.
ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.

SIGNATURE OF GENERATOR'S REPRESENTATIVE	DATE

7. WASTE ACCEPTANCE INTO ICDF Landfill SSTF Evaporation Pond	
SIGNATURE OF ICDF Complex DESIGNEE Preliminary Acceptance	**DATE**
SIGNATURE OF ICDF Complex DESIGNEE Final Acceptance	**DATE**

PART III

HAZARDOUS CHARACTERISTIC LIST

Total Metals TCLP* ✓ Process Knowledge

CONTAMINANT	EPA HW No.	(mg/L)	CONTAMINANT	EPA HW No.	(mg/L)
__ ARSENIC	D004		__ HEXACHLORO-1,3,-BUTADIENE	D033	
__ BARIUM	D005		__ HEXACHLOROETHANE	D034	
__ BENZENE	D018		__ LEAD	D008	
__ CADMIUM	D006		__ LINDANE	D013	
__ CARBON TETRACHLORIDE	D019		__ MERCURY	D009	
__ CHLORDANE	D020		__ METHOXYCHLOR	D014	
__ CHLOROBENZENE	D021		__ METHYL ETHYL KETONE	D035	
__ CHLOROFORM	D022		__ NITROBENZENE	D036	
__ CHROMIUM	D007		__ PENTACHLOROPHENOL	D037	
__ O-CRESOL	D023		__ PYRIDINE	D038	
__ M-CRESOL	D024		__ SELENIUM	D010	
__ P-CRESOL	D025		__ SILVER	D011	
__ CRESOL	D026		__ TETRACHLOROETHYLENE	D039	
__ 2,4-D	D016		__ TOXOPHENE	D015	
__ 1,4-DICHLOROBENZENE	D027		__ TRICHLOROETHYLENE	D040	
__ 1,2-DICHLOROETHANE	D028		__ 2,4,5-TRICHLOROPHENOL	D041	
__ 1,1-DICHLOROETHYLENE	D029		__ 2,4,6-TRICHLOROPHENOL	D042	
__ 2,4-DINITROTOLUENE	D030		__ 2,45-TP (SILVEX)	D017	
__ ENDRIN	D012		__ VINYL CHLORIDE	D043	
__ HEPTACHLOR (AND ITS HYDROXIDE)	D031				
__ HEXACHLOROBENZENE	D032				

***TCLP data are required for waste streams where total metals exceed 20X the TCLP LDRs.**

All required analysis for this sheet must be attached prior to submittal.

PART IV
RADIOLOGICAL LIST

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)
___ ^{3}H			___ ^{60}Co		
___ ^{7}Be			___ ^{60}Co act. metal[C]		
___ ^{10}Be			___ ^{63}Ni		
___ ^{14}C			___ ^{63}Ni act. metal[C]		
___ ^{14}C act. Metal[C]			___ ^{65}Zn		
___ ^{22}Na			___ ^{68}Ge		
___ ^{32}P			___ ^{75}Se		
___ ^{35}S			___ ^{79}Se		
___ ^{36}Cl			___ ^{82}Sr		
___ ^{40}K			___ ^{85}Kr		
___ ^{45}Ca			___ ^{85}Sr		
___ ^{46}Sc			___ ^{86}Rb		
___ ^{49}V			___ ^{88}Y		
___ ^{51}Cr			___ ^{89}Sr		
___ ^{54}Mn			___ ^{90}Sr–^{90}Y		
___ ^{55}Fe			___ ^{93}Mo		
___ ^{56}Co			___ ^{93m}Nb		
___ ^{57}Co			___ ^{93}Zr		
___ ^{58}Co			___ ^{94}Nb		
___ ^{59}Fe			___ ^{94}Nb act.[C]		
___ ^{59}Ni			___ ^{95}Nb		
___ ^{59}Ni act. Metal[C]			___ ^{207}Bi		
^{95}Zr–^{95m}Nb			___ ^{210}Pb		
^{99}Tc			___ ^{210}Po		
___ ^{103}Ru–^{103m}Rh			___ ^{226}Ra		
___ ^{106}Ru–^{106}Rh			___ ^{227}Ac		
___ ^{107}Pd			___ ^{228}Ra		
___ ^{108m}Ag			___ ^{228}Th		
___ ^{109}Cd			___ ^{229}Th		
___ ^{110m}Ag–^{110}Ag			___ ^{230}Th		
___ ^{113m}Cd			___ ^{231}Pa		
___ ^{113}Sn			___ ^{232}Th		
___ ^{119m}Sn			___ Total U		
___ ^{121m}Sn			___ ^{232}U		
___ ^{121}Te			___ ^{233}U		
___ ^{123}Te			___ ^{234}Th		
___ ^{124}Sb			___ ^{234}U		
___ ^{125}I			___ ^{235}U		
___ ^{126}Sn–^{126m}Sb			___ ^{236}Pu		
___ ^{125m}Te			___ ^{236}U		
___ ^{125}Sb			___ ^{237}Np[d]		
___ ^{127m}Te–^{127}Te			___ ^{238}Pu[d]		
___ ^{129}I			___ ^{238}U		
___ ^{129m}Te			___ ^{239}Pu[d]		
___ ^{131m}Xe					

RADIOLOGICAL LIST (continued)

ISOTOPE	%	(pCi/g)	ISOTOPE	%	(pCi/g)
___ ^{133}Ba			___ $^{240}Pu^{d}$		
___ ^{134}Cs			___ $^{241}Am^{d}$		
___ ^{135}Cs			___ ^{241}Pu		
___ ^{137}Cs–^{137m}Ba			___ $^{242m}Am^{d}$		
___ ^{140}Ba			___ ^{242}Cm		
___ ^{141}Ce			___ $^{242}Pu^{d}$		
___ ^{144}Ce–^{144}Pr			___ $^{243}Am^{d}$		
___ ^{147}Nd			___ $^{243}Cm^{d}$		
___ ^{147}Pm			___ ^{244}Cm		
___ ^{147}Sm			___ $^{244}Pu^{d}$		
___ ^{150}Eu			___ $^{245}Cm^{d}$		
___ ^{151}Sm			___ $^{246}Cm^{d}$		
___ ^{152}Eu			___ $^{247}Bk^{d}$		
___ ^{152}Gd			___ $^{247}Cm^{d}$		
___ ^{153}Gd			___ $^{248}Cm^{d}$		
___ ^{154}Eu			___ $^{249}Cf^{d}$		
___ ^{155}Eu			___ ^{250}Cf		
___ ^{170}Tm			___ $^{250}Cm^{d}$		
___ ^{175}Hf			___ $^{251}Cf^{d}$		
___ ^{181}Hf			___ ^{252}Cf		
___ ^{182}Ta			___ ^{254}Es		
___ ^{185}W					
___ ^{187}Re					
___ ^{195}Au					
___ ^{203}Hg					
___ ^{204}Tl					

PART V

LABELING	Yes	No
1. Are containers marked with the waste generation date?		
2. Does container have CERCLA label?		
3. Does container have IWTS label?		
5. PCB Containing Waste (40 CFR 761.45)?		
Large PCB Mark (M_L) [for large containers] | Small PCB Mark (M_S) [used for small containers]		

PART VI

PACKAGING TYPE

Waste Type	55 Gallon Drum[a] Or other sized steel drums	Roll Off Containers[a]	Crosslink Polyethylene Tanks (storage) Or tanker truck (transport)		INEEL Wood Boxes[a] 2 x 4 x 8 ft 4 x 4 x 4 ft 4 x 4 x 8 ft
			VCT[c]	VOT[c]	
Hazardous	XX	XX	—	—	XX
RAD[b]	XX	XX	—	—	XX
RAD & Mixed RAD[b]	XX	XX	—	—	XX
Asbestos-TSCA	XX	XX	—	—	XX
Asbestos-TSCA/RAD Waste[b]	XX	XX	—	—	XX
Purge Water	—	—	XX	XX	—
Case-by-Case[d]	XX	XX	XX	XX	XX

a. Drums, roll-offs, and INEEL wood boxes will be lined with polyethylene liners (or supersacks). Roll-off containers will have containers.

b. Low-level radioactive waste shall be packaged for disposal in accordance with 10 CFR 61.56(a). The container must also be surveyed to ensure occupational exposures to radiation are < 500 mR/h at 1 meter for the exterior of the container. If the containers radiation level is > 500 mR/h then the container must be shielded by other containers within the SSA.

c. VCT (Vertical Closed Top) and VOT (Vertical Open Top) above ground tanks will meet or exceed ASTM D 1998-91, Type I: Tanks molded from crosslinkable polyethylene.

d. Wastes accepted on a case-by-case basis could require special container requirements. Therefore, the generator must verify proper containers with 49 CFR 101, Subpart C

Drums, roll offs, and INEEL wood boxes will be lined with polyethylene liner.

E: Other types of containers may be used if they have received approval prior to shipment.

WASTE CERTIFICATION FORM

Package identification number(s): _____

The undersigned certifies that, to the best of his/her knowledge, the waste identified above meets the waste acceptance criteria for the SSSTF. A complete and comprehensive copy of the laboratory analytical data is attached to the Waste Profile Sheet.

_____

Certification:

Name (print) _____ Signature _____

Date _____

Title _____ Phone: _____

Email: _____

Appendix B

Radiological Calculation Methods

Appendix B

Radiological Calculation Methods

A variety of radiological calculations are required to determine whether a waste can be stored at the INEEL SSSTF. The following sections describe the methodology for performing these calculations. For each calculation, the following assumptions shall be used:

- All major radionuclides in the waste, as defined in Section 2.3.1, must be considered in the calculations. If there is a major radionuclide in the waste that is not listed in Tables A-1 and A-2 (which will be modified as necessary), the generator must notify the SSSTF to calculate the applicable limits and conversion factors

- Except for the Nuclear Regulatory Commission (NRC) Class C calculation, the volume of the waste in each container should be used when limits are expressed in volume concentration (Section A.6 presents information regarding the Class C calculations).

B.1. Transuranic Waste Determination

Per DOE Order M435.1, transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:

- High-level radioactive waste

- Waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations.

B.2. Calculation of Plutonium Equivalents

PU-239 equivalent activity of the following individual waste packages is in accordance with WIPP WAC (INEEL RCRA Permit):

- 5-gallon drums, 80 curies equivalent

- Standard waste box, 130 curies equivalent

- Standard waste box, ≤ 1800 curies equivalent

- Solidified/vitrified waste, ≤ 1800 curies equivalent

- INEEL Wood Boxes, measuring 2 × 4 × 8 feet.

- INEEL Wood Boxes, measuring 4 × 4 × 4 feet

- INEEL Wood Boxes, measuring 4 × 4 × 8 feet.

B.3. Calculation of Thermal Power

The thermal power of the waste in a container is calculated from the concentration of radionuclides in the waste and the heat of decay from Table A-1. The thermal power calculation is performed in the following steps:

1. The concentration of each radionuclide (expressed in curies per cubic meter) is multiplied by the heat of decay for that nuclide from Table A-1, yielding the heat of decay for each in units of watts per cubic meter

2. Thermal power is the sum of the heat of decay of all radionuclides in the waste.

B.4. Category 1 Determination

Classification of waste as Category 1 or greater than Category 1 is a sum of fractions calculation, performed in the following steps:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 1 limit (Table A-2)

2. The resulting values are added to form the sum of fractions

3. If the sum of fractions is less than or equal to 1, the waste is Category 1. If the sum of fractions exceeds 1, the waste is greater than Category 1, and the Category 3 determination must be performed to classify the waste.

B.5. Category 3 Determination

Category 3 determination is performed in the same way as the Category 1 calculation, except that the Category 3 limits from Table A-2 are used as follows:

1. The concentration of each nuclide (expressed in curies per cubic meter) is divided by its respective Category 3 limit from Table A-2

2. The resulting values are added to form a sum of fractions

3. If the sum of fractions is less than or equal to 1, the waste is Category 3. If the sum of fractions exceeds 1, the waste is greater than Category 3.

B.6. Class C Determination

Class C determination shall be performed as specified in 10 CFR 61.55.

B.7. Interim Safety Basis Calculations For Low-Level Storage

The ISB calculations are performed in the following steps:

1. Determine the appropriate set of limits from Table A-2 (i.e., noncombustible containerized waste or combustible containerized waste)

2. Divide the concentration of each radionuclide by its respective limit

3. Add the resulting values to form a sum of fractions.

If the sum of fractions is less than or equal to 1, the waste lies within the ISB limits. If combustible waste exceeds the combustible waste limit, but does not exceed the noncombustible waste limit, the SSSTF acceptance organization can perform an evaluation to determine whether segregation or stabilization can be used to mitigate the combustibility hazard. The SSSTF will not accept noncombustible waste if the noncombustible waste limit is exceeded.

B.8. Mobile Radionuclide Reporting

This is a simple comparison of the concentration of each mobile radionuclide (3H, 14C, 36Cl, 79Se, 93Mo, 99Tc, 129I, 187Re, Total U, and 237Np) against its respective reporting value from Table A-2.

Table B-1. Conversion Factors for General Radiological Calculations.

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)
^{3}H	4.5034 E+03	9.66 E+03	3.38 E-05
^{7}Be	5.3920 E+01	3.50 E+05	2.94 E-04
^{10}Be	5.8439 E+08	2.23 E-02	1.20 E-03
^{14}C	2.0928 E+06	4.46 E+00	2.93 E-04
^{22}Na	9.5032 E+02	6.25 E+03	8.71 E-03
^{32}P	1.4262 E+01	2.86 E+05	4.21 E-03
^{35}S	8.7510 E+01	4.26 E+04	2.88 E-04
^{36}Cl	1.0994 E+08	3.30 E-02	1.43 E-03
^{40}K	4.6641 E+11	7.00 E-06	3.33 E-03
^{45}Ca	1.6380 E+02	1.77 E+04	4.56 E-04
^{46}Sc	8.3790 E+01	3.39 E+04	1.26 E-02
^{49}V	3.3000 E+02	8.08 E+03	5.16 E-06
^{51}Cr	2.7702 E+01	9.24 E+04	1.93 E-04
^{54}Mn	3.1210 E+02	7.75 E+03	4.96 E-03
^{55}Fe	9.9711 E+02	2.38 E+03	9.66 E-06
^{56}Co	7.7270 E+01	3.02 E+04	2.02 E-02
^{57}Co	2.7179 E+02	8.43 E+03	7.42 E-04
^{58}Co	7.0820 E+01	3.12 E+04	4.91 E-03
^{59}Fe	4.4503 E+01	4.97 E+04	7.74 E-03
^{59}Ni	2.7758 E+07	7.97 E-02	1.36 E-05
^{60}Co	1.9253 E+03	1.13 E+03	1.54 E-02
^{63}Ni	3.6561 E+04	5.67 E+01	1.01 E-04
^{65}Zn	2.4426 E+02	8.22 E+03	3.38 E-03
^{68}Ge	2.7082 E+02	7.09 E+03	2.44 E-05
^{75}Se	1.1978 E+02	1.45 E+04	2.32 E-03
^{79}Se	2.3741 E+07	6.96 E-02	3.14 E-04
^{82}Sr	2.5550 E+01	6.23 E+04	4.65 E-05
^{85}Kr	3.9285 E+03	3.91 E+02	1.50 E-03
^{85}Sr	6.4840 E+01	2.37 E+04	3.07 E-03
^{86}Rb	1.8631 E+01	8.15 E+04	4.51 E-03
^{88}Y	1.0665 E+02	1.39 E+04	1.59 E-02
^{89}Sr	5.0530 E+01	2.90E+04	3.46 E-03
$^{90}Sr - ^{90}Y$*	1.0512 E+04	2.76 E+02	5.54 E-03
^{93}Mo	1.4610 E+06	9.61 E-01	7.41 E-05
^{93m}Nb	5.8914 E+03	2.38 E+02	1.09 E-05
^{93}Zr	5.5882 E+08	2.51 E-03	1.24 E-04

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)
^{94}Nb	7.4144 E+06	1.87 E-01	1.02 E-02
^{95}Nb	3.4975 E+01	3.93 E+05	4.68 E-03
^{95}Zr–^{95m}Nb*	6.4020 E+01	4.42 E+04	4.24 E-04
^{99}Tc	7.7103 E+07	1.71 E-02	5.04 E-04
^{103}Ru–^{103m}Rh*	3.6260 E+01	7.00 E+04	3.36 E-03
^{106}Ru–^{106}Rh*	3.7359 E+02	6.59 E+03	3.99 E-04
^{107}Pd	2.3741 E+09	5.14 E-04	5.51 E-05
^{108m}Ag	4.6386 E+04	2.61 E+01	9.96 E-03
^{109}Cd	4.6260 E+02	2.59 E+03	1.54 E-04
^{110m}Ag–^{110}Ag*	2.4979 E+02	9.50 E+03	7.19 E-03
^{113m}Cd	5.1499 E+03	2.24 E+02	1.08 E-03
^{113}Sn	1.1509 E+02	1.00 E+04	1.66 E-03
^{119m}Sn	2.9310 E+02	3.74 E+03	6.78 E-05
^{121m}Sn	2.0088 E+04	5.37 E+01	6.59 E-05
^{121}Te	1.6780 E+01	6.43 E+04	3.42 E-03
^{123}Te	3.6524 E+15	2.91 E-10	1.29 E-03
^{124}Sb	6.0200 E+01	1.75 E+04	1.33 E-02
^{125}I	5.9408 E+01	1.76 E+04	2.51 E-04
^{125}Sb	1.0074 E+03	1.04 E+03	3.14 E-03
^{125m}Te	5.7400 E+01	1.82 E+04	2.13 E-04
^{126}Sb	1.2460 E+01	8.32 E+04	1.83 E-02
^{126}Sn–^{126m}Sb*	3.6524 E+07	5.68 E+02	1.23 E-02
^{127m}Te–^{127}Te*	1.0900 E+02	1.86 E+04	1.36 E-03
^{129}I	5.7343 E+09	1.77 E-04	3.93 E-04
^{129m}Te	3.3600 E+01	3.01 E+04	1.44 E-03
^{131m}Xe	1.1840 E+01	8.42 E+04	1.19 E-04
^{133}Ba	3.8423 E+03	2.56 E+02	2.39 E-03
^{134}Cs	7.5313 E+02	1.29 E+03	1.02 E-02
^{135}Cs	8.4006 E+08	1.15 E-03	3.32 E-04
^{137}Cs–^{137m}Ba*	1.0983 E+04	1.69 E+02	3.36 E-03
^{140}Ba	1.2752 E+01	7.31 E+04	2.72 E-03
^{141}Ce	3.2501 E+01	2.85 E+04	8.60 E-04
^{144}Ce–^{144}Pr*	2.8489 E+02	6.37 E+03	7.34 E-03
^{147}Nd	1.0980 E+01	8.09 E+04	2.22 E-03
^{147}Pm	9.5818 E+02	9.27 E+02	3.68 E-04
^{147}Sm	3.8716 E+13	2.29 E-08	1.37 E-02

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)
^{150}Eu	1.3076 E+04	6.66 E+01	8.90 E-03
^{151}Sm	3.2872 E+04	2.63 E+01	7.41 E-04
^{152}Eu	4.9461 E+03	1.74 E+02	7.03 E-03
^{152}Gd	3.9446 E+16	2.18 E-11	1.31 E-02
^{153}Gd	2.4160 E+02	3.53 E+03	6.03 E-04
^{154}Eu	3.1385 E+03	2.70 E+02	8.77 E-03
^{155}Eu	1.7390 E+03	4.84 E+02	6.53 E-04
^{170}Tm	1.2860 E+02	5.97 E+03	1.90 E-03
^{175}Hf	7.0000 E+01	1.07 E+04	2.16 E-03
^{181}Hf	4.2390 E+01	1.70 E+04	3.85 E-03
^{182}Ta	1.1443 E+02	6.27 E+03	8.46 E-03
^{185}W	7.5100 E+01	9.40 E+03	7.53 E-04
^{187}Re	1.5888 E+13	4.39 E+08	3.91 E-06
^{195}Au	1.8609 E+02	3.60 E+03	5.10 E-04
^{203}Hg	4.6612 E+01	1.38 E+04	1.75 E-03
^{204}Tl	1.3806 E+03	4.64 E+02	1.38 E-03
^{207}Bi	1.1523 E+04	5.47 E+01	9.12 E-03
^{210}Pb	8.1449 E+03	7.63 E+01	6.62 E-05
^{210}Po	1.3838 E+02	4.49 E+03	3.26 E-02
^{226}Ra	5.8439 E+05	9.89 E+01	2.89 E-02
^{227}Ac	7.9524 E+03	7.23 E+01	1.46 E-03
^{228}Ra	2.1001 E+03	2.73 E+02	2.71 E-04
^{228}Th	6.9874 E+02	8.20 E+02	3.27 E-02
^{229}Th	2.6809 E+06	2.13 E-01	3.08 E-02
^{230}Th	2.7532 E+07	2.06 E-02	2.83 E-02
^{231}Pa	1.1965 E+07	4.72 E-02	3.08 E-02
^{232}Th	5.1317 E+12	1.10 E-07	2.42 E-02
^{232}U	2.5165 E+04	2.24 E+01	3.21 E-02
^{233}U	5.8147 E+07	9.64 E-03	2.91 E-02
^{234}Th	2.4100 E+01	2.32 E+04	1.49 E-04
^{234}U	8.9667 E+07	6.26 E-043	2.88 E-02
^{235}U	2.5706 E+11	2.16 E-06	2.86 E-02
^{236}Pu	1.0439 E+03	5.30 E+02	3.48 E-02
^{236}U	8.5540 E+09	6.47 E-05	2.71 E-02
^{237}Np	7.8162 E+08	7.05 E-04	2.96 E-02
^{238}Pu	3.2032 E+04	1.71 E+01	3.31 E-02

Table B-1. (continued).

Isotope	Half-life (days)	Specific activity (curies per gram)	Heat of decay (watts per curie)
^{238}U	1.6319 E+12	3.36 E-07	2.53 E-02
^{239}Pu	8.8060 E+06	6.21 E-02	3.11 E-02
^{240}Pu	2.3971 E+06	2.28 E-01	3.10 E-02
^{241}Am	1.5786 E+05	3.44 E+00	3.33 E-02
^{241}Pu	5.2412 E+03	1.03 E+02	3.30 E-05
^{242m}Am	5.1499 E+04	1.05 E+01	2.37 E-04
^{242}Cm	1.6280 E+02	3.31 E+03	3.68 E-02
^{242}Pu	1.3634 E+08	3.96 E-03	2.93 E-02
^{243}Am	2.6918 E+06	2.00 E-01	3.22 E-02
^{243}Cm	1.0629 E+04	5.16 E+01	3.73 E-02
^{244}Cm	6.6109 E+03	8.09 E+01	3.50 E-02
^{244}Pu	2.9512 E+10	1.83 E-05	2.77 E-02
^{245}Cm	3.1046 E+06	1.72 E-01	3.40 E-02
^{246}Cm	1.7276 E+06	3.07 E-01	3.25 E-02
^{247}Bk	5.0403 E+05	1.05 E+00	3.56 E-02
^{247}Cm	5.6978 E+09	9.29 E-05	3.36 E-02
^{248}Cm	1.2418 E+08	4.24 E-03	3.06 E-02
^{249}Cf	1.2820 E+05	4.09 E+00	3.93 E-02
^{250}Cf	4.7774 E+03	1.09 E+02	3.63 E-02
^{250}Cm	3.2872 E+06	2.07 E-01	2.19 E-04
^{251}Cf	3.2799 E+05	1.59 E+00	3.74 E-02
^{252}Cf	9.6607 E+02	5.38 E+02	3.69 E-02
^{254}Es	2.7570 E+02	1.86 E+03	3.92 E-02

Table B-2. Low-Level Radiological Content Limits.

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Non-combustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{3}H	4.4 E+00	9.9 E+04	NL	4.00 E+07	5.00 E+02
^{7}Be	NL	NL	NL	2.64 E+07	6.59 E+05
^{10}Be	NL	1.1 E+00	2.4 E+02	1.00 E+04	2.50 E+02
^{14}C	1.3 E-04	9.1 E-02	2.1 E+01	1.76 E+06	4.41 E+04
^{14}C act. metal[c]	1.3 E-04	9.1 E-01	2.1 E+02	1.76 E+06	4.41 E+04
^{22}Na	NL	NL	NL	4.29 E+05	1.07 E+04
^{32}P	NL	NL	NL	2.31 E+05	5.77 E+03
^{35}S	NL	NL	NL	1.46 E+06	3.66 E+04
^{36}Cl	3.1 E-05	6.4 E-05	1.4 E-01	1.70 E+05	4.17 E+03
^{40}K	NL	1.8 E-03	3.8 E-01	3.00 E+05	7.50 E+03
^{45}Ca	NL	NL	NL	5.45 E+05	1.36 E+04
^{46}Sc	NL	NL	NL	1.22 E+05	3.06 E+03
^{49}V	NL	NL	NL	1.05 E+07	2.63 E+05
^{51}Cr	NL	NL	NL	1.00 E+07	2.50 E+05
^{54}Mn	NL	NL	NL	5.22 E+05	1.30 E+04
^{55}Fe	NL	NL	NL	1.33 E+06	3.33 E+04
^{56}Co	NL	NL	NL	9.16 E+04	2.29 E+03
^{57}Co	NL	NL	NL	4.29 E+05	1.07 E+04
^{58}Co	NL	NL	NL	3.24 E+05	8.11 E+03
^{59}Fe	NL	NL	NL	2.35 E+05	5.88 E+03
^{59}Ni	NL	3.9 E+00	8.5 E+02	2.86 E+06	7.14 E+04
^{59}Ni act. metal[c]	NL	3.9 E+01	8.5 E+03	2.86 E+06	7.14 E+04
^{60}Co	NL	7.5 E+01	NL	1.82 E+04	4.55 E+02
^{60}Co act. metal[c]	NL	7.5 E+02	NL	1.82 E+04	4.55 E+02
^{63}Ni	NL	5.9 E+00	2.0 E+04	1.20 E+06	3.00 E+04
^{63}Ni act. metal[c]	NL	5.9 E+01	2.0 E+05	1.20 E+06	3.00 E+04
^{65}Zn	NL	NL	NL	1.97 E+05	4.92 E+03
^{68}Ge	NL	NL	NL	7.02 E+04	1.75 E+03
^{75}Se	NL	NL	NL	4.29 E+05	1.07 E+04
^{79}Se	3.4 E-05	5.1 E-01	1.1 E+02	3.87 E+05	9.68 E+03
^{82}Sr	NL	NL	NL	5.91 E+04	1.48 E+03
^{85}Kr	NL	NL	NL	2.11 E+09	2.63 E+04
^{85}Sr	NL	NL	NL	1.97 E+06	4.92 E+04
^{86}Rb	NL	NL	NL	5.45 E+05	1.36 E+04
^{88}Y	NL	NL	NL	1.29 E+05	3.24 E+03
^{89}Sr	NL	NL	NL	6.67 E+05	1.67 E+04
^{90}Sr–^{90}Y	NL	1.6 E-02	5.4 E+04	1.50 E+04	3.75 E+02
^{93}Mo	2.1 E-04	8.7 E-01	2.0 E+02	1.28 E+05	3.19 E+03

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Non-combustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{93m}Nb	NL	NL	NL	1.21 E+05	3.03 E+03
^{93}Zr	NL	2.50 E+00	5.40 E+02	4.62 E+03	1.15 E+02
^{94}Nb	NL	2.2 E-04	4.8 E-02	9.23 E+03	2.31 E+02
^{94}Nb act.[c]	NL	2.2 E-03	4.8 E-01	9.23 E+03	2.31 E+02
^{95}Nb	NL	NL	NL	5.71 E+05	1.43 E+04
^{95}Zr–^{95m}Nb	NL	NL	NL	9.23 E+04	2.31 E+03
^{99}Tc	2.1 E-04	2.3 E-02	5.0 E+00	4.00 E+05	1.00 E+04
^{103}Ru–^{103m}Rh	NL	NL	NL	3.87 E+05	9.68 E+03
^{106}Ru–^{106}Rh	NL	NL	NL	8.00 E+03	2.00 E+02
^{107}Pd	NL	1.5 E+01	3.3 E+03	2.86 E+05	7.14 E+03
^{108m}Ag	NL	NL	NL	2.15 E+04	5.39 E+02
^{109}Cd	NL	NL	NL	2.45 E+04	6.12 E+02
^{110m}Ag–^{110}Ag	NL	NL	NL	1.00 E+04	2.50 E+02
^{113m}Cd	NL	7.6 E-01	NL	1.79 E+03	4.48 E+01
^{113}Sn	NL	NL	NL	3.24 E+05	8.11 E+03
^{119m}Sn	NL	NL	NL	6.00 E+05	1.50 E+04
^{121m}Sn	NL	6.7 E-01	2.2 E+04	3.08 E+05	7.69 E+03
^{121}Te	NL	NL	NL	1.91 E+06	4.77 E+04
^{123}Te	NL	NL	NL	1.38 E+05	3.44 E+03
^{124}Sb	NL	NL	NL	1.38 E+05	3.45 E+03
^{125}I	NL	NL	NL	5.00 E+04	1.25 E+00
^{126}Sn–^{126m}Sb	NL	1.6 E-04	3.4 E-02	3.64 E+04	9.09 E+02
^{125m}Te	NL	NL	NL	2.18 E+06	5.45 E+04
^{125}Sb	NL	NL	NL	2.79 E+05	6.98 E+03
^{127m}Te–^{127}Te	NL	NL	NL	1.67 E+05	4.17 E+03
^{129}I	1.0 E-06	8.5 E-03	1.8 E+00	7.06 E+03	1.76 E-01
^{129m}Te	NL	NL	NL	1.56 E+05	3.90 E+03
^{131m}Xe	NL	NL	NL	7.50 E+08	9.38 E+03
^{133}Ba	NL	7.1 E-01	NL	4.62 E+05	1.15 E+04
^{134}Cs	NL	NL	NL	8.57 E+04	2.14 E+03
^{135}Cs	NL	1.6 E-01	3.5 E+01	8.03 E+05	2.00 E+04
^{137}Cs–^{137m}Ba	NL	5.5 E-03	1.2 E+04	1.20 E+05	3.00 E+03
^{140}Ba	NL	NL	NL	3.87 E+05	9.68 E+03
^{141}Ce	NL	NL	NL	4.14 E+05	1.03 E+04
^{144}Ce–^{144}Pr	NL	NL	NL	1.00 E+04	2.50 E+02
^{147}Nd	NL	NL	NL	5.45 E+05	1.36 E+04
^{147}Pm	NL	NL	NL	9.23 E+04	2.31 E+03
^{147}Sm	NL	1.7 E-02	3.7 E+00	2.86 E+01	7.14 E-01

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Non-combustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{150}Eu	NL	1.4 E-03	6.7 E+02	1.38 E+04	3.45 E+02
^{151}Sm	NL	4.6 E+01	2.1 E+05	7.06 E+04	1.76 E+03
^{152}Eu	NL	4.8 E-02	NL	1.74 E+04	4.35 E+02
^{152}Gd	NL	6.4 E-03	1.4 E+00	3.64 E+00	9.09 E-02
^{153}Gd	NL	NL	NL	1.09 E+05	2.73 E+03
^{154}Eu	NL	7.5 E-01	NL	1.32 E+04	3.30 E+02
^{155}Eu	NL	NL	NL	6.67 E+04	1.67 E+03
^{170}Tm	NL	NL	NL	1.38 E+05	3.46 E+03
^{175}Hf	NL	NL	NL	6.52 E+05	1.63 E+04
^{181}Hf	NL	NL	NL	1.23 E+05	3.07 E+03
^{182}Ta	NL	NL	NL	8.00 E+04	2.00 E+03
^{185}W	NL	NL	NL	4.62 E+06	1.15 E+05
^{187}Re	3.3 E-02	3.6 E+01	7.8 E+03	6.32 E+07	1.58 E+06
^{195}Au	NL	NL	NL	2.81 E+05	7.03 E+03
^{203}Hg	NL	NL	NL	5.00 E+05	1.25 E+04
^{204}Tl	NL	NL	NL	1.51 E+06	3.78 E+04
^{207}Bi	NL	TBD	TBD	1.82 E+05	4.54 E+03
^{210}Pb	NL	3.7 E-02	2.1 E+06	1.82 E+02	4.55 E+00
^{210}Po	NL	NL	NL	1.82 E+02	4.55 E+00
^{226}Ra	NL	1.7 E-04	4.3 E-02	4.44 E+02	1.11 E+01
^{227}Ac	NL	4.2 E-03	3.0 E+05	3.08 E-01	7.69 E-03
^{228}Ra	NL	1.7 E+01	NL	8.57 E+02	2.14 E+01
^{228}Th	NL	NL	NL	7.06 E+00	1.76 E-01
^{229}Th	NL	4.4 E-04	9.8 E-02	7.06 E-01	1.76 E-02
^{230}Th	NL	2.1 E-03	1.5 E-01	4.62 E+00	1.15 E-01
^{231}Pa	NL	1.4 E-04	3.0 E-02	1.09 E+00	2.73 E-02
^{232}Th	NL	1.1 E-04	2.3 E-02	8.57 E-01	2.14 E-02
Total U	1.4 E-05	NL	NL	NL	NL
^{232}U	See Total U	4.6 E-04	4.6 E+00	5.45 E+00	1.36 E-01
^{233}U	See Total U	7.4 E-03	9.7 E-01	2.67 E+01	6.67 E-01
^{234}Th	NL	NL	NL	1.00 E+05	2.50 E+03
^{234}U	See Total U	8.9 E-03	1.9 E+00	2.73 E+01	6.82 E-01
^{235}U	See Total U	2.8 E-03	5.0 E-01	2.93 E+01	7.32 E-01
^{236}Pu	NL	NL	NL	1.40 E+01	3.49 E-01
^{236}U	See Total U	9.5 E-03	2.0 E+00	2.86 E+01	7.14 E-01
^{237}Np[d]	1.1 E-05	6.8 E-04	1.5 E-01	2.55 E+00	6.38 E-02
^{238}Pu[d]	NL	4.7 E-03	2.4 E+01	5.22 E+00	1.30 E-01
^{238}U	See Total U	5.7 E-03	1.2 E+00	3.08 E+01	7.69 E-01

Table B-2. (continued).

Isotope	Mobile Radionuclide Reporting Limit (Ci/m3)	Category 1 Waste Limit (Ci/m3)	Category 3 Waste Limit (Ci/m3)	ISB Non-combustible Waste Limit[a] (Ci/m3)	ISB Combustible Waste Limit[b] (Ci/m3)
^{239}Pu[d]	NL	1.9 E-03	4.2 E-01	4.62 E+00	1.15 E-01
^{240}Pu[d]	NL	1.9 E-03	4.3 E-01	4.62 E+00	1.15 E-01
^{241}Am[d]	NL	2.1 E-03	8.5 E-01	4.44 E+00	1.11 E-01
^{241}Pu	NL	6.4 E-02	2.5 E+01	2.35 E+02	5.88 E+00
^{242m}Am[d]	NL	1.9 E-03	1.6 E+00	4.62 E+00	1.15 E-01
^{242}Cm	NL	NL	NL	2.03 E+02	5.08 E+00
^{242}Pu[d]	NL	2.0 E-03	4.3 E-01	5.00 E+00	1.25 E-01
^{243}Am[d]	NL	1.0 E-03	2.3 E-01	4.44 E+00	1.11 E-01
^{243}Cm[d]	NL	1.8 E-02	3.4 E+02	6.67 E+00	1.67 E-01
^{244}Cm	NL	1.4 E-01	1.6 E+02	8.57 E+00	2.14 E-01
^{244}Pu[d]	NL	6.1 E-04	1.3 E-01	5.00 E+00	1.25 E-01
^{245}Cm[d]	NL	1.3 E-03	2.2 E-01	4.44 E+00	1.11 E-01
^{246}Cm[d]	NL	1.8 E-03	4.2 E-01	4.29 E+00	1.07 E-01
^{247}Bk[d]	NL	TBD	TBD	2.98 E+00	7.44 E-02
^{247}Cm[d]	NL	5.6 E-04	1.2 E-01	4.80 E+00	1.20 E-01
^{248}Cm[d]	NL	5.1 E-04	1.1 E-01	1.21 E+00	3.03 E-02
^{249}Cf[d]	NL	TBD	TBD	2.96 E+00	7.41 E-02
^{250}Cf	NL	TBD	TBD	6.74 E+00	1.69 E-01
^{250}Cm[d]	NL	TBD	TBD	2.13 E-01	5.33 E-03
^{251}Cf[d]	NL	TBD	TBD	2.91 E+00	7.26 E-02
^{252}Cf	NL	NL	NL	1.43 E+01	3.57 E-01
^{254}Es	NL	NL	NL	5.22 E+01	1.30 E+00

Ci/m^3 = curies per cubic meter.

NL = no applicable limit for this isotope.

TBD = a limit is under development.

a. Noncombustible waste means containerized waste forms that show no evidence of combustion or decomposition on exposure to 538 °C (1,000 °F) for 10 minutes.

b. The combustible waste limit should be used for containerized waste forms that do not meet the definition of noncombustible waste.

c. Limit for isotope in activated metal.

d. TRU isotope (half-life >20 years)