D.3.4 Accident Analyses Consequences and Risks Results

This section summarizes the consequences and risks to individuals and the general public from the operation of different residue processes (technologies) considered in this EIS. For each residue process, there are four alternatives: No Action, Processing without Plutonium Separation, Processing with Plutonium Separation, and Combination of Processing Technologies. The following subsections provide the summary results for each residue category and processing technology that were considered in this EIS. The details of each processing technology are provided in Appendix C and are summarized in Chapter 2 of this EIS; they will not be repeated here. The process data for each technology are provided by the DOE management sites. For example, the Rocky Flats Field Office provided the process data sheets for those technologies that will be performed at Rocky Flats; the Westinghouse Savannah River Company provided process data sheets for the technologies that will be performed at the Savannah River Site; and Los Alamos National Laboratory provided the process data sheets for the technologies that will be performed at Los Alamos National Laboratory (SAIC 1998a).

The results provided on the following pages represent the incremental increase in risks associated with the implementation of each processing technology. In evaluating the risk for the processing technologies, this EIS used the following assumptions and simplifications:

For each processing technology, the material at risk is the residue material in its most vulnerable form.

For the room fire and the earthquake accident scenarios, the material at risk is a 5-day supply, or a weekly throughput. The supply is divided into 3 days of feed and 2 days of product.

For earthquakes, risk is calculated only for a frequency that results in the total collapse or breach of the building.

When there is no building damage, the Building 371 earthquake-initiated fire and explosion are limited to the affected rooms. The Building 371 Basis for Interim Operation report identified the analytical laboratory (Room 3412) as the source of the explosion and the Caustic Waste Treatment System area (Rooms 1103, 1105, 1113, and 1115) as the main source of the fire. Although the earthquake-initiated fire and explosion were important for the Basis for Interim Operation report, they will not be considered in this EIS because the location of the gloveboxes for proposed processing technologies (Room 3701) is separated from the affected rooms. The explosion would be localized and would not damage the building. The whole building must be involved for the fire to spread and involve Room 3701; and the probability of this happening is smaller than that of another fire scenario that will be evaluated in this EIS.

For earthquake-initiated criticality, the bound is the 1×10^{19} fission criticality event analyzed for the plutonium liquid processes.

When a process involves operations in more than one building, it will be treated as two independent subprocesses with an interim storage in between. For example, in the acid dissolution of residues, the process of changing the residue to a calcined plutonium starts in Building 371; the final calcination occurs in Building 707A after a temporary storage in that building vault. Two sets of accident scenarios, one in Building 371 and the second in Building 707A, will be applied to residue materials that use this processing technology.

D.3.4.1 Ash Residues

D.3.4.1.1 Alternative 1 – No Action

The ash residues processing technology considered for this alternative is calcination/cementation. All ash residue (incinerator ash, SS&C, graphite fines, and inorganic) can be processed using the calcination/ cementation technology. The calcination/cementation process will be performed at Rocky Flats in Building 371, Room 3701. Building 707 is under consideration as an alternate location for the process. The accident analysis evaluates both the primary and alternate locations.

Table D–85 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of calcination/cementation processing technology of ash at Rocky Flats. **Table D–86** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of ash residues. The risks associated with this processing technology are summarized in **Table D–87** and **Table D–88**.

Table D–85 Ash Residue Accident Scenario Parameters for the Calcination/Cementation Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Ash Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	2/0 [b]	4,000 g
Nuclear Criticality [c]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [d]	2	3,507 g supply + 2,338 g product [e]
b. Loading Dock	2.0×10^{-6}	4 drums [f]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the limit [g]	2	600 g
b. Glovebox	0.8	1 feed prep container	2	83.5 g
c. Loading Dock	0.001	1 drum [h]	0	3,000 g
Earthquake				
a. Building 371	0.000094	5-day supply [d]	0	3,507 g supply + 2,338 g product [e]
b. Building 707	0.0026	5-day supply [d]	0	3,507 g supply + 2,338 g product [e]
Aircraft Crash				
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–
b. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion					
a. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
b. Building 707	1.0	0.001	0.1	1.0	Ground
Nuclear Criticality [c]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Spill:					
a. Room	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [j]	0.3 [j]	0.1	Ground
Aircraft Crash					
a. Building 371 [k]	–	–	–	–	–
b. Building 707 [l]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.

[c] The wet nuclear criticality is not a viable accident scenario for the calcination/cementation technology assessment.

[d] 3-day supply of feed and 2-day supply of product.

[e] The product is cemented ash. The effect of the cemented ash product on the accident source term is negligible.

[f] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[g] 5 containers per drum of feed.

[h] 1 drum at the maximum plutonium content level.

[j] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[k] The aircraft will not penetrate the building.

[l] Consequences enveloped by the earthquake.

Table D–86 Summary of the Ash Residue Accident Analysis Doses for the Calcination/Cementation Process at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371							
Explosion	8.00×10^{-7}	Oxide	1.20×10^{-6}	1.36×10^{-7}	0.02	0.00048	1.44×10^{-6}
Fire (Room)	0.021	Oxide	0.0379	0.00379	526	12.6	0.442
Fire (Dock)	0.0018	Oxide	0.00324	0.000324	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.80×10^{-8}	2.04×10^{-9}	0.0003	7.20×10^{-6}	2.16×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Oxide	2.51×10^{-9}	2.84×10^{-10}	0.0000418	1.00×10^{-6}	3.01×10^{-9}
Spill (Dock)	0.003	Oxide	0.0054	0.00054	75.0	1.80	0.063
Earthquake	0.278	Oxide	0.50	0.050	6,940	167	5.83
Building 707							
Explosion	0.400	Oxide	0.480	0.0520	10,000	240	8.40
Fire (Room)	0.021	Oxide	0.0253	0.00297	526	12.6	0.442
Fire (Dock)	0.00180	Oxide	0.00216	0.000234	45.0	1.08	0.378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.4×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Oxide	2.67×10^{-10}	1.00×10^{-10}	0.0000145	7.52×10^{-7}	2.34×10^{-10}
Spill (Dock)	0.00300	Oxide	0.00360	0.000390	75.0	1.80	0.0630
Earthquake	0.278	Oxide	0.331	0.0361	6,940	167	5.83

MEI = maximally exposed individual Met = meteorological data

Table D–87 Summary of the Ash Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Calcination/Cementation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
Explosion	0.00005	3.00×10^{-14}	3.40×10^{-15}	5.00×10^{-10}	1.20×10^{-11}	2.88×10^{-14}
Fire (Room)	0.0005	9.47×10^{-9}	9.47×10^{-10}	0.000132	3.16×10^{-6}	8.84×10^{-8}
Fire (Dock)	2.0×10^{-6}	3.24×10^{-12}	3.24×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.20×10^{-14}	8.16×10^{-15}	1.20×10^{-9}	2.88×10^{-11}	6.91×10^{-14}
Spill (Glovebox)	0.8	1.00×10^{-12}	1.14×10^{-13}	1.67×10^{-8}	4.01×10^{-10}	9.62×10^{-13}
Spill (Dock)	0.001	2.70×10^{-9}	2.70×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.000094	2.35×10^{-8}	2.35×10^{-9}	0.000326	7.83×10^{-6}	2.19×10^{-7}
Building 707						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.000250	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	6.31×10^{-9}	6.48×10^{-10}	0.000132	3.16×10^{-6}	8.84×10^{-8}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	1.07×10^{-13}	4.01×10^{-14}	5.81×10^{-9}	3.01×10^{-10}	7.48×10^{-14}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	4.33×10^{-7}	4.69×10^{-8}	0.00903	0.000217	6.07×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–88 Alternative 1 Accident Risks During Ash Residue Processing

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Calcination/Cementation Process- Building 371						
Incinerator Ash	3.00	1.07×10^{-7}	1.07×10^{-8}	0.00149	0.0000357	9.99×10^{-7}
SS&C	0.42	1.50×10^{-8}	1.50×10^{-9}	0.000208	4.99×10^{-6}	1.40×10^{-7}
Graphite Fines	0.24	8.56×10^{-9}	8.56×10^{-10}	0.000119	2.85×10^{-6}	7.99×10^{-8}
Inorganic Ash	0.17	6.06×10^{-9}	6.06×10^{-10}	0.0000842	2.02×10^{-6}	5.66×10^{-8}
All Ash Residues	3.83	1.37×10^{-7}	1.37×10^{-8}	0.00190	0.0000455	1.28×10^{-6}
Calcination/Cementation Process - Building 707						
Incinerator Ash	3.00	1.36×10^{-6}	1.47×10^{-7}	0.0283	0.000680	0.0000190
SS&C	0.42	1.90×10^{-7}	2.06×10^{-8}	0.00397	0.0000952	2.67×10^{-6}

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Graphite Fines	0.24	1.09×10^{-7}	1.18×10^{-8}	0.00227	0.0000544	1.52×10^{-6}
Inorganic Ash	0.17	7.71×10^{-8}	8.35×10^{-9}	0.00161	0.0000385	1.08×10^{-6}
All Ash Residues	3.83	1.64×10^{-6}	1.88×10^{-7}	0.0362	0.000868	0.0000243

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality SS&C = sand, slag, and crucible ash residue

[a] Sum of postulated accident scenario risks

D.3.4.1.2 Alternative 2 – Processing without Plutonium Separation

The ash residue processing technologies considered for this alternative are calcination/vitrification, blend down, and cold ceramification. All ash residue (incinerator ash; sand, slag, and crucible; graphite fines; and inorganic) can be processed using the either the calcination/vitrification or the blend down technologies. The cold ceramification technology can process incinerator, graphite fines and inorganic ash residue. The calcination/vitrification process will be performed at Rocky Flats in Building 707, Modules D and E; final drum packaging will be performed in Module F. The blend down process will be performed at Rocky Flats in Building 707, Module E. Building 371 is under consideration as an alternate location for the blend down process. The cold ceramification process will be performed at Rocky Flats in Building 707, Rooms 115, 120, 125, 126, 181, and 182. The accident analysis evaluates both the primary and alternate locations for the blend down process. Similar accidents are applicable to both of these technologies. **Table D–89** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of ash processing technology at Rocky Flats. **Table D–90** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of ash residues. The risks associated with these processing technologies are summarized in **Table D–91** and **Table D–92**.

Table D–89 Ash Residue Accident Scenario Parameters for the Vitrification, Blend Down, and Cold Ceramification Processes at Rocky Flats

Accident Scenario	Frequency (per year)	Ash Residues	HEPA Banks	Material at Risk (grams)			
				Calcination/ Vitrification Process [a]	Blend Down Process [b]		Cold Ceramification Process [p]
					Incinerator and Graphite Fines Ash Residue	SS&C and Inorganic Ash Residue	
Explosion	0.000050	2 drums [c]	0/2 [d]	4,000 g	4,000 g	4,000 g	4,000 g
Nuclear Criticality [e]	–	–	–	–	–	–	–
Fire:							
a. Room	0.0005	5-day supply [f]	2	4,810 g feed+3,206 g product [g]	7,014 g	1,520 g	8,000 g feed+ 5,344 g product [q]
b. Loading Dock	2.0×10^{-6}	4 drums [h]	0	6,000 g	6,000 g	6,000 g	6,000 g

Accident Scenario	Frequency (per year)	Ash Residues	HEPA Banks	Material at Risk (grams)			
				Calcination/ Vitrification Process [a]	Blend Down Process [b]		Cold Ceramification Process [p]
					Incinerator and Graphite Fines Ash Residue	SS&C and Inorganic Ash Residue	
Spill:							
a. Room	0.008	1 container at the limit [j]	2	600 g	600 g	600 g	600 g
b. Glovebox	0.8	1 feed prep container		83.5 g	83.5 g	18.1 g	167 g
c. Loading Dock	0.001	1 drum [k]	0	3,000 g	3,000 g	3,000 g	3,000 g
Earthquake:							
a. Building 707	0.0026	5-day supply [f]	0	4,810 g feed+3,206 g product [g]	7,104 g	1,520 g	8,016 g feed+5,344 g product [q]
b. Building 371	0.000094	5-day supply [f]	0	N/A	7,014 g	1,520 g	–
Aircraft Crash:							
a. Building 707	0.000030	Consequences enveloped by the earthquake.	–	–	–	–	–
b. Building 371	0.00004	The aircraft will not penetrate the building walls.	–	–	–	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion:					
a. Building 707	1.0	0.001	0.1	1.0	Ground
b. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
Nuclear Criticality [e]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [l]	0.3 [l]	0.1	Ground
Aircraft Crash:					
a. Building 707 [m]	–	–	–	–	–
b. Building 371 [n]	–	–	–	–	–

SS&C = sand, slag, and crucible

[a] Building 707, Modules D, E, and F.

[b] Building 707, Module E or Building 371 (alternate location).

[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level for plutonium content (1,000 g).

[d] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.

[e] The wet nuclear criticality is not a viable accident scenario for the calcination/vitrification and blend down technology assessments.

[f] 3-day supply of feed and 2-day supply of product.

[g] The product is glass. The effect of the vitrified product on the accident source term is negligible.
[h] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[j] 5 containers per drum of feed.
[k] 1 drum at the maximum plutonium content level.
[l] Add 0.000192 to all (ARF×RF) values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[m] Enveloped by the earthquake.
[n] The aircraft will not penetrate the building walls.
[p] Building 707, Rooms 115, 120, 125, 126, 181, and 182.
[q] The product is ceramic. The effect of the ceramic product on the accident source term is negligible.

Table D–90 Summary of the Ash Residue Accident Analysis Doses for the Vitrification and Blend Down Processes at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Calcination/Vitrification Process							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.0289	Oxide	0.0346	0.00375	722	17.3	0.606
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Oxide	2.67×10^{-10}	1.00×10^{-10}	0.0000145	7.52×10^{-7}	2.34×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.80	0.063
Earthquake	0.381	Oxide	0.457	0.0495	9,520	229	8.00
Blend Down Process (Incinerator and Graphite Fines Ash Residue)—Building 707							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.0421	Oxide	0.0505	0.00547	1,050	25.3	0.884
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	1.67×10^{-9}	Oxide	2.67×10^{-10}	1.00×10^{-10}	0.0000145	7.52×10^{-7}	2.34×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.80	0.063
Earthquake	0.556	Oxide	0.667	0.0722	13,900	333	11.7
Blend Down Process (SS&C and Inorganic Ash Residue)—Building 707							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.00912	Oxide	0.0109	0.00119	228	5.47	0.192
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	3.62×10^{-10}	Oxide	5.79×10^{-11}	2.17×10^{-11}	3.15×10^{-6}	1.63×10^{-7}	5.07×10^{-11}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.8	0.063
Earthquake	0.12	Oxide	0.144	0.0156	3,010	72.2	2.53
Blend Down Process (Incinerator and Graphite Fines Ash Residue)—Building 371							
Explosion	8.00×10^{-7}	Oxide	1.20×10^{-6}	1.36×10^{-7}	0.0200	0.000480	1.44×10^{-6}
Fire (Room)	0.0421	Oxide	0.0758	0.00758	1,050	25.3	0.884

	Building Source Term		***MEI (rem)***		***Population (person-rem)***		***Worker (rem)***
Accident Scenario	***(grams)***	***Type***	***95% Met***	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Fire (Dock)	0.00180	Oxide	0.00324	0.000324	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.80×10^{-8}	2.04×10^{-9}	0.000300	7.20×10^{-6}	2.16×10^{-8}
Spill (Glovebox)	1.67×10^{-9}	Oxide	2.51×10^{-9}	2.84×10^{-10}	0.0000418	1.00×10^{-6}	3.01×10^{-9}
Spill (Dock)	0.00300	Oxide	0.00540	0.000540	75.0	1.80	0.0630
Earthquake	0.556	Oxide	1.00	0.100	13,900	333	11.7

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Blend Down Process (SS&C and Inorganic Ash Residue)—Building 371							
Explosion	8×10^{-7}	Oxide	1.20×10^{-6}	1.36×10^{-7}	0.02	0.00048	1.44×10^{-6}
Fire (Room)	0.00912	Oxide	0.0164	0.00164	228	5.47	0.192
Fire (Dock)	0.0018	Oxide	0.00324	0.000324	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.80×10^{-8}	2.04×10^{-9}	0.0003	7.20×10^{-6}	2.16×10^{-8}
Spill (Glovebox)	3.62×10^{-10}	Oxide	5.43×10^{-10}	6.15×10^{-11}	9.05×10^{-6}	2.17×10^{-7}	6.52×10^{-10}
Spill (Dock)	0.003	Oxide	0.0054	0.00054	75.0	1.8	0.063
Earthquake	0.12	Oxide	0.217	0.0217	3,010	72.2	2.53
Cold Ceramification Process (No SS&C)							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.4
Fire (Room)	0.0481	Oxide	0.0577	0.00625	1,200	28.9	1.01
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	3.34×10^{-9}	Oxide	5.34×10^{-10}	2.00×10^{-10}	0.0000291	1.50×10^{-6}	4.68×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.8	0.063
Earthquake	0.635	Oxide	0.762	0.0825	15,900	381	13.3

SS&C = sand, slag, and crucible MEI = maximally exposed individual Met = meteorological data

Table D–91 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Calcination/Vitrification Process						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	8.66×10^{-9}	9.38×10^{-10}	0.00018	4.33×10^{-6}	1.21×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	1.07×10^{-13}	4.01×10^{-14}	5.81×10^{-9}	3.01×10^{-10}	7.48×10^{-14}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	5.94×10^{-7}	6.44×10^{-8}	0.0124	0.000297	8.32×10^{-6}
Blend Down Process (Incinerator and Graphite Fines Ash Residue)—Building 707						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	1.26×10^{-8}	1.37×10^{-9}	0.000263	6.31×10^{-6}	1.77×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	1.07×10^{-13}	4.01×10^{-14}	5.81×10^{-9}	3.01×10^{-10}	7.48×10^{-14}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	8.67×10^{-7}	9.39×10^{-8}	0.0181	0.000433	0.0000121

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Blend Down Process (SS&C and Inorganic Ash Residue)—Building 707						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	2.74×10^{-9}	2.96×10^{-10}	0.000057	1.37×10^{-6}	3.83×10^{-8}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	2.32×10^{-14}	8.69×10^{-15}	1.26×10^{-9}	6.52×10^{-11}	1.62×10^{-14}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	1.88×10^{-7}	2.03×10^{-8}	0.00391	0.0000939	2.63×10^{-6}
Blend Down Process (Incinerator and Graphite Fines Ash Residue)—Building 371						
Explosion	0.00005	3.00×10^{-14}	3.40×10^{-15}	5.00×10^{-10}	1.20×10^{-11}	2.88×10^{-14}
Fire (Room)	0.0005	1.89×10^{-8}	1.89×10^{-9}	0.000263	6.31×10^{-6}	1.77×10^{-7}
Fire (Dock)	2.0×10^{-6}	3.24×10^{-12}	3.24×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.20×10^{-14}	8.16×10^{-15}	1.20×10^{-9}	2.88×10^{-11}	6.91×10^{-14}
Spill (Glovebox)	0.8	1.00×10^{-12}	1.14×10^{-13}	1.67×10^{-8}	4.01×10^{-10}	9.62×10^{-13}
Spill (Dock)	0.001	2.70×10^{-9}	2.70×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.000094	4.70×10^{-8}	4.70×10^{-9}	0.000653	0.0000157	4.39×10^{-7}
Blend Down Process (SS&C and Inorganic Fines Ash Residue)—Building 371						
Explosion	0.00005	3.00×10^{-14}	3.40×10^{-15}	5.00×10^{-10}	1.20×10^{-11}	2.88×10^{-14}
Fire (Room)	0.0005	4.10×10^{-9}	4.10×10^{-10}	0.000057	1.37×10^{-6}	3.83×10^{-8}
Fire (Dock)	2.0×10^{-6}	3.24×10^{-12}	3.24×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.20×10^{-14}	8.16×10^{-15}	1.20×10^{-9}	2.88×10^{-11}	6.91×10^{-14}
Spill (Glovebox)	0.8	2.17×10^{-13}	2.46×10^{-14}	3.62×10^{-9}	8.69×10^{-11}	2.09×10^{-13}
Spill (Dock)	0.001	2.70×10^{-9}	2.70×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.000094	1.02×10^{-8}	1.02×10^{-9}	0.000141	3.39×10^{-6}	9.51×10^{-8}
Cold Ceramification Process (No SS&C)						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	1.44×10^{-8}	1.56×10^{-9}	0.000301	7.21×10^{-6}	2.02×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	2.14×10^{-13}	8.02×10^{-14}	1.16×10^{-8}	6.01×10^{-10}	1.50×10^{-13}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	9.90×10^{-7}	1.07×10^{-7}	0.0206	0.000495	0.0000139

SS&C = sand, slag, and crucible MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–92 Alternative 2 Accident Risks During Ash Residue Processing

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Calcination/Vitrification Process						
Incinerator Ash	2.18	1.34×10^{-6}	1.46×10^{-7}	0.028	0.000672	0.0000188
SS&C	0.31	1.91×10^{-7}	2.07×10^{-8}	0.00398	0.0000956	2.68×10-6
Graphite Fines	0.18	1.11×10^{-7}	1.20×10^{-8}	0.00231	0.0000555	1.55×10^{-6}
Inorganic Ash	0.12	7.40×10^{-8}	8.02×10^{-9}	0.00154	0.000037	1.04×10^{-6}
All Ash Residues	2.79	1.72×10^{-6}	1.86×10^{-7}	0.0358	0.00086	0.0000241
Blend Down Process – Building 707						
Incinerator Ash	2.47	2.21×10^{-6}	2.39×10^{-7}	0.046	0.0011	0.0000309
SS&C	1.61	3.29×10^{-7}	3.56×10^{-8}	0.00685	0.000164	4.61×10^{-6}
Graphite Fines	0.2	1.79×10^{-7}	1.93×10^{-8}	0.00372	0.0000893	2.50×10^{-6}
Inorganic Ash	0.64	1.31×10^{-7}	1.42×10^{-8}	0.00272	0.0000654	1.83×10^{-6}
All Ash Residues	4.92	2.84×10^{-6}	3.08×10^{-7}	0.0593	0.00142	0.0000398
Blend Down Process – Building 371						
Incinerator Ash	2.47	1.70×10^{-7}	1.70×10^{-8}	0.00235	0.0000565	1.58×10^{-6}
SS&C	1.61	2.74×10^{-8}	2.74×10^{-9}	0.00038	9.12×10^{-6}	2.55×10^{-7}
Graphite Fines	0.2	1.37×10^{-8}	1.37×10^{-9}	0.000191	4.58×10^{-6}	1.28×10^{-7}
Inorganic Ash	0.64	1.09×10^{-8}	1.09×10^{-9}	0.000151	3.62×10^{-6}	1.01×10^{-7}
All Ash Residues	4.92	2.21×10^{-7}	2.21×10^{-8}	0.00308	0.0000738	2.07×10^{-6}
Cold Ceramification Process						
Incinerator Ash	1.31	1.33×10^{-6}	1.45×10^{-7}	0.0278	0.000667	0.0000187
Graphite Fines	0.11	1.12×10^{-7}	1.21×10^{-8}	0.00233	0.000056	1.57×10^{-6}
Inorganic Ash	0.07	7.13×10^{-8}	7.72×10^{-9}	0.00149	0.0000357	9.98×10^{-7}
All Ash Residues	1.49	1.51×10^{-6}	1.65×10^{-7}	0.0316	0.000759	0.0000213

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality SS&C = sand, slag, and crucible

[a] Sum of postulated accident scenario risks

D.3.4.1.3 Alternative 3 – Processing with Plutonium Separation

The ash residue processing technologies considered for this alternative are the Purex/plutonium metal (or oxide) recovery process and the mediated electrochemical oxidation process. Either incinerator ash or sand, slag, and crucible residues can be processed using the Purex/plutonium metal recovery technology. Incinerator ash and graphite fine residue can be processed using the mediated electrochemical oxidation technology. Both of these processes will be performed in the Savannah River Site F-Canyon or H-Canyon. The ash residues will be preprocessed and packaged at Rocky Flats in Building 707, Module E, before shipment to the Savannah River Site for processing.

Similar accidents are applicable to both ash residue processing technologies and their associated ash residue preprocessing and packaging requirements. **Table D–93** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of preprocessing and packaging the ash residue at Rocky Flats and processing the residue using the Purex/plutonium metal recovery process and mediated electrochemical oxidation process at the Savannah River Site. **Table D–94** summarizes the consequences to the maximally exposed individual, the public, and workers from the accidental releases associated with preprocessing and packaging the residues at Rocky Flats and processing the residues at the Savannah River Site. The risks associated with the preprocessing and packaging at Rocky Flats and the Purex/plutonium metal or oxide recovery process and mediated electrochemical oxidation process at the Savannah River Site are summarized in **Table D–95** and **Table D–96**. The processes at the Savannah River Site can be performed in either the F-Canyon and FB-Line or the H-Canyon and HB-Line. Data are presented in Table D–93, Table D–94, Table D–95, and Table D–96 for both options.

Table D–93 Ash Residue Accident Scenario Parameters for the Purex/ Plutonium Metal or Oxide Recovery and Mediated Electrochemical Oxidation Processes

Rocky Flats Preprocessing and Packaging of Ash Residues for Shipment to the Savannah River Site for Processing						
				Material at Risk (grams)		
				Purex/Plutonium Metal or Oxide Recovery Process		*MEO Process*
Accident Scenario	*Frequency (per year)*	*Ash Residues*	*HEPA Banks*	*Ash (No SS&C)*	*SS&C*	*Ash (No SS&C)*
Explosion	0.00005	2 drums [a]	0	4,000 g	4,000 g	4,000 g
Nuclear Criticality [b]	–	–	–	–	–	–
Fire:						
a. Room	0.0005	5-day supply [c]	2	12,288 g	8,083 g	17,088 g
b. Loading Dock	2.0×10^{-6}	4 drums [d]	0	6,000 g	6,000 g	6,000 g
Spill:						
a. Room	0.008	1 container at the maximum limit [e]	2	600 g	600 g	600 g
b. Glovebox	0.8	1 feed prep container	2	128 g	84.2 g	178 g
c. Loading Dock	0.001	1 drum [f]	0	3,000 g	3,000 g	3,000 g
Earthquake	0.0026	5-day supply [c]	0	12,288 g	8,083 g	17,088 g
Aircraft Crash [g]	0.00003	Consequences enveloped by the earthquake.	–	–	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.1	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [h]	0.3 [h]	0.1	Ground
Aircraft Crash [g]	–	–	–	–	–

Ash Residue Processing at the Savannah River Site F-Canyon				
		Material at Risk (grams)		
		Purex/Plutonium Metal Recovery Process		***MEO Process***
Accident Scenario	***Frequency (per year)***	***Ash (No SS&C)***	***SS&C***	***Ash (No SS&C)***
Explosion:				
a. Hydrogen	0.000015	4,000 g	2,000 g	6,000 g
b. Ion Exchange Column	0.0001	120.5 mg [j]	60.25 mg [j]	180.75 mg [j]
Nuclear Criticality [k]	0.0001	1.0×10^{19} fissions	1.0×10^{19} fissions	1.0×10^{19} fissions
Fire	0.00061	4,000 g	2,000 g	6,000 g
Spill	0.01	–	–	178 g
Earthquake:	0.000125			
a. F-Canyon Liquid		12,000 g	6,000 g	18,000 g
b. FB-Line:				
Powder		1,334 g	500 g	1,500 g
Molten Metal		1,333 g	500 g	1,500 g
Liquid		1,333 g	500 g	1,500 g

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion:				
a. Hydrogen	1.0	0.001	0.005	Elevated
b. Ion Exchange Column	1.0	1.0	1.0	Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated
Earthquake:				
a. F-Canyon Liquid	1.0	0.000047	0.1	Ground
b. FB-Line:				
Powder	1.0	0.002	0.1	Ground
Molten Metal	1.0	0.0022	0.1	Ground
Liquid	1.0	0.000047	0.1	Ground

Ash Residue Processing at the Savannah River Site H-Canyon				
		Material at Risk (grams)		
		Purex/Plutonium Oxide Recovery Process		***MEO Process***
Accident Scenario	***Frequency (per year)***	***Ash (No SS&C)***	***SS&C***	***Ash (No SS&C)***
Explosion:				
a. Hydrogen	0.000015	1,000 g	1,000 g	6,000 g
b. Ion Exchange Column	0.0001	241 mg [j, l]	241 mg [j, l]	241 mg [j]
Nuclear Criticality [k]	0.0001	1.0×10^{19} fissions	1.0×10^{19} fissions	1.0×10^{19} fissions
Fire	0.00061	3,000 g	3,000 g	6,000 g
Spill	0.01	–	–	178 g
Earthquake:	0.000182			
a. H-Canyon Liquid		54,000 g	54,000 g	18,000 g
b. HB-Line Powder		4,000 g [l]	4,000 g [l]	4,000 g
HB-Line Liquid		4,000 g [l]	4,000 g [l]	4,000 g

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion:				
a. Hydrogen	1.0	0.001	0.005	Elevated
b. Ion Exchange Column	1.0	1.0	1.0	Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill	1.0	0.00001	0.005	Elevated

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Earthquake:				
a. H-Canyon Liquid	1.0	0.000047	0.1	Ground
b. HB-Line Powder	1.0	0.002	0.1	Ground
HB-Line Liquid	1.0	0.000047	0.1	Ground

MEO = mediated electrochemical oxidation SS&C = sand, slag, and crucible DR = damage ratio ARF = airborne release fraction RF = respirable fraction

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content. The analysis conservatively assumed the maximum content level and the administrative control level for drums containing ash.

[b] The wet nuclear criticality is not a viable accident scenario for the residue packaging process in Building 707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content. The analysis conservatively assumed the maximum content level and the administrative control level for drums containing ash.

[e] 5 containers per drum of feed. The analysis conservatively assumed the maximum content level and the administrative control level for drums containing ash.

[f] 1 drum at the maximum plutonium content level. The analysis conservatively assumed the maximum content level for a drum containing ash.

[g] Consequences enveloped by the earthquake.

[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[j] Respirable source term value in milligrams of plutonium released up the stack.

[k] Refer to Table D–28 for criticality source term.

[l] Duty cycle = 12.5%.

Table D–94 Summary of the Ash Residue Accident Analysis Doses for the Purex/ Plutonium Metal or Oxide Recovery and Mediated Electrochemical Oxidation Processes

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) Residue for Purex Process at the Savannah River Site							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.0737	Oxide	0.0885	0.00958	1,840	44.2	1.55
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	10,400	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	2.56×10^{-9}	Oxide	4.10×10^{-10}	1.54×10^{-10}	0.0000223	1.15×10^{-6}	3.58×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.80	0.063
Earthquake	0.973	Oxide	1.17	0.127	24,300	584	20.4
Rocky Flats Preprocessing and Packaging of SS&C Residue for Purex Process at the Savannah River Site							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.0485	Oxide	0.0582	0.0063	1,210	29.1	1.02
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	1.68×10^{-9}	Oxide	2.69×10^{-10}	1.01×10^{-10}	0.0000147	7.58×10^{-7}	2.36×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.80	0.063

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Earthquake	0.64	Oxide	0.768	0.0832	16,000	384	13.4
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) Residue for MEO Process at the Savannah River Site							
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.103	Oxide	0.123	0.0133	2,560	61.5	2.15
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	3.56×10^{-9}	Oxide	5.70×10^{-10}	2.14×10^{-10}	0.000031	1.60×10^{-6}	4.98×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.80	0.063
Earthquake	1.35	Oxide	1.62	0.176	33,800	812	28.4
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon—Ash (No SS&C) Residue							
Explosion (Hydrogen)	0.02	Metal	0.00068	0.00024	36.0	3.20	0.002
Explosion (Ion Exchange Column)	0.121	Metal-FB	0.00374	0.00133	193	18.1	0.0112
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.2	Metal	0.0068	0.0024	360	32.0	0.02
Earthquake	0.623	Metal	0.0573	0.0106	2,050	143	13.7
MEO Process at the Savannah River Site F-Canyon—Ash (No SS&C) Residue							
Explosion (Hydrogen)	0.03	Metal	0.00102	0.00036	54.0	4.80	0.003
Explosion (Ion Exchange Column)	0.181	Metal-FB	0.0056	0.00199	289	27.1	0.0168
Criticality	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.3	Metal	0.0102	0.0036	540	48.0	0.03
Spill	8.90×10^{-6}	Metal	3.03×10^{-7}	1.07×10^{-7}	0.016	0.00142	8.90×10^{-7}
Earthquake	0.722	Metal	0.0664	0.0123	2,380	166	15.9
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon—SS&C Residue							
Explosion (Hydrogen)	0.01	Metal	0.00034	0.00012	18.0	1.60	0.001
Explosion (Ion Exchange Column)	0.0603	Metal-FB	0.00187	0.000663	96.4	9.04	0.0056

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	***(grams)***	***Type***	***95% Met***	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.1	Metal	0.0034	0.0012	180	16.0	0.01
Earthquake	0.241	Metal	0.0221	0.00409	794	55.3	5.29
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon—Ash (No SS&C) Residue							
Explosion (Hydrogen)	0.005	Metal	0.00016	0.000048	8.00	0.75	0.0005
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.15	Metal	0.0048	0.00144	240	22.5	0.015
Earthquake	1.07	Metal	0.074	0.015	3,330	215	23.6
MEO Process at the Savannah River Site H-Canyon—Ash (No SS&C) Residue							
Explosion (Hydrogen)	0.03	Metal	0.00096	0.000288	48.0	4.50	0.003
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.3	Metal	0.0096	0.00288	480	45.0	0.03
Spill	8.90×10^{-6}	Metal	2.85×10^{-7}	8.54×10^{-8}	0.0142	0.00134	8.90×10^{-7}
Earthquake	0.903	Metal	0.0623	0.0126	2,800	181	19.9
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon—SS&C Residue							
Explosion (Hydrogen)	0.005	Metal	0.00016	0.000048	8.00	0.75	0.0005
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.15	Metal	0.0048	0.00144	240	22.5	0.015
Earthquake	1.07	Metal	0.074	0.015	3,330	215	23.6

MEI = maximally exposed individual Met = meteorological data SS&C = sand, slag, and crucible
MEO = mediated electrochemical oxidation
[a] 1.0×10^{19} fissions.

Table D–95 Summary of the Ash Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Purex/Plutonium Metal or Oxide Recovery and Mediated Electrochemical Oxidation Processes

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) Residue for Purex Process at the Savannah River Site						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	2.21×10^{-8}	2.40×10^{-9}	0.000461	0.0000111	3.10×10^{-7}
Fire (Dock)	2.00×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	1.64×10^{-13}	6.14×10^{-14}	8.91×10^{-9}	4.61×10^{-10}	1.15×10^{-13}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	1.52×10^{-6}	1.64×10^{-7}	0.0316	0.000759	0.0000425
Rocky Flats Preprocessing and Packaging of SS&C Residue for Purex Process at the Savannah River Site						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	1.45×10^{-8}	1.58×10^{-9}	0.000303	7.27×10^{-6}	2.04×10^{-7}
Fire (Dock)	2.00×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	1.08×10^{-13}	4.04×10^{-14}	5.86×10^{-9}	3.03×10^{-10}	7.54×10^{-14}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	9.99×10^{-7}	1.08×10^{-7}	0.0208	0.000499	0.000014
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) Residue for MEO Process at the Savannah River Site						
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	3.08×10^{-8}	3.33×10^{-9}	0.000641	0.0000154	4.31×10^{-7}
Fire (Dock)	2.00×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	2.16×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	2.28×10^{-13}	8.54×10^{-14}	1.24×10^{-8}	6.41×10^{-10}	1.59×10^{-13}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	2.11×10^{-6}	2.29×10^{-7}	0.044	0.00106	0.0000591
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon—Ash (No SS&C) Residue						
Explosion (Hydrogen)	0.000015	5.10×10^{-12}	1.80×10^{-12}	2.70×10^{-7}	2.40×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.0001	1.87×10^{-10}	6.63×10^{-11}	9.64×10^{-6}	9.04×10^{-7}	4.48×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Fire	0.00061	2.07×10^{-9}	7.32×10^{-10}	0.00011	9.76×10^{-6}	4.88×10^{-9}
Earthquake	0.000125	3.58×10^{-9}	6.62×10^{-10}	0.000128	8.95×10^{-6}	6.85×10^{-7}
MEO Process at the Savannah River Site F-Canyon—Ash (No SS&C) Residue						
Explosion (Hydrogen)	0.000015	7.65×10^{-12}	2.70×10^{-12}	4.05×10^{-7}	3.60×10^{-8}	1.80×10^{-11}
Explosion (Ion Exchange Column)	0.0001	2.80×10^{-10}	9.94×10^{-11}	0.0000145	1.36×10^{-6}	6.72×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	3.11×10^{-9}	1.10×10^{-9}	0.000165	0.0000146	7.32×10^{-9}
Spill	0.01	1.51×10^{-12}	5.34×10^{-13}	8.01×10^{-8}	7.12×10^{-9}	3.56×10^{-12}
Earthquake	0.000125	4.15×10^{-9}	7.67×10^{-10}	0.000149	0.0000104	7.94×10^{-7}
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon—SS&C Residue						
Explosion (Hydrogen)	0.000015	2.55×10^{-12}	9.00×10^{-13}	1.35×10^{-7}	1.20×10^{-8}	6.00×10^{-12}
Explosion (Ion Exchange Column)	0.0001	9.34×10^{-11}	3.31×10^{-11}	4.82×10^{-6}	4.52×10^{-7}	2.24×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.04×10^{-9}	3.66×10^{-10}	0.0000549	4.88×10^{-6}	2.44×10^{-9}
Earthquake	0.000125	1.38×10^{-9}	2.56×10^{-10}	0.0000496	3.46×10^{-6}	2.65×10^{-7}
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon—Ash (No SS&C) Residue						
Explosion (Hydrogen)	0.000015	1.20×10^{-12}	3.60×10^{-13}	6.00×10^{-8}	5.63×10^{-9}	3.00×10^{-12}
Explosion (Ion Exchange Column)	0.0001	4.37×10^{-11}	1.33×10^{-11}	2.14×10^{-6}	2.12×10^{-7}	1.12×10^{-10}
Criticality	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.46×10^{-9}	4.39×10^{-10}	0.0000732	6.86×10^{-6}	3.66×10^{-9}
Earthquake	0.000182	2.24×10^{-9}	4.54×10^{-10}	0.0001	6.48×10^{-6}	1.14×10^{-6}
MEO Process at the Savannah River Site H-Canyon—Ash (No SS&C) Residue						
Explosion (Hydrogen)	0.000015	7.20×10^{-12}	2.16×10^{-12}	3.60×10^{-7}	3.38×10^{-8}	1.80×10^{-11}
Explosion (Ion Exchange)	0.0001	3.49×10^{-10}	1.06×10^{-10}	0.0000171	1.70×10^{-6}	8.97×10^{-10}
Criticality	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.93×10^{-9}	8.78×10^{-10}	0.000146	0.0000137	7.32×10^{-9}
Spill	0.01	1.42×10^{-12}	4.27×10^{-13}	7.12×10^{-8}	6.68×10^{-9}	3.56×10^{-12}
Earthquake	0.000182	5.67×10^{-9}	1.15×10^{-10}	0.000255	0.0000164	1.45×10^{-6}

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon—SS&C Residue						
Explosion (Hydrogen)	0.000015	1.20×10^{-12}	3.60×10^{-13}	6.00×10^{-8}	5.63×10^{-9}	3.00×10^{-12}
Explosion (Ion Exchange Column)	0.0001	4.37×10^{-11}	1.33×10^{-11}	2.14×10^{-6}	2.12×10^{-7}	1.12×10^{-10}
Criticality	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.46×10^{-9}	4.39×10^{-10}	0.0000732	6.86×10^{-6}	3.66×10^{-9}
Earthquake	0.000182	2.24×10^{-9}	4.54×10^{-10}	0.0001	6.48×10^{-6}	1.14×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data SS&C = sand, slag, and crucible
MEO = mediated electrochemical oxidation

Table D–96 Alternative 3 Accident Risks During Ash Residue Processing

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) for Purex Process at the Savannah River Site						
Incinerator Ash	1.41	2.19×10^{-6}	2.37×10^{-7}	0.0457	0.0011	0.0000606
Rocky Flats Preprocessing and Packaging of SS&C Residue for Purex Process at the Savannah River Site						
SS&C	0.31	3.18×10^{-7}	3.45×10^{-8}	0.00663	0.000159	4.46×10^{-6}
Rocky Flats Preprocessing and Packaging of Ash (No SS&C) for MEO Process at the Savannah River Site						
Incinerator Ash	1.03	2.22×10^{-6}	2.41×10^{-7}	0.0463	0.00111	0.0000615
Graphite Fines	0.08	1.72×10^{-7}	1.87×10^{-8}	0.00359	0.0000862	4.78×10^{-6}
Sum	1.11	2.39×10^{-6}	2.59×10^{-7}	0.0499	0.0012	0.0000663
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon – Ash (No SS&C) Residue						
Incinerator Ash	4.00	2.56×10^{-8}	6.73×10^{-9}	0.00105	0.000085	2.77×10^{-6}
MEO Process at the Savannah River Site F-Canyon – Ash (No SS&C) Residue						
Incinerator Ash	2.16	1.75×10^{-8}	4.72×10^{-9}	0.000743	0.0000605	1.74×10^{-6}
Graphite Fines	0.17	1.38×10^{-9}	3.72×10^{-10}	0.0000585	4.76×10^{-6}	1.37×10^{-7}
Sum	2.33	1.89×10^{-8}	5.10×10^{-9}	0.000801	0.0000653	1.87×10^{-6}
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon – SS&C Residue						
SS&C	1.00	3.07×10^{-9}	8.76×10^{-10}	0.000125	0.0000104	2.69×10^{-7}
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon – Ash (No SS&C) Residue						
Incinerator Ash	15.83	6.64×10^{-8}	1.67×10^{-8}	0.00301	0.000238	0.0000181
MEO Process at the Savannah River Site H-Canyon – Ash (No SS&C) Residue						
Incinerator Ash	2.16	2.03×10^{-8}	4.94×10^{-9}	0.000936	0.000072	3.15×10^{-6}

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Graphite Fines	0.17	1.60×10^{-9}	3.89×10^{-10}	0.0000737	5.67×10	2.48×10^{-7}
Sum	2.33	2.19×10^{-8}	5.33×10^{-9}	0.00101	0.0000777	3.39×10^{-6}
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon - SS&C Residue						
SS&C	1.58	6.63×10^{-9}	1.67×10^{-9}	0.000301	0.0000237	1.81×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality SS&C = sand, slag, and crucible MEO = mediated electrochemical oxidation

[a] Sum of postulated accident scenario risks

D.3.4.1.4 Alternative 4 – Combination of Processing Technologies

Ash residue processing technologies considered for this alternative are calcination/cementation and repackaging. All ash residue (incinerator ash; sand, slag, and crucible; graphite fines; and inorganic ash) can be processed using either technology. The calcination/cementation process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.1.1, Alternative 1 - No Action. Refer to Section D.3.4.1.1 for details.

The repackaging process will be performed at Rocky Flats in Building 707, Module E. **Table D–97** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the repackaging of ash at Rocky Flats. **Table D–98** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the repackaging of ash residue. The risks associated with repackaging are summarized in **Table D–99** and **Table D–100**.

Table D–97 Ash Residue Accident Scenario Parameters for the Repackaging Process at Rocky Flats

Accident Scenario	Frequency (per year)	Ash Residues	HEPA Banks	Material at Risk (grams)
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 16,320 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.8 0.001	 1 container at the limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 600 g 170 g 3,000 g
Earthquake	0.0026	5-day supply [c]	0	16,320 g
Aircraft Crash	–	The aircraft will not penetrate the building wall.	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion	1.0	0.001	0.1	1.0	Elevated
Nuclear Criticality	–	–	–	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.5	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000) for plutonium content.

[b] The wet criticality is not a viable accident scenario for the repackaging process.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 1 drum at the maximum plutonium content level.

[f] 5 containers per drum of feed.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

Table D–98 Summary of the Ash Residue Accident Doses for the Repackaging Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.4	Oxide	0.48	0.052	10,000	240	8.4
Fire (Room)	0.0979	Oxide	0.118	0.0127	2,450	58.8	2.06
Fire (Dock)	0.0018	Oxide	0.00216	0.000234	45.0	1.08	0.0378
Spill (Room)	1.20×10^{-8}	Oxide	1.92×10^{-9}	7.20×10^{-10}	0.000104	5.40×10^{-6}	1.68×10^{-9}
Spill (Glovebox)	3.40×10^{-9}	Oxide	5.44×10^{-10}	2.04×10^{-10}	0.0000296	1.53×10^{-6}	4.76×10^{-10}
Spill (Dock)	0.003	Oxide	0.0036	0.00039	75.0	1.8	0.063
Earthquake	1.29	Oxide	1.55	0.168	32,300	776	27.1

MEI = maximally exposed individual Met = meteorological data

Table D–99 Summary of Ash Residue Accident Risks for the Repackaging Process at Rocky Flats in Terms of Latent Cancer Fatalities per Year

Accident Scenario	*Accident Frequency (per year)*	*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-17}

Accident Scenario	Accident Frequency (per year)	MEI (rem)		Population (person-rem)		Worker (rem)
		95% Met	50% Met	95% Met	50% Met	50% Met
Fire (Room)	0.0005	2.94×10^{-8}	3.18×10^{-9}	0.000612	0.0000147	4.11×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.16×10^{-12}	2.34×10^{-13}	4.50×10^{-8}	1.08×10^{-9}	3.02×10^{-11}
Spill (Room)	0.008	7.68×10^{-15}	2.88×10^{-15}	4.18×10^{-10}	1.67×10^{-11}	5.38×10^{-15}
Spill (Glovebox)	0.8	2.18×10^{-13}	8.16×10^{-14}	1.18×10^{-8}	6.12×10^{-10}	5.27×10^{-13}
Spill (Dock)	0.001	1.80×10^{-9}	1.95×10^{-10}	0.0000375	9.00×10^{-7}	2.52×10^{-8}
Earthquake	0.0026	2.02×10^{-6}	2.18×10^{-7}	0.042	0.00101	0.0000565

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality

Table D–100 Alternative 4 Accident Risks During Ash Residue Repackaging

Ash Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Incinerator Ash	1.07	2.20×10^{-6}	2.39×10^{-7}	0.0459	0.00110	0.0000611
SS&C	0.15	3.09×10^{-7}	3.35×10^{-8}	0.00644	0.000154	8.56×10^{-6}
Graphite Fines	0.09	1.85×10^{-7}	2.01×10^{-8}	0.00386	0.0000927	5.14×10^{-6}
Inorganic Ash	0.06	1.34×10^{-7}	1.24×10^{-8}	0.00257	0.0000618	3.42×10^{-6}
Sum	1.37	2.82×10^{-6}	3.06×10^{-7}	0.0588	0.00141	0.0000782

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality SS&C = sand, slag, and crucible
[a] Sum of postulated accident scenario risks

D.3.4.2 Pyrochemical Salt Residues

D.3.4.2.1 Alternative 1 – No Action

The processing technology considered for this alternative is pyro-oxidizing of the pyrochemical salt residues. The pyro-oxidizing process will be performed at Rocky Flats in Building 707, Module A.

Table D–101 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of pyro-oxidizing the pyrochemical salt residue at Rocky Flats. **Table D–102** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of pyrochemical salt residues. The risks associated with this processing technology are summarized in **Table D–103** and **Table D–104**.

Table D–101 Pyrochemical Salt Residue Accident Scenario Parameters

Accident Scenario	Frequency (per year)	Pyrochemical Salt Residues	HEPA Banks	Material at Risk (grams)		DR	ARF	RF	LPF	Release Point
				DOR Salt Residue	MR and MSE Salt Residue					
Explosion	0.00005	2 drums [a]	0	4,000 g	4,000 g	1.0	0.001	0.001	1.0	Ground

Accident Scenario	Frequency (per year)	Pyrochemical Salt Residues	HEPA Banks	Material at Risk (grams)		DR	ARF	RF	LPF	Release Point
				DOR Salt Residue	MR and MSE Salt Residue					
Nuclear Criticality [b]	–	–	–	–	–	–	–	–	–	–
Fire:										
a. Room	0.0005	5-day supply [c]	2	2,672 g	4,800 g	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	2.0×10^{-6}	4 drums [d]	0	6,000 g	6,000 g	0.01	0.006	0.01	0.5	Ground
Spill:										
a. Room	0.008	1 container at the limit [e]	2	600 g	600 g	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
b. Glovebox	0.8	1 feed prep container	2	83.5 g	150 g	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
c. Loading Dock	0.001	1 drum [f]	0	3,000 g	3,000 g	0.25	0.00008	0.001	0.1	Ground
Earthquake	0.0026	5-day supply [c]	0	2,672 g	4,800 g	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–	–	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor DOR = direct oxide reduction
ER = electrorefining MSE = molten salt extraction

[a] 1 drum at the maximum plutonium content level (3,000 grams) and 1 drum at the administrative control level (1,000 grams) for plutonium content.
[b] The wet nuclear criticality is not a viable accident scenario for the pyro-oxidizing technology assessment.
[c] 3-day supply of feed and 2-day supply of product.
[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[e] 5 containers per drum of feed.
[f] 1 drum at the maximum plutonium content level.
[g] Add 0.000192 to ARF×RF value for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

Table D–102 Summary of the Pyrochemical Salt Residue Accident Analysis Doses

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Process Direct Oxide Reduction Salt Residue							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.016	Salt-M	0.257	0.0273	4,490	107	2.89
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	3.34×10^{-12}	Salt-M	7.01×10^{-12}	2.64×10^{-12}	3.21×10^{-7}	1.64×10^{-8}	4.01×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.212	Salt-M	3.39	0.36	59,300	1,420	38.1
Process Electrofining and Molten Salt Extraction Salt Residue							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0288	Salt-M	0.461	0.049	8,060	193	5.18
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	6.00×10^{-12}	Salt-M	1.26×10^{-11}	4.74×10^{-12}	5.76×10^{-7}	2.94×10^{-8}	7.20×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.38	Salt-M	6.08	0.646	106,000	2,550	68.4

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt

Table D–103 Summary of the Pyrochemical Salt Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Process Direct Oxide Reduction Salt Residue						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	6.41×10^{-8}	6.81×10^{-9}	0.00112	0.0000269	5.77×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	2.81×10^{-15}	1.06×10^{-15}	1.28×10^{-10}	6.55×10^{-12}	1.28×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	4.40×10^{-6}	4.68×10^{-7}	0.077	0.00184	0.0000792
Process Electrofining and Molten Salt Extraction Salt Residue						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.15×10^{-7}	1.22×10^{-8}	0.00202	0.0000482	1.04×10^{-6}
Fire (Dock)	2.0×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	5.04×10^{-15}	1.90×10^{-15}	2.30×10^{-10}	1.18×10^{-11}	2.30×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	7.91×10^{-6}	8.40×10^{-7}	0.138	0.00331	0.000142

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–104 Alternative 1 Accident Risks During Salt Residue Processing

Salt Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
DOR Salt (IDCs 365, 413, 427)	1.00	4.47×10^{-6}	4.75×10^{-7}	0.0782	0.00187	0.0000295
DOR Salt (All other IDCs)	0.37	1.65×10^{-6}	1.76×10^{-7}	0.0289	0.000692	0.0000798
MSE Salt (IDC 409)	0.95	7.62×10^{-6}	8.10×10^{-7}	0.133	0.00319	0.000033
ER and MSE Salt (All other IDCs)	2.30	0.0000185	1.96×10^{-6}	0.323	0.00773	0.00136
All Salt Residues	4.62	0.0000323	3.42×10^{-6}	0.563	0.0135	0.000575

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality DOR = direct oxide reduction ER = electrorefining MSE = molten salt extraction
[a] Sum of postulated accident scenario risks

D.3.4.2.2 Alternative 2 – Processing without Plutonium Separation

The pyrochemical salt residues processing technology considered for this alternative is the blend down process. The blend down process will be performed at Rocky Flats in Building 707, Modules A, D, and E. Building 371 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process. **Table D–105** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the pyrochemical salt processing technology at Rocky Flats. **Table D–106** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of pyrochemical salt residues. The risks associated with this processing technology are summarized in **Table D–107** and **Table D–108**.

Table D–105 Pyrochemical Salt Residue Accident Scenario Parameters

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0/2 [b]	4,000 g
Nuclear Criticality [c]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [d]	2	1,650g
b. Loading Dock	2.0×10^{-6}	4 drums [e]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the limit [f]	2	600 g
b. Glovebox	0.8	1 feed prep container	2	165 g
c. Loading Dock	0.001	1 drum [g]	0	3,000 g
Earthquake:				
a. Building 707	0.0026	5-day supply [d]	0	1,650 g
b. Building 371	0.000094	5-day supply [d]	0	1,650 g
Aircraft Crash:				
a. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–
b. Building 371	0.00004	The aircraft will not penetrate the building walls.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707	1.0	0.001	0.001	1.0	Ground
b. Building 371	1.0	0.001	0.001	2.0×10^{-6}	Elevated
Nuclear Criticality [c]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.001	0.1	Ground
Earthquake	1.0	0.002 [h]	0.3 [h]	0.1	Ground

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Aircraft Crash:					
a. Building 707 [j]	–	–	–	–	–
b. Building 371 [k]	–	–	–	–	–

DR= damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.

[c] The wet nuclear criticality is not a viable accident scenario for the blend down technology assessment.

[d] 3-day supply of feed and 2-day supply of product.

[e] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[f] 5 containers per drum of feed.

[g] 1 drum at the maximum plutonium content level.

[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[j] The aircraft will not penetrate the building walls.

[k] Consequences enveloped by the earthquake.

Table D–106 Summary of the Pyrochemical Salt Residue Accident Analysis Doses

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 707							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0099	Salt-M	0.158	0.0168	2,770	66.3	1.78
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	6.60×10^{-12}	Salt-M	1.39×10^{-11}	5.21×10^{-12}	6.34×10^{-7}	3.23×10^{-8}	7.92×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.131	Salt-M	2.09	0.222	36,600	876	23.5

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Building 371							
Explosion	8.00×10^{-9}	Salt-M	1.52×10^{-7}	1.76×10^{-8}	0.00216	0.0000512	1.28×10^{-7}
Fire (Room)	0.00990	Salt-M	0.238	0.0238	2,770	66.3	1.78
Fire (Dock)	0.00180	Salt-M	0.0432	0.00432	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	4.56×10^{-10}	5.28×10^{-11}	6.48×10^{-6}	1.54×10^{-7}	3.84×10^{-10}
Spill (Glovebox)	6.60×10^{-12}	Salt-M	1.25×10^{-10}	1.45×10^{-11}	1.78×10^{-6}	4.22×10^{-8}	1.06×10^{-10}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000144	0.0000144	1.68	0.0402	0.00108
Earthquake	0.131	Salt-M	3.14	0.314	36,600	876	23.5

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt

Table D–107 Summary of the Pyrochemical Salt Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Building 707						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	3.96×10^{-8}	4.21×10^{-9}	0.000693	0.0000166	3.56×10^{-7}
Fire (Dock)	2.0×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	5.54×10^{-15}	2.09×10^{-15}	2.53×10^{-10}	1.29×10^{-11}	2.53×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	2.72×10^{-6}	2.89×10^{-7}	0.0476	0.000114	0.0000489
Building 371						
Explosion	0.00005	3.80×10^{-15}	4.40×10^{-16}	5.40×10^{-11}	1.28×10^{-12}	2.56×10^{-15}
Fire (Room)	0.0005	5.94×10^{-8}	5.94×10^{-9}	0.000693	0.0000166	3.56×10^{-7}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-11}	4.32×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	1.82×10^{-15}	2.11×10^{-16}	2.59×10^{-11}	6.14×10^{-13}	1.23×10^{-15}
Spill (Glovebox)	0.8	5.02×10^{-14}	5.81×10^{-15}	7.13×10^{-10}	1.69×10^{-11}	3.38×10^{-14}
Spill (Dock)	0.001	7.20×10^{-11}	7.20×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.000094	1.47×10^{-7}	1.47×10^{-8}	0.00172	0.0000412	1.77×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–108 Alternative 2 Accident Risks During Salt Residue Processing

Salt Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 707						
DOR Salt (IDCs 365, 413, 427)	1.62	4.47×10^{-6}	4.75×10^{-7}	0.0782	0.00187	0.0000799
DOR Salt (All other IDC's	0.60	1.66×10^{-6}	1.76×10^{-7}	0.029	0.000693	0.0000296
ER and MSE Salt (IDC 409)	2.76	7.62×10^{-6}	8.09×10^{-7}	0.133	0.00319	0.000136
ER and MSE Salt (All other IDCs)	6.70	0.0000185	1.96×10^{-6}	0.324	0.00774	0.00033
All Salt Residues	11.68	0.0000322	3.42×10^{-6}	0.564	0.0135	0.000576
Building 371						
DOR Salt (IDCs 365, 413, 427)	1.62	3.35×10^{-7}	3.35×10^{-8}	0.00391	0.0000936	3.44×10^{-6}
DOR Salt (All other IDCs)	0.60	1.24×10^{-7}	1.24×10^{-8}	0.00145	0.0000347	1.28×10^{-6}
ER and MSE Salt (IDC 409)	2.76	5.71×10^{-7}	5.71×10^{-8}	0.00666	0.000159	5.87×10^{-6}
ER and MSE Salt (All other IDCs)	6.70	1.39×10^{-6}	1.39×10^{-7}	0.0162	0.000387	0.0000142
All Salt Residues	11.68	$2.42\times^{-6}$	2.42×10^{-7}	0.0282	0.000675	0.0000248

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality DOR = direct oxide reduction
ER = electrorefining MSE = molten salt extraction
[a] Sum of postulated accident scenario risks

D.3.4.2.3 Alternative 3 – Processing with Plutonium Separation

The pyrochemical salt residues processing technologies considered for this alternative are salt distillation, water leach, acid dissolution, and salt scrub.

- **Salt Distillation Technology—**The salt distillation technology is only used to treat sodium chloride/ potassium chloride salts. Processing of pyrochemical salt residues with the salt distillation process may be performed at either Rocky Flats or Los Alamos National Laboratory. At Rocky Flats, the process will be performed in Building 707, Modules A and B. For processing at Los Alamos National Laboratory, the preprocessing and packaging of the residues at Rocky Flats will be performed in Building 707, Module A. The salt distillation process will be performed in Los Alamos National Laboratory Technical Area 55.

  Similar accidents are applicable to all the technologies at both of the sites. **Table D–109** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of pyrochemical salt processing with the salt distillation technology at Rocky Flats. **Table D–110** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental

releases associated with the processing of pyrochemical salt residues at Rocky Flats. The risks associated with this processing technology at Rocky Flats are summarized in **Table D–111** and **Table D–112**.

Table D–109 Pyrochemical Salt Residue Accident Scenario Parameters for the Salt Distillation Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 7,014 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.8 0.001	 1 container at the maximum limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 600 g 222 g 3,000 g
Earthquake	0.0026	5-day supply [c]	0	7,014 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.001	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.1 0.5	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 1.0 1.0 0.25	 0.00002 0.00002 0.00008	 0.001 0.001 0.001	 2.0×10^{-6} 2.0×10^{-6} 0.1	 Elevated Elevated Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the salt distillation process in Building 707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 5 containers per drum of feed.

[f] 1 drum at the maximum plutonium content level.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

Table D–110 Summary of the Pyrochemical Salt Residue Accident Analysis Doses for the Salt Distillation Process at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72

Accident Scenario	Building Source Term		MEI (rem)		Population (person-rem)		Worker (rem)
	(grams)	Type	95% Met	50% Met	95% Met	50% Met	50% Met
Fire (Room)	0.0426	Salt-M	0.682	0.0725	11,900	286	7.67
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	8.88×10^{-12}	Salt-M	1.86×10^{-11}	7.02×10^{-12}	8.52×10^{-7}	4.35×10^{-8}	1.07×10^{-11}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.563	Salt-M	9.00	0.956	158,000	3,770	101

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt

Table D–111 Summary of the Pyrochemical Salt Residue Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Salt Distillation Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.70×10^{-7}	1.81×10^{-8}	0.00298	0.0000714	1.53×10^{-6}
Fire (Dock)	2.00×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	7.46×10^{-15}	2.81×10^{-15}	3.41×10^{-10}	1.74×10^{-11}	3.41×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	0.0000117	1.24×10^{-6}	0.205	0.0049	0.000211

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–112 Alternative 3 Accident Risks During the Salt Distillation Process at Rocky Flats

Salt Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
ER and MSE Salt (IDC 409)	0.64	7.60×10^{-6}	8.08×10^{-7}	0.133	0.00318	0.000136
ER and MSE Salt (All other IDCs)	1.56	0.0000185	1.97×10^{-6}	0.324	0.00776	0.000331
Sum	2.20	0.0000261	2.78×10^{-6}	0.457	0.0109	0.000467

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality ER = electrorefining
MSE = molten salt extraction
[a] Sum of postulated accident scenario risks

Table D–113 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of preprocessing and packaging the pyrochemical salt residue at Rocky Flats and processing the residue using the salt distillation technology at Los Alamos National Laboratory. **Table D–114** summarizes

the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the preprocessing and packaging of the residues at Rocky Flats and the processing of pyrochemical salt residues at Los Alamos National Laboratory. The risks associated with the preprocessing and packaging at Rocky Flats and processing using the salt distillation technology at Los Alamos National Laboratory are summarized in **Table D–115** and **Table D–116**.

Table D–113 Pyrochemical Salt Residue Accident Scenario Parameters for the Salt Distillation Process at Los Alamos National Laboratory

Rocky Flats Preprocessing and Packaging of Electrorefining and Molten Salt Extraction Residue for Shipment to Los Alamos National Laboratory				
Accident Scenario	***Frequency (per year)***	***Pyrochemical Salt Residues***	***HEPA Banks***	***Material at Risk (grams)***
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 7,104 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.8 0.001	 1 container at the maximum limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 600 g 222 g 3,000 g
Earthquake	0.0026	5-day supply [c]	0	7,104 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	***DR***	***ARF***	***RF***	***LPF***	***Release Point***
Explosion	1.0	0.001	0.001	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.1 0.5	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 1.0 1.0 0.25	 0.00002 0.00002 0.00008	 0.001 0.001 0.001	 2.0×10^{-6} 2.0×10^{-6} 0.1	 Elevated Elevated Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

Salt Distillation Processing at Los Alamos National Laboratory		
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***
Explosion [j]	–	–
Nuclear Criticality	0.0001	1.0×10^{-18} fissions
Fire	0.0005	4,112 g
Spill	0.003	3,000 g
Earthquake	0.0005	5,112 g
Aircraft Crash [k]	–	–

Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Nuclear Criticality	–	–	–	Elevated
Fire	1.0	0.00006	0.011	Ground
Spill	1.0	0.00001	4.00×10^{-9}	Elevated

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Earthquake	1.0	0.000792	0.1	Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the residue preprocessing and packaging process in Building 707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 5 containers per drum of feed.

[f] 1 drum at the maximum plutonium content level.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

[j] Neither of the explosions postulated in the Technical Area 55 Safety Analysis Report (LANL 1996) would breach the integrity of the gloveboxes proposed for the processing of the Rocky Flats residues.

[k] The Technical Area 55 Safety Analysis Report (LANL 1996) stated that an aircraft crash into Technical Area 55 is not a credible event.

Table D–114 Summary of the Accident Analysis Doses for the Salt Distillation Process at Los Alamos National Laboratory

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Preprocessing and Packaging of Electrorefining and Molten Salt Extraction Salt Residue for Shipment to Los Alamos National Laboratory							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0409	Salt-M	0.654	0.0695	11,500	274	7.36
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	8.52×10^{-12}	Salt-M	1.79×10^{-11}	6.73×10^{-12}	8.18×10^{-7}	4.17×10^{-8}	1.02×10^{-11}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.540	Salt-M	8.64	0.918	151,000	3,620	97.2
Salt Distillation Processing of Electrorefining and Molten Salt Extraction Salt Residue at Los Alamos National Laboratory							
Nuclear Criticality	[a]	–	0.137	0.0220	98.8	15.7	0.0450
Fire	0.00337	Salt-O	0.128	0.0165	169	17.2	1.38
Spill	1.20×10^{-10}	Salt-O	3.72×10^{-9}	5.52×10^{-10}	4.32×10^{-6}	6.24×10^{-7}	3.36×10^{-10}
Earthquake	0.405	Salt-O	15.4	1.98	20,200	2,060	166

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-O = oxide salt

[a] 1.0×10^{-18} fissions

Table D–115 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Salt Distillation Process at Los Alamos National Laboratory

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Preprocessing and Packaging of Electrorefining and Molten Salt Extraction Salt Residues for Shipment to Los Alamos National Laboratory						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.64×10^{-7}	1.74×10^{-8}	0.00286	0.0000685	1.47×10^{-6}
Fire (Dock)	2.00×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	7.16×10^{-15}	2.69×10^{-15}	3.27×10^{-10}	1.67×10^{-11}	3.27×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	0.0000112	1.19×10^{-6}	0.196	0.0047	0.000202
Salt Distillation Processing of Electrorefining and Molten Salt Extraction Salt Residues at Los Alamos National Laboratory						
Nuclear Criticality	0.0001	6.85×10^{-9}	1.10×10^{-9}	4.94×10^{-6}	7.85×10^{-7}	1.80×10^{-9}
Fire	0.0005	3.21×10^{-8}	4.13×10^{-9}	0.0000422	4.30×10^{-6}	2.77×10^{-7}
Spill	0.003	5.58×10^{-16}	8.28×10^{-16}	6.48×10^{-13}	9.36×10^{-13}	4.03×10^{-16}
Earthquake	0.0005	3.85×10^{-6}	4.96×10^{-7}	0.00506	0.000516	0.0000664

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–116 Alternative 3 Accident Risks During the Salt Distillation Process at Los Alamos National Laboratory

Salt Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Preprocess Electrorefining and Molten Salt Extraction Salt Residue at Rocky Flats						
ER and MSE Salt (IDC 409)	0.67	7.63×10^{-6}	8.11×10^{-7}	0.134	0.0032	0.000136
ER and MSE Salt (All other IDCs)	1.62	0.0000185	1.96×10^{-6}	0.323	0.00773	0.00033
Sum	2.29	0.0000261	2.77×10^{-6}	0.457	0.0109	0.000466
Process Electrorefining and Molten Salt Extraction Salt Residue at Los Alamos National Laboratory						
ER and MSE Salt (IDC 409)	1.77	6.88×10^{-6}	8.87×10^{-7}	0.00904	0.000923	0.000118
ER and MSE Salt (All other IDCs)	4.20	0.0000166	2.15×10^{-6}	0.0219	0.00223	0.000285
Sum	6.05	0.0000235	3.03×10^{-6}	0.0309	0.00315	0.000403

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality ER = electrorefining
MSE = molten salt extraction
[a] Sum of postulated accident scenario risks

- **Water Leach Technology—**The water leach technology can be used to process all salt residues: direct oxide reduction salts, electrorefining salts, and molten salt extraction salts. At Rocky Flats, this process will be performed on all salts in Building 371, Room 3701. The final calcination in the process will be performed in Building 707A, Module J. The water leach technology also may be used at Los Alamos National Laboratory for the processing of direct oxide reduction salt residues. For processing at Los Alamos National Laboratory, the preprocessing and packaging of the residues at Rocky Flats will be performed in Building 707, Module A. The water leach process will be performed in Los Alamos National Laboratory Technical Area 55, Building PF-4, Room 420.

Table D–117 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of pyrochemical salt processing with the water leach technology at Rocky Flats. **Table D–118** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of pyrochemical salt residues. The risks associated with this processing technology are summarized in **Table D–119** and **Table D–120**.

Table D–117 Pyrochemical Salt Residue Accident Scenario Parameters for the Water Leach Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*		
				Process DOR Salt Residue	*Process ER and MSE Salt Residues*	*Final Calcination*
				Building 371	*Building 371*	*Building 707A* [a]
Explosion	0.00005	2 drums	2/0 [b]	4,000 g [c]	4,000 g	2,000 g
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	1.0×10^{19} fissions	N/A [d]
Fire:						
a. Room	0.0005	5-day supply [e]	2	8,148 g	8,148 g	11,000 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [f]	6,000 g	4,000 g
Spill:						
a. Room	0.008	1 container at the maximum limit	2	600 g [g]	600 g [g]	1,000 g
b. Glovebox	0.8	1 feed prep container	2	200 g	200 g	1,000 g
c. Loading Dock	0.001	1 drum	0	3,000 g [h]	3,000 g	1,000 g
Earthquake:						
a. Building 371	0.000094	5-day supply [e]	0	8,148 g	8,148 g	N/A
b. Building 707A	0.0026	5-day supply [e]	0	N/A	N/A	11,000 g
Aircraft Crash:						
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707A	1.0	0.001	0.001	1.0	Ground
b. Building 371	1.0	0.001	0.001	2.0×10^{-6}	Elevated

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Nuclear Criticality [d, j]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.001	0.1	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [k]	0.3 [k]	0.1	Ground
Aircraft Crash:					
a. Building 707A [l]	–	–	–	–	–
b. Building 371 [m]	–	–	–	–	–

DOR = direct oxide reduction ER = electrorefining MSE = molten salt extraction N/A = not applicable DR = damage ratio
ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product containers are transported from Building 371 to Building 707A for processing.
[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[d] The wet nuclear criticality is not a viable accident scenario for the final calcination process in Building 707A.
[e] 3-day supply of feed and 2-day supply of product.
[f] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[g] 5 containers per drum of feed.
[h] 1 drum at the maximum plutonium content level.
[j] Refer to Table D–28 for Building 371 criticality accident source term.
[k] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[l] Consequences enveloped by the earthquake.
[m] The aircraft will not penetrate the building walls.

Table D–118 Summary of the Pyrochemical Salt Residue Accident Analysis Doses for the Water Leach Process at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Process Direct Oxide Reduction Salt Residue—Building 371							
Explosion	8.00×10^{-9}	Salt-M	1.52×10^{-7}	1.76×10^{-8}	0.00216	0.0000512	1.28×10^{-7}
Criticality (Liquid)	[a]	–	0.79	0.11	6,980	252	0.321
Fire (Room)	0.0489	Salt-M	1.17	0.117	13,700	328	8.80
Fire (Dock)	0.0018	Salt-M	0.0432	0.00432	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	4.56×10^{-10}	5.28×10^{-11}	6.48×10^{-6}	1.54×10^{-7}	3.84×10^{-10}
Spill (Glovebox)	8.00×10^{-12}	Salt-M	1.52×10^{-10}	1.76×10^{-11}	2.16×10^{-6}	5.12×10^{-8}	1.28×10^{-10}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000144	0.0000144	1.68	0.0402	0.00108
Earthquake	0.645	Salt-M	15.5	1.55	181,000	4,320	116
Process Electrorefining and Molten Salt Extraction Salt Residues—Building 371							
Explosion	8.00×10^{-9}	Salt-M	1.52×10^{-7}	1.76×10^{-8}	0.00216	0.0000512	1.28×10^{-7}

Accident Scenario	Building Source Term (grams)	Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Criticality (Liquid)	[a]	–	0.79	0.11	6,980	252	0.321
Fire (Room)	0.0489	Salt-M	1.17	0.117	13,700	328	8.80
Fire (Dock)	0.0018	Salt-M	0.0432	0.00432	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	4.56×10^{-10}	5.28×10^{-11}	6.48×10^{-6}	1.54×10^{-7}	3.84×10^{-10}
Spill (Glovebox)	8.00×10^{-12}	Salt-M	1.52×10^{-10}	1.76×10^{-11}	2.16×10^{-6}	5.12×10^{-8}	1.28×10^{-10}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000144	0.0000144	1.68	0.0402	0.00108
Earthquake	0.645	Salt-M	15.5	1.55	181,000	4,320	116
Final Calcination—Building 707A							
Explosion	0.002	Salt-O	0.028	0.003	520	12.4	0.34
Fire (Room)	0.066	Salt-O	0.924	0.099	17,200	409	11.2
Fire (Dock)	0.0012	Salt-O	0.0168	0.0018	312	7.44	0.204
Spill (Room)	4.00×10^{-11}	Salt-O	7.60×10^{-11}	2.88×10^{-11}	3.60×10^{-6}	1.84×10^{-7}	4.80×10^{-11}
Spill (Glovebox)	4.00×10^{-11}	Salt-O	7.60×10^{-11}	2.88×10^{-11}	3.60×10^{-6}	1.84×10^{-7}	4.80×10^{-11}
Spill (Dock)	2.00×10^{-6}	Salt-O	0.000028	3.00×10^{-6}	0.52	0.0124	0.00034
Earthquake	0.871	Salt-O	12.2	1.31	227,000	5,400	148

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-O = oxide salt
[a] 1.0×10^{19} fissions.

Table D–119 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Water Leach Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Process Direct Oxide Reduction Salt Residues—Building 371						
Explosion	0.00005	3.80×10^{-15}	4.40×10^{-16}	5.40×10^{-11}	1.28×10^{-12}	2.56×10^{-15}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	2.93×10^{-7}	2.93×10^{-8}	0.00342	0.0000819	1.76×10^{-6}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-11}	4.32×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	1.82×10^{-15}	2.11×10^{-16}	2.59×10^{-11}	6.14×10^{-13}	1.23×10^{-15}
Spill (Glovebox)	0.8	6.08×10^{-14}	7.04×10^{-15}	8.64×10^{-10}	2.05×10^{-11}	4.10×10^{-14}
Spill (Dock)	0.001	7.20×10^{-11}	7.20×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.000094	7.28×10^{-7}	7.28×10^{-8}	0.00849	0.000203	8.74×10^{-6}
Process Electrorefining and Molten Salt Extraction Salt Residues—Building 371						
Explosion	0.00005	3.80×10^{-15}	4.40×10^{-16}	5.40×10^{-11}	1.28×10^{-12}	2.56×10^{-15}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Fire (Room)	0.0005	2.93×10^{-7}	2.93×10^{-8}	0.00342	0.0000819	1.76×10^{-6}
Fire (Dock)	2.0×10^{-6}	4.32×10^{-11}	4.32×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	1.82×10^{-15}	2.11×10^{-16}	2.59×10^{-11}	6.14×10^{-13}	1.23×10^{-15}
Spill (Glovebox)	0.8	6.08×10^{-14}	7.04×10^{-15}	8.64×10^{-10}	2.05×10^{-11}	4.10×10^{-14}
Spill (Dock)	0.001	7.20×10^{-11}	7.20×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.000094	7.28×10^{-7}	7.28×10^{-8}	0.00849	0.000203	8.74×10^{-6}
Final Calcination—Building 707A						
Explosion	0.00005	7.00×10^{-10}	7.50×10^{-11}	0.000013	3.10×10^{-7}	6.80×10^{-9}
Fire (Room)	0.0005	2.31×10^{-7}	2.48×10^{-8}	0.00429	0.000102	2.24×10^{-6}
Fire (Dock)	2.0×10^{-6}	1.68×10^{-11}	1.80×10^{-12}	3.12×10^{-7}	7.44×10^{-9}	1.63×10^{-10}
Spill (Room)	0.008	3.04×10^{-16}	1.15×10^{-16}	1.44×10^{-11}	7.36×10^{-13}	1.54×10^{-16}
Spill (Glovebox)	0.8	3.04×10^{-14}	1.15×10^{-14}	1.44×10^{-9}	7.36×10^{-11}	1.54×10^{-14}
Spill (Dock)	0.001	1.40×10^{-11}	1.50×10^{-12}	2.60×10^{-7}	6.20×10^{-9}	1.36×10^{-10}
Earthquake	0.0026	0.0000159	1.70×10^{-6}	0.294	0.00702	0.000308

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data DOR = direct oxide reduction

Table D–120 Alternative 3 Accident Risks During the Water Leach Process at Rocky Flats

Salt Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Process Direct Oxide Reduction Salt Residue – Building 371						
IDCs 365, 413, 427	0.33	3.50×10^{-7}	3.55×10^{-8}	0.00405	0.0000983	3.47×10^{-6}
All other IDCs	0.12	1.27×10^{-7}	1.29×10^{-8}	0.00147	0.0000357	1.26×10^{-6}
Sum	0.45	4.77×10^{-7}	4.84×10^{-8}	0.00552	0.000134	4.73×10^{-6}
Process Direct Oxide Reduction Salt Residue – Building 707A						
IDCs 365, 413, 427	0.25	4.02×10^{-6}	4.31×10^{-7}	0.0747	0.00178	0.0000776
All other IDCs	0.09	1.45×10^{-6}	1.55×10^{-7}	0.0269	0.000641	0.0000279
Sum	0.34	5.47×10^{-6}	5.86×10^{-7}	0.102	0.00242	0.0000106
Process Direct Oxide Reduction Salt Residue – Buildings 371 and 707A						
IDCs 365, 413, 427	0.58	4.37×10^{-6}	4.66×10^{-7}	0.0787	0.00188	0.000081
All other IDCs	0.21	1.58×10^{-6}	1.68×10^{-7}	0.0284	0.000677	0.0000292
Sum	0.79	5.95×10^{-6}	6.34×10^{-7}	0.107	0.00256	0.00011
Process Electrorefining and Molten Salt Extraction Salt Residue – Building 371						
IDCs 365, 413, 427	0.56	5.94×10^{-7}	6.03×10^{-8}	0.00687	0.000167	5.88×10^{-6}
All other IDCs	1.34	1.42×10^{-6}	1.44×10^{-7}	0.0164	0.000399	0.0000141
Sum	1.90	2.02×10^{-6}	2.05×10^{-7}	0.0233	0.000566	0.00002
Process Electrorefining and Molten Salt Extraction Salt Residue – Building 707A						
IDCs 365, 413, 427	0.42	6.76×10^{-6}	7.24×10^{-7}	0.125	0.00299	0.00013
All other IDCs	1.01	0.0000162	1.74×10^{-6}	0.302	0.0072	0.000313
Sum	1.43	0.000023	2.46×10^{-6}	0.427	0.0102	0.000444
Process Electrorefining and Molten Salt Extraction Salt Residue – Buildings 371 and 707A						
IDCs 365, 413, 427	0.98	7.35×10^{-6}	7.84×10^{-7}	0.132	0.00316	0.000136
All other IDCs	2.35	0.0000177	1.89×10^{-6}	0.318	0.00759	0.000327
Sum	3.33	0.0000251	2.67×10^{-6}	0.45	0.0108	0.000463

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

Table D–121 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of preprocessing and packaging the direct oxide reduction salt residue at Rocky Flats and of processing the residue using the water leach technology at Los Alamos National Laboratory. **Table D–122** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the preprocessing and packaging of the residues at Rocky Flats and the processing of the pyrochemical salt residues at Los Alamos National Laboratory. The risks associated with the preprocessing and packaging at Rocky Flats and the processing using water leach technology at Los Alamos National Laboratory are summarized in **Table D–123** and **Table D–124**.

Table D–121 Pyrochemical Salt Residue Accident Scenario Parameters for the Water Leach Process at Los Alamos National Laboratory

Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Residue for Shipment to Los Alamos National Laboratory

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire: a. Room b. Loading Dock	 0.0005 2.0×10^{-6}	 5-day supply [c] 4 drums [d]	 2 0	 6,560 g 6,000 g
Spill: a. Room b. Glovebox c. Loading Dock	 0.008 0.8 0.001	 1 container at the maximum limit [e] 1 feed prep container 1 drum [f]	 2 2 0	 600 g 205 g 3,000 g
Earthquake	0.0026	5-day supply [c]	0	6,560 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Residues for Shipment to Los Alamos National Laboratory

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.001	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire: a. Room b. Loading Dock	 1.0 0.01	 0.006 0.006	 0.01 0.01	 0.1 0.5	 Ground Ground
Spill: a. Room b. Glovebox c. Loading Dock	 1.0 1.0 0.25	 0.00002 0.00002 0.00008	 0.001 0.001 0.001	 2.0×10^{-6} 2.0×10^{-6} 0.1	 Elevated Elevated Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

Water Leach Processing of Direct Oxide Reduction Residues at Los Alamos National Laboratory

Accident Scenario	*Frequency (per year)*	*Material at Risk (grams)*
Explosion [j]	–	–
Nuclear Criticality	0.0001	1.0×10^{18} fissions
Fire	0.0005	1,000 g slurry 5,000 g powder
Spill	0.003	205 g
Earthquake	0.0005	1,000 g slurry 5,000 g powder
Aircraft Crash [k]	–	–

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Nuclear Criticality	–	–	–	Elevated
Fire: a. Powder b. Slurry	 1.0 1.0	 0.00006 0.00006	 0.011 0.011	 Ground Ground
Spill	1.0	0.00001	4.00×10^{-9}	Elevated
Earthquake: a. Powder b. Slurry	 1.0 1.0	 0.000792 7.00×10^{-6}	 0.1 0.1	 Ground Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the residue preprocessing and packaging process in Building707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 5 containers per drum of feed.

[f] 1 drum at the maximum plutonium content level.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

[j] Neither of the explosions postulated in the Technical Area 55 Safety Analysis Report (LANL 1996) would breach the integrity of the gloveboxes proposed for the processing of the Rocky Flats residues.

[k] The Technical Area 55 Safety Analysis Report (LANL 1996) stated that an aircraft crash into Technical Area 55 is not a credible event.

Table D–122 Summary of the Accident Analysis Doses for the Water Leach Process at Los Alamos National Laboratory

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Salt Residues for Shipment to Los Alamos National Laboratory							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0394	Salt-M	0.63	0.0669	11,000	264	7.08
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	8.20×10^{-12}	Salt-M	1.72×10^{-11}	6.48×10^{-12}	7.87×10^{-7}	4.02×10^{-8}	9.84×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.52	Salt-M	8.31	0.883	145,000	3,480	93.5
Water Leach Processing of Direct Oxide Reduction Salt Residues at Los Alamos National Laboratory							
Criticality	[a]	–	0.137	0.0220	98.8	15.7	0.0450
Fire	0.00396	Salt-O	0.150	0.0194	198	20.2	1.62
Spill	8.20×10^{-12}	Salt-O	2.54×10^{-10}	3.77×10^{-11}	2.95×10^{-7}	4.26×10^{-8}	2.30×10^{-11}
Earthquake	0.397	Salt-O	15.1	1.94	19,800	2,020	163

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-O = oxide salt

[a] 1.0×10^{18} fissions.

Table D–123 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Water Leach Process at Los Alamos National Laboratory

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr)		Population (LCF/yr)		Worker (LCF/yr)
		95% Met	50% Met	95% Met	50% Met	50% Met
Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Salt Residues for Shipment to Los Alamos National Laboratory						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.57×10^{-7}	1.67×10^{-8}	0.00276	0.0000659	1.42×10^{-6}
Fire (Dock)	2.00×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	6.89×10^{-15}	2.59×10^{-15}	3.15×10^{-10}	1.61×10^{-11}	3.15×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	0.0000108	1.15×10^{-6}	0.189	0.00453	0.000195
Water Leach Processing of Direct Oxide Reduction Salt Residues at Los Alamos National Laboratory						
Criticality	0.0001	6.85×10^{-9}	1.10×10^{-9}	4.94×10^{-6}	7.85×10^{-7}	1.80×10^{-9}
Fire	0.0005	3.76×10^{-8}	4.85×10^{-9}	0.0000495	5.05×10^{-6}	3.25×10^{-7}
Spill	0.003	3.81×10^{-16}	5.66×10^{-17}	4.43×10^{-13}	6.40×10^{-14}	2.76×10^{-17}
Earthquake	0.0005	3.77×10^{-6}	4.86×10^{-7}	0.00496	0.000506	0.0000651

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–124 Alternative 3 Accident Risks During the Water Leach Process at Los Alamos National Laboratory

Salt Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Preprocess Direct Oxide Reduction Salt Residue at Rocky Flats						
IDCs 365, 413, 427	0.41	4.50×10^{-6}	4.78×10^{-7}	0.0787	0.00188	0.0000803
All other IDCs	0.15	1.64×10^{-6}	1.75×10^{-7}	0.0288	0.000689	0.0000294
Sum	0.56	6.14×10^{-6}	6.52×10^{-7}	0.107	0.00257	0.00011
Process Direct Oxide Reduction Salt Residue at Los Alamos National Laboratory						
IDCs 365, 413, 427	0.8	3.05×10^{-6}	3.94×10^{-7}	0.00401	0.000409	0.0000523
All other IDCs	0.3	1.14×10^{-6}	1.48×10^{-7}	0.0015	0.000153	0.0000196
Sum	1.1	4.19×10^{-6}	5.41×10^{-7}	0.00551	0.000563	0.0000719

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

❒ **Acid Dissolution Technology—**The acid dissolution technology can be used to process direct oxide reduction salts. This process will be performed in gloveboxes at the Los Alamos National Laboratory

Technical Area 55, Building PF-4, Room 420. Preprocessing and packaging of the residues at Rocky Flats will be performed in Building 707A, Module A.

Table D–125 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of preprocessing and packaging the direct oxide reduction salt residue at Rocky Flats and of processing the residue using the acid dissolution technology at Los Alamos National Laboratory. **Table D–126** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the preprocessing and packaging of the residues at Rocky Flats and the processing of the pyrochemical salt residues at Los Alamos National Laboratory. The risks associated with the preprocessing and packaging at Rocky Flats and the processing using acid dissolution technology at Los Alamos National Laboratory are summarized in **Table D–127** and **Table D–128**.

Table D–125 Pyrochemical Salt Residue Accident Scenario Parameters for the Acid Dissolution Process at Los Alamos National Laboratory

Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Residue for Shipment to Los Alamos National Laboratory

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [c]	2	6,560 g
b. Loading Dock	2.0×10^{-6}	4 drums [d]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the maximum limit [e]	2	600 g
b. Glovebox	0.8	1 feed prep container	2	205 g
c. Loading Dock	0.001	1 drum [f]	0	3,000 g
Earthquake	0.0026	5-day supply [c]	0	6,560 g
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Residues for Shipment to Los Alamos National Laboratory

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.001	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.001	0.1	Ground
Earthquake	1.0	0.002 [g]	0.3 [g]	0.1	Ground
Aircraft Crash [h]	–	–	–	–	–

Acid Dissolution Processing of Direct Oxide Reduction Residues at Los Alamos National Laboratory

Accident Scenario	*Frequency (per year)*	*Material at Risk (grams)*
Explosion [j]	–	–
Nuclear Criticality	0.0001	1.0×10^{18} fissions

Acid Dissolution Processing of Direct Oxide Reduction Residues at Los Alamos National Laboratory				
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***		
Fire	0.0005	4,100 g		
Spill	0.003	205 g		
Earthquake	0.0005	4,100 g		
Aircraft Crash [k]	–	–		
Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Nuclear Criticality	–	–	–	Elevated
Fire	1.0	0.00006	0.011	Ground
Spill	1.0	0.00001	4.00×10^{-9}	Elevated
Earthquake	1.0	0.000792	0.1	Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the residue preprocessing and packaging process in Building707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 5 containers per drum of feed.

[f] 1 drum at the maximum plutonium content level.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] Consequences enveloped by the earthquake.

[j] Neither of the explosions postulated in the Technical Area 55 Safety Analysis Report (LANL 1996) would breach the integrity of the gloveboxes proposed for the processing of the Rocky Flats residues.

[k] The Technical Area 55 Safety Analysis Report (LANL 1996) stated that an aircraft crash into Technical Area 55 is not a credible event.

Table D–126 Summary of the Accident Analysis Doses for the Acid Dissolution Process at Los Alamos National Laboratory

	Building Source Term		***MEI (rem)***		***Population (person-rem)***		***Worker (rem)***
Accident Scenario	***(grams)***	***Type***	***95% Met***	***50% Met***	***95% Met***	***50% Met***	***50% Met***
Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Salt Residues for Shipment to Los Alamos National Laboratory							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0394	Salt-M	0.63	0.0669	11,000	264	7.08
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	8.20×10^{-12}	Salt-M	1.72×10^{-11}	6.48×10^{-12}	7.87×10^{-7}	4.02×10^{-8}	9.84×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.52	Salt-M	8.31	0.883	145,000	3,480	93.5
Acid Dissolution Processing of Direct Oxide Reduction Salt Residues at Los Alamos National Laboratory							
Criticality	[a]	–	0.137	0.0220	98.8	15.7	0.0450
Fire	0.00271	Salt-O	0.103	0.0133	135	13.8	1.11
Spill	8.20×10^{-12}	Salt-O	2.54×10^{-10}	3.77×10^{-11}	2.95×10^{-7}	4.26×10^{-8}	2.30×10^{-11}
Earthquake	0.325	Salt-O	12.3	1.59	16,200	1,660	133

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-O = oxide salt
[a] 1.0×10^{18} fissions.

Table D–127 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Acid Dissolution Process at Los Alamos National Laboratory

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Preprocessing and Packaging of Direct Oxide Reduction Salt Residues for Shipment to Los Alamos National Laboratory						
Explosion	0.00005	1.60×10^{-9}	1.70×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.57×10^{-7}	1.67×10^{-8}	0.00276	0.0000659	1.42×10^{-6}
Fire (Dock)	2.00×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	6.89×10^{-15}	2.59×10^{-15}	3.15×10^{-10}	1.61×10^{-11}	3.15×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	0.0000108	1.15×10^{-6}	0.189	0.00453	0.000195
Acid Dissolution Processing of Direct Oxide Reduction Salt Residues at Los Alamos National Laboratory						
Criticality	0.0001	6.85×10^{-9}	1.10×10^{-9}	4.94×10^{-6}	7.85×10^{-7}	1.80×10^{-9}
Fire	0.0005	2.57×10^{-8}	3.31×10^{-9}	0.0000338	3.45×10^{-6}	2.22×10^{-7}
Spill	0.003	3.81×10^{-16}	5.66×10^{-17}	4.43×10^{-13}	6.40×10^{-14}	2.76×10^{-17}
Earthquake	0.0005	3.08×10^{-6}	3.98×10^{-7}	0.00406	0.000414	0.0000533

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–128 Alternative 3 Accident Risks During the Acid Dissolution Process at Los Alamos National Laboratory

Salt Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Preprocess Direct Oxide Reduction Salt Residue at Rocky Flats						
IDCs 365, 413, 427	0.41	4.50×10^{-6}	4.78×10^{-7}	0.0787	0.00188	0.0000803
All other IDCs	0.15	1.64×10^{-6}	1.75×10^{-7}	0.0288	0.000689	0.0000294
Sum	0.56	6.14×10^{-6}	6.52×10^{-7}	0.107	0.00257	0.00011
Process Direct Oxide Reduction Salt Residue at Los Alamos National Laboratory						
IDCs 365, 413, 427	0.64	2.00×10^{-6}	2.57×10^{-7}	0.00262	0.000268	0.0000342
All other IDCs	0.24	7.48×10^{-7}	9.65×10^{-8}	0.000983	0.0001	0.0000128
Sum	0.88	2.74×10^{-6}	3.54×10^{-7}	0.00361	0.000368	0.000471

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality IDC = item description code
[a] Sum of postulated accident scenario risks

❒ **Salt Scrub Technology—**The salt scrub technology can be used to process all pyrochemical salt residues. Implementation of this technology requires processing of the residues in Rocky Flats Building 707, Modules A and B. The scrub alloy byproduct of the process will be sent to the Savannah River Site F-Canyon or H-Canyon for final processing.

Table D–129 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of pyrochemical salt processing with the salt scrub technology at Rocky Flats and the Savannah River Site. **Table D–130** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of pyrochemical salt residues. The risks associated with this processing technology are summarized in **Table D–131** and **Table D–132**. The processes at the Savannah River Site can be performed in either the F-Canyon and FB-Line or the H-Canyon and HB-Line. Data are presented in Table D–129, Table D–130, Table D–131, and Table D–132 for both options.

Table D–129 Pyrochemical Salt Residue Accident Scenario Parameters for the Salt Scrub Process at Rocky Flats and the Savannah River Site

Accident Scenario	*Frequency (per year)*	*Pyrochemical Salt Residues*	*HEPA Banks*	*Material at Risk (grams)*
Salt Scrub at Rocky Flats				
Explosion	0.00005	2 drums [a]	0	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [c]	2	7,403 g feed 4,693 g product [d]
b. Loading Dock	2.0×10^{-6}	4 drums [e]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the maximum limit [f]	2	600 g
b. Glovebox	0.8	1 feed prep container	2	168 g
c. Loading Dock	0.001	1 drum [g]	0	3,000 g
Earthquake	0.0026	5-day supply [c]	0	7,403 g feed 4,693 g product [d]
Aircraft Crash	0.00003	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.001	1.0	Ground
Nuclear Criticality [b]	–	–	–	–	–
Fire:					
a. Room					
Feed	1.0	0.006	0.01	0.1	Ground
Product	0.01	0.006	0.01	0.1	Ground
b. Loading Dock	0.01	0.006	0.01	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.001	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.001	0.1	Ground
Earthquake:					
a. Feed	1.0	0.002 [h]	0.3 [h]	0.1	Ground
b. Product	0.01	0.001 [j]	0.1 [j]	0.1	Ground
Aircraft Crash [k]	–	–	–	–	–

Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon				
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***		
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001	 8,000 g 241 mg [l]		
Nuclear Criticality [m]	0.0001	1.0×10^{19} fissions		
Fire	0.00061	8,000 g		
Spill [n]	–	–		
Earthquake: a. F-Canyon: Liquid b. FB-Line: Powder Molten Metal Liquid	0.000125	 24,000 g 2,000 g 2,000 g 2,000 g		
Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [m]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [n]	–	–	–	–
Earthquake: a. F-Canyon: Liquid b. FB-Line: Powder Molten Metal Liquid	 1.0 1.0 1.0 1.0	 0.000047 0.002 0.0022 0.000047	 0.1 0.1 0.1 0.1	 Ground Ground Ground Ground
Purex Process/Plutonium Oxide Recovery at the Savannah River Site H-Canyon				
Accident Scenario	***Frequency (per year)***	***Material at Risk (grams)***		
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001	 6,000 g 241 mg [l]		
Nuclear Criticality [m]	0.0001	1.0×10^{19} fissions		
Fire	0.00061	6,000 g		
Spill [n]	–	–		
Earthquake: a. H-Canyon b. HB-Line: Powder Liquid	0.000182	 18,000 g 4,000 g 4,000 g		
Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [m]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [n]	–	–	–	–

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Earthquake:				
a. H-Canyon:				
Liquid	1.0	0.000047	0.1	Ground
b. HB-Line:				
Powder	1.0	0.002	0.1	Ground
Liquid	1.0	0.000047	0.1	Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the salt scrub and pyro-oxidizing processes in Building 707.

[c] 3-day supply of feed and 2-day supply of product.

[d] 97% (4,693 g) of the product is in alloy form and 3% (145 g) is in salt form. The 145 g in salt form was added to the feed supply.

[e] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[f] 5 containers per drum of feed.

[g] 1 drum at the maximum plutonium content level.

[h] Add 0.000192 to ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[j] Add 0.000192 to ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).

[k] Consequences enveloped by the earthquake.

[l] Respirable source term value in milligrams of plutonium released up the stack.

[m] Refer to Table D–28 for criticality accident source term.

[n] Powder spill is not a viable accident scenario for processing salt residue at the Savannah River Site.

Table D–130 Summary of the Accident Analysis Doses for the Salt Scrub Process at Rocky Flats and the Savannah River Site

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Salt Scrub Process							
Explosion	0.004	Salt-M	0.064	0.0068	1,120	26.8	0.72
Fire (Room)	0.0447	Salt-M	0.715	0.076	12,500	299	8.05
Fire (Dock)	0.0018	Salt-M	0.0288	0.00306	504	12.1	0.324
Spill (Room)	2.40×10^{-11}	Salt-M	5.04×10^{-11}	1.90×10^{-11}	2.30×10^{-6}	1.18×10^{-7}	2.88×10^{-11}
Spill (Glovebox)	6.72×10^{-12}	Salt-M	1.41×10^{-11}	5.31×10^{-12}	6.45×10^{-7}	3.29×10^{-8}	8.06×10^{-12}
Spill (Dock)	6.00×10^{-6}	Salt-M	0.000096	0.0000102	1.68	0.0402	0.00108
Earthquake	0.588	Salt-M	9.40	0.999	165,000	3,940	106
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon							
Explosion (Hydrogen)	0.04	Salt-M	0.0088	0.00328	480	40.0	0.0264
Explosion (Ion Exchange)	0.241	Salt-FB	0.00771	0.00265	386	36.2	0.0231
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.4	Salt-M	0.0880	0.0328	4,800	400	0.264
Earthquake	0.962	Salt-M	0.577	0.106	20,200	1,440	144

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Purex Process/Plutonium Oxide Recovery at the Savannah River Site H-Canyon							
Explosion (Hydrogen)	0.03	Salt-M	0.0063	0.00189	330	28.8	0.0198
Explosion (Ion Exchange)	0.241	Salt-HB	0.00747	0.00205	354	34.7	0.0231
Criticality (Liquid)	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.3	Salt-M	0.0630	0.0189	3,300	288	0.198
Earthquake	0.903	Salt-M	0.407	0.0813	18,100	1,170	136

MEI = maximally exposed individual Met = meteorological data Salt-M = metal salt Salt-FB = FB-Line salt
Salt-HB = HB-Line salt
[a] 1.0×10^{19} fissions.

Table D–131 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Salt Scrub Process at Rocky Flats and the Savannah River Site

Rocky Flats Salt Scrub Process						
Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion	0.00005	1.60×10^{-9}	1.71×10^{-10}	0.000028	6.70×10^{-7}	1.44×10^{-8}
Fire (Room)	0.0005	1.79×10^{-7}	1.90×10^{-8}	0.00313	0.0000749	1.61×10^{-6}
Fire (Dock)	2.0×10^{-6}	2.88×10^{-11}	3.06×10^{-12}	5.04×10^{-7}	1.21×10^{-8}	2.59×10^{-10}
Spill (Room)	0.008	2.02×10^{-16}	7.58×10^{-17}	9.22×10^{-12}	4.70×10^{-13}	9.22×10^{-17}
Spill (Glovebox)	0.8	5.64×10^{-15}	2.12×10^{-15}	2.58×10^{-10}	1.32×10^{-11}	2.58×10^{-15}
Spill (Dock)	0.001	4.80×10^{-11}	5.10×10^{-12}	8.40×10^{-7}	2.01×10^{-8}	4.32×10^{-10}
Earthquake	0.0026	0.0000122	1.30×10^{-6}	0.214	0.00512	0.00022
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon						
Explosion (Hydrogen)	0.000015	6.60×10^{-11}	2.46×10^{-11}	3.60×10^{-6}	3.00×10^{-7}	1.58×10^{-10}
Explosion (Ion Exchange)	0.0001	3.86×10^{-10}	1.33×10^{-10}	0.0000193	1.81×10^{-6}	9.25×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.68×10^{-8}	1.00×10^{-8}	0.00146	0.000122	6.44×10^{-8}
Earthquake	0.000125	3.61×10^{-8}	6.62×10^{-9}	0.00126	0.0000902	0.0000144
Purex Process/Plutonium Oxide Recovery at the Savannah River Site H-Canyon						
Explosion (Hydrogen)	0.000015	4.73×10^{-11}	1.42×10^{-11}	2.48×10^{-6}	2.16×10^{-7}	1.19×10^{-10}
Explosion (Ion Exchange)	0.0001	3.74×10^{-10}	1.02×10^{-10}	0.0000177	1.74×10^{-6}	9.25×10^{-10}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Criticality (Liquid)	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.92×10^{-8}	5.76×10^{-9}	0.00101	0.0000878	4.83×10^{-8}
Earthquake	0.000182	3.70×10^{-8}	7.40×10^{-9}	0.00164	0.000107	0.0000197

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–132 Alternative 3 Accident Risks During the Salt Scrub Process at Rocky Flats and the Purex Process at Savannah River Site

Salt Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Salt Scrub at Rocky Flats						
DOR Salt (IDCs 365, 413, 427)	0.22	2.73×10^{-6}	2.90×10^{-7}	0.0478	0.00114	0.0000488
DOR Salt (all other IDCs)	0.08	9.92×10^{-7}	1.05×10^{-7}	0.0174	0.000416	0.0000177
MSE Salt (IDC 409)	0.38	4.71×10^{-6}	5.01×10^{-7}	0.0825	0.00197	0.0000842
ER and MSE Salt (all other IDCs)	0.91	0.0000113	1.20×10^{-6}	0.198	0.00473	0.000202
All Salt Residues	1.59	0.0000197	2.10×10^{-6}	0.345	0.00826	0.000352
Purex/Plutonium Metal Recovery at Savannah River Site F-Canyon						
DOR Salt (IDCs 365, 413, 427)	0.22	1.41×10^{-8}	3.74×10^{-9}	0.000608	0.0000475	3.19×10^{-6}
DOR Salt (all other IDCs)	0.08	5.11×10^{-9}	1.36×10^{-9}	0.000221	0.0000173	1.16×10^{-6}
MSE Salt (IDC 409)	0.37	2.37×10^{-8}	6.29×10^{-9}	0.00102	0.0000799	5.37×10^{-6}
ER and MSE Salt (all other IDCs)	0.91	5.82×10^{-8}	1.55×10^{-8}	0.00252	0.000196	0.0000132
All Salt Residues	1.58	1.01×10^{-7}	2.69×10^{-8}	0.00437	0.000341	0.0000229
Purex/Plutonium Oxide Recovery at Savannah River Site H-Canyon						
DOR Salt (IDCs 365, 413, 427)	0.31	1.77×10^{-8}	4.16×10^{-9}	0.000832	0.0000614	6.13×10^{-6}
DOR Salt (all other IDCs)	0.12	6.85×10^{-9}	1.61×10^{-9}	0.000322	0.0000238	2.37×10^{-6}
MSE Salt (IDC 409)	0.53	3.03×10^{-8}	7.12×10^{-9}	0.00142	0.000105	0.0000105
ER and MSE Salt (all other IDCs)	1.29	6.36×10^{-8}	1.73×10^{-8}	0.00346	0.000256	0.0000255
All Salt Residues	2.25	1.28×10^{-7}	3.02×10^{-8}	0.00604	0.000446	0.0000445

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality DOR = direct oxide reduction
ER = electrorefining MSE = molten salt extraction
[a] Sum of postulated accident scenario risks

D.3.4.2.4 Alternative 4 – Combination of Processing Technologies

The salt residue processing technology considered for this alternative is repackaging. All salt residue (direct oxide reduction, molten salt extraction, and electrorefining) can be processed using this technology. Some of the salt residue may rerquire pyro-oxidation prior to repackaging. For the puropse of this analysis, it is assumed that all the salt residue will require pyro-oxidation prior to repackaging. The pyro-oxidation and repackaging process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.2.1, Alternative 1 - No Action. Refer to Section D.3.4.2.1 for details.

D.3.4.3 Combustible Residues

D.3.4.3.1 Alternative 1 – No Action

The combustible residues processing technologies considered for this alternative are the neutralization process for the aqueous - contaminated residue, the thermal desorption/steam passivation process for the organic - contaminated residue, and the repackaging process for the dry residue. The neutralization and thermal desorption/steam passivation processes will be performed at Rocky Flats in Building 371, Room 3701. The repackaging process will be performed at Rocky Flats in Building 707, Modules D, E, and F.

Table D–133 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the processing technologies of combustible residues at Rocky Flats. **Table D–134** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of combustible residues. The risks associated with these processing technologies are summarized in **Table D–135** and **Table D–136**.

Table D–133 Combustible Residue Accident Scenario Parameters at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Combustible Residues*	*HEPA Banks*	*Material at Risk (grams)*		
				Neutralization Process Building 371	*Desorption and Passivation Process Building 371*	*Repackaging Process Building 707*
Explosion	0.00005	2 drums [a]	2/0 [b]	1,000 g	1,000 g	1,000 g
Nuclear Criticality [c]	–	–	–	–	–	–
Fire:						
a. Room	0.0005	5-day supply [d]	2	1,218 g	325 g	4,455 g
b. Loading Dock	2.0×10^{-6}	4 drums [a]	0	2,000 g	2,000 g	2,000 g
Spill:						
a. Room [e]	–	–		–	–	–
b. Glovebox	0.8	1 feed prep container	2	87 g	23.2 g	23.2 g
c. Loading Dock	0.001	1 drum [a]	0	500 g	500 g	500 g
Earthquake:						
a. Building 371	0.000094	5-day supply [d]	0	1,218 g	325 g	N/A
b. Building 707	0.0026	5-day supply [d]	0	N/A	N/A	4,455 g

Accident Scenario	Frequency (per year)	Combustible Residues	HEPA Banks	Material at Risk (grams)		
				Neutralization Process Building 371	Desorption and Passivation Process Building 371	Repackaging Process Building 707
Aircraft Crash:						
a Building 371	0.00003	Consequences enveloped by the earthquake.	–	–	–	–
b. Building 707	0.00004	The aircraft will not penetrate the building wall.	–	–	–	–

Accident Scenario	DR	ARF	RF	LPF	Release Point
Explosion:					
a. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
b. Building 707	1.0	0.001	0.1	1.0	Ground
Nuclear Criticality [c]	–	–	–	–	–
Fire:					
a. Room	1.0	0.0005	1.0	0.1	Ground
b. Loading Dock	1.0	0.0005	1.0	0.5	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [f]	1.0 [f]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [f]	1.0 [f]	0.1	Ground
Earthquake:					
a. Building 371	1.0	0.001 [g]	0.1 [g]	0.1	Ground
b. Building 707	1.0	0.001 [g]	0.1 [g]	0.1	Ground
Aircraft Crash:					
a. Building 371 [h]	–	–	–	–	–
b. Building 707 [j]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor N/A = not applicable

[a] 1 drum contains the maximum plutonium content level (500 g) (SAIC 1998a).

[b] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.

[c] The wet nuclear criticality is not a viable accident scenario for the No Action Alternative technology assessment.

[d] 3-day supply of feed and 2-day supply of product.

[e] Materials are opened in a glovebox. No room spill is considered.

[f] The product of ARF×RF = 1.0×10^{-6}.

[g] Add 0.000192 to ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).

[h] The aircraft will not penetrate the building.

[j] Consequences enveloped by the earthquake.

Table D–134 Summary of the Accident Analysis Doses at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Neutralization Process—Building 371							
Explosion	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Fire (Room)	0.0609	Metal	0.219	0.0219	2,560	60.9	1.71
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	1.74×10^{-10}	Metal	5.22×10^{-10}	5.92×10^{-11}	7.31×10^{-6}	1.74×10^{-7}	4.35×10^{-10}

Accident Scenario	Building Source Term (grams)	Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.0356	Metal	0.128	0.0128	1,490	35.6	0.996
Desorption and Passivation Process—Building 371							
Explosion	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Fire (Room)	0.0163	Metal	0.0585	0.00585	683	16.3	0.455
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	4.64×10^{-11}	Metal	1.39×10^{-10}	1.58×10^{-11}	1.95×10^{-6}	4.64×10^{-8}	1.16×10^{-10}
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.00949	Metal	0.0342	0.00342	399	9.49	0.266
Repackaging Process—Building 707							
Explosion	0.1	Metal	0.24	0.026	4,200	100	2.80
Fire (Room)	0.233	Metal	0.535	0.0579	9,360	223	6.24
Fire (Dock)	0.5	Metal	1.20	0.13	21,000	500	14.0
Spill (Glovebox)	4.64×10^{-11}	Metal	1.48×10^{-11}	5.57×10^{-12}	6.96×10^{-7}	3.57×10^{-8}	8.22×10^{-12}
Spill (Dock)	0.0000125	Metal	0.00003	3.25×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.130	Metal	0.312	0.0338	5,460	130	3.64

MEI = maximally exposed individual Met = meteorological data

Table D–135 Summary of the Accident Analysis Risks at Rocky Flats in Terms of Latent Cancer Fatalities per Year

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Neutralization Process—Building 371						
Explosion	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Fire (Room)	0.0005	5.48×10^{-8}	5.48×10^{-9}	0.000639	0.0000152	3.41×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	2.09×10^{-13}	2.37×10^{-14}	2.92×10^{-9}	6.96×10^{-11}	1.39×10^{-13}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	6.02×10^{-9}	6.02×10^{-10}	0.0000702	1.67×10^{-6}	3.74×10^{-8}
Desorption and Passivation Process—Building 371						
Explosion	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Fire (Room)	0.0005	1.46×10^{-8}	1.46×10^{-9}	0.000171	4.06×10^{-6}	9.10×10^{-8}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.0000210	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	5.57×10^{-14}	6.31×10^{-15}	7.80×10^{-10}	1.86×10^{-11}	3.71×10^{-14}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	1.61×10^{-9}	1.61×10^{-10}	0.0000187	4.46×10^{-7}	9.99×10^{-9}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Repackaging Process—Building 707						
Explosion	0.00005	6.00×10^{-9}	6.50×10^{-10}	0.000105	2.50×10^{-6}	5.60×10^{-8}
Fire (Room)	0.0005	1.34×10^{-7}	1.45×10^{-8}	0.00234	0.0000557	1.25×10^{-6}
Fire (Dock)	2.0×10^{-6}	1.20×10^{-9}	1.30×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	5.94×10^{-15}	2.23×10^{-15}	2.78×10^{-10}	1.43×10^{-11}	2.82×10^{-15}
Spill (Dock)	0.001	1.50×10^{-11}	1.63×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.0026	4.06×10^{-7}	4.40×10^{-8}	0.00710	0.000169	3.79×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–136 Alternative 1 Accident Risks During Combustible Residue Processing

Combustible Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Neutralization Process – Building 371						
Aqueous - Contaminated	0.15	9.40×10^{-9}	9.40×10^{-10}	0.00011	2.61×10^{-6}	5.85×10^{-8}
Desorption and Passivation Process – Building 371						
Organic - Contaminated	0.39	7.04×10^{-9}	7.04×10^{-10}	0.0000821	1.96×10^{-6}	4.38×10^{-8}
Repackaging Process – Building 707						
Dry	0.023	1.26×10^{-8}	1.36×10^{-9}	0.00022	5.24×10^{-6}	1.17×10^{-7}
Process All Combustible Residue – Buildings 371 and 707						
Sum	0.55	2.89×10^{-8}	2.99×10^{-9}	0.00038	9.76×10^{-6}	2.18×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.3.2 Alternative 2 – Processing without Plutonium Separation

The combustible residues processing technologies considered for this alternative are blend down, catalytic chemical oxidation, and sonic wash. The blend down process, the catalytic chemical oxidation process, and the sonic wash process will be performed at Rocky Flats in Building 371, Room 3701. Building 707 at Rocky Flats is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process.

Similar accidents are applicable to all of these technologies. **Table D–137** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of combustible residue processing technology at Rocky Flats. **Table D–138** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of combustible residues. The risks associated with these processing technologies are summarized in **Table D–139** and **Table D–140**.

Table D–137 Combustible Residue Accident Scenario Parameters at Rocky Flats

Accident Scenario	Frequency (per year)	Combustible Residues	HEPA Banks	Material at Risk (grams)		
				Blend Down Process Building 371 or Building 707	Catalytic Chemical Oxidation Process Building 371	Sonic Wash Process Building 371
Explosion	0.00005	2 drums	0/2 [a]	1,000 g [b]	1,000 g [b]	1,000 g [b]
Nuclear Criticality	0.0001	Solution	–	N/A [c]	1.0×10^{19} fissions	N/A [c]
Fire:						
a. Room	0.0005	5-day supply [b]	2	7,014 g	610 g	837 g feed + 471 g product [e]
b. Loading Dock	2.0×10^{-6}	4 drums	0	2,000 g [b]	2,000 g [b]	2,000 g [b]
Spill:						
a. Room [f]	–	–	–	–	–	–
b. Glovebox	0.8	1 feed prep container	2	83.5 g	2 g	93.4 g
c. Loading Dock	0.001	1 drum	0	500 g [b]	500 g [b]	500 g [b]

Accident Scenario	*Frequency (per year)*	*Combustible Residues*	*HEPA Banks*	*Material at Risk (grams)*		
				Blend Down Process Building 371 or Building 707	*Catalytic Chemical Oxidation Process Building 371*	*Sonic Wash Process Building 371*
Earthquake:						
a. Building 371	0.000094	5-day supply [d]	0	7,014 g	610 g	837 g feed + 471 g product [e]
b. Building 707	0.0026	5-day supply [d]	0	7,014 g	N/A	N/A
Aircraft Crash:						
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	–	–
b. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–	N/A	N/A

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707	1.0	0.001	0.1	1.0	Ground
b. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
Nuclear Criticality [c, g]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.0005	1.0	0.1	Ground
b. Loading Dock	1.0	0.0005	1.0	0.5	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [h]	1.0 [h]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [h]	1.0 [h]	0.1	Ground
Earthquake:					
Buildings 371 and 707	1.0	0.001 [j]	0.1 [j]	0.1	Ground
Aircraft Crash:					
a. Building 707 [k]	–	–	–	–	–
b. Building 371 [l]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] Building 707, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[b] 1 drum contains the maximum plutonium content level of 500 g (SAIC 1998a).
[c] The wet nuclear criticality is not a viable accident scenario for the blend down, and sonic wash technology assessments.
[d] 3-day supply of feed and 2-day supply of product.
[e] 90% of the product is glass, 10% is powder. The effect of the vitrified product on the accident source term is negligible. The product powder is included with the feed supply accident source term.
[f] Materials are opened in a glovebox. No room spill is considered.
[g] Refer to Table D–28 for the Building 371 catalytic chemical oxidation criticality accident source term.
[h] The product of ARF×RF = 1.0×10^{-6}.
[j] Add 0.000192 to ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[k] Consequences enveloped by the earthquake.
[l] The aircraft will not penetrate the building walls.

Table D–138 Summary of the Accident Analysis Doses at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Blend Down Process—Building 371							
Explosion	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Fire (Room)	0.351	Metal	1.26	0.126	14,700	351	9.82
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	1.67×10^{-10}	Metal	5.01×10^{-10}	5.68×10^{-11}	7.01×10^{-6}	1.67×10^{-7}	4.18×10^{-10}
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.205	Metal	0.737	0.0737	8,600	205	5.73

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Blend Down Process—Building 707							
Explosion	0.100	Metal	0.240	0.0260	4,200	100	2.80
Fire (Room)	0.351	Metal	0.842	0.0912	14,700	351	9.82
Fire (Dock)	0.500	Metal	1.20	0.130	21,000	5.00	14.0
Spill (Glovebox)	1.67×10^{-10}	Metal	5.34×10^{-11}	2.00×10^{-11}	2.51×10^{-6}	1.29×10^{-7}	3.17×10^{-11}
Spill (Dock)	0.0000125	Metal	0.0000300	3.25×10^{-6}	0.525	0.0125	0.000350
Earthquake	0.205	Metal	0.492	0.0533	8,600	205	5.73
Catalytic Chemical Oxidation Process—Building 371							
Explosion	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Nuclear Criticality	[a]	–	0.79	0.11	0.00698	252	0.321
Fire (Room)	0.0305	Metal	0.11	0.011	1,280	30.5	0.854
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	4.00×10^{-12}	Metal	1.20×10^{-11}	1.36×10^{-12}	1.68×10^{-7}	4.00×10^{-9}	1.00×10^{-11}
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.0178	Metal	0.0641	0.00641	748	17.8	0.499
Sonic Wash Process—Building 371							
Explosion	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Fire (Room)	0.0419	Metal	0.151	0.0151	1,760	41.9	1.17
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	1.87×10^{-10}	Metal	5.60×10^{-10}	6.35×10^{-11}	7.85×10^{-6}	1.87×10^{-7}	4.67×10^{-10}
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.0244	Metal	0.088	0.0088	1,030	24.4	0.684

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–139 Summary of the Accident Analysis Risks at Rocky Flats in Terms of Latent Cancer Fatalities per Year

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Blend Down Process—Building 371						
Explosion	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Fire (Room)	0.0005	3.16×10^{-7}	3.16×10^{-8}	0.00368	0.0000877	1.96×10^{-6}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	2.00×10^{-13}	2.27×10^{-14}	2.81×10^{-9}	6.68×10^{-11}	1.34×10^{-13}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	3.47×10^{-8}	3.47×10^{-9}	0.000404	9.63×10^{-6}	2.16×10^{-7}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Blend Down Process—Building 707						
Explosion	0.00005	6.00×10^{-9}	6.50×10^{-10}	0.000105	2.50×10^{-6}	5.60×10^{-8}
Fire (Room)	0.0005	2.10×10^{-6}	2.28×10^{-8}	0.00368	0.0000877	1.96×10^{-6}
Fire (Dock)	2.0×10^{-6}	1.20×10^{-9}	1.30×10^{-10}	0.0000210	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	2.14×10^{-14}	8.02×10^{-15}	1.00×10^{-9}	5.14×10^{-11}	1.02×10^{-14}
Spill (Dock)	0.001	1.50×10^{-11}	1.63×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.0026	6.39×10^{-7}	6.92×10^{-8}	0.0112	0.000226	5.96×10^{-6}
Catalytic Chemical Oxidation Process—Building 371						
Explosion	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Nuclear Criticality	0.0001	3.95×10^{-8}	5.50×10^{-9}	3.49×10^{-10}	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	2.75×10^{-8}	2.75×10^{-9}	0.00032	7.63×10^{-6}	1.71×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	4.80×10^{-15}	5.44×10^{-16}	6.72×10^{-11}	1.60×10^{-12}	3.20×10^{-15}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	3.01×10^{-9}	3.01×10^{-10}	0.0000352	8.37×10^{-7}	1.88×10^{-8}
Sonic Wash Process—Building 371						
Explosion	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Fire (Room)	0.0005	3.77×10^{-8}	3.77×10^{-9}	0.000439	0.0000105	2.34×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}
Spill (Glovebox)	0.8	2.24×10^{-13}	2.54×10^{-14}	3.14×10^{-9}	7.47×10^{-11}	1.49×10^{-13}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	4.14×10^{-9}	4.14×10^{-10}	0.0000482	1.15×10^{-6}	2.57×10^{-8}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–140 Alternative 2 Accident Risks During Combustible Residue Processing

Combustible Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Blend Down Process – Building 371						
Aqueous - Contaminated	0.026	9.15×10^{-9}	9.15×10^{-10}	0.000107	2.54×10^{-6}	5.70×10^{-8}
Organic - Contaminated	0.018	6.34×10^{-9}	6.34×10^{-10}	0.0000739	1.76×10^{-6}	3.94×10^{-8}
Dry	0.015	5.28×10^{-9}	5.28×10^{-10}	0.0000616	1.47×10^{-6}	3.29×10^{-8}

Combustible Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
All Combustible Residue	0.059	2.08×10^{-8}	2.08×10^{-9}	0.000242	5.77×10^{-6}	1.29×10^{-7}
Blend Down Process – Building 707						
Aqueous - Contaminated	0.026	2.23×10^{-8}	2.41×10^{-9}	0.00039	9.28×10^{-6}	2.08×10^{-7}
Organic - Contaminated	0.018	1.54×10^{-8}	1.67×10^{-9}	0.00027	6.42×10^{-6}	1.44×10^{-7}
Dry	0.015	1.28×10^{-8}	1.39×10^{-9}	0.000225	5.35×10^{-6}	1.20×10^{-7}
All Combustible Residues	0.059	5.05×10^{-8}	5.48×10^{-9}	0.000884	0.0000211^{-11}	4.72×10^{-7}
Catalytic Chemical Oxidation Process – Building 371						
Aqueous - Contaminated	0.45	3.23×10^{-8}	3.93×10^{-9}	0.00017	9.71×10^{-6}	9.62×10^{-8}
Organic - Contaminated	0.32	2.30×10^{-8}	2.79×10^{-9}	0.000121	6.90×10^{-6}	6.84×10^{-8}
Dry	0.26	1.87×10^{-8}	2.27×10^{-9}	0.0000979	5.61×10^{-6}	5.56×10^{-8}
All Combustible Residues	1.03	7.39×10^{-8}	8.99×10^{-9}	0.000388	0.0000222	2.20×10^{-7}
Sonic Wash Process – Building 371						
Aqueous - Contaminated	0.14	6.11×10^{-9}	6.11×10^{-10}	0.0000713	1.70×10^{-6}	3.80×10^{-8}
Organic - Contaminated	0.09	3.93×10^{-9}	3.93×10^{-10}	0.0000458	1.09×10^{-6}	2.44×10^{-8}
Dry	0.08	3.49×10^{-9}	3.49×10^{-10}	0.0000407	9.69×10^{-7}	2.17×10^{-8}
All Combustible Residues	0.31	1.35×10^{-8}	1.35×10^{-9}	0.000158	3.76×10^{-6}	8.41×10^{-8}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.3.3 Alternative 3 – Processing with Plutonium Separation

The combustible residues processing technology considered for this alternative is mediated electrochemical oxidation. Most of the mediated electrochemical oxidation process will be performed at Rocky Flats in Building 371, Room 3701. The final calcination in the process will be performed at Rocky Flats in Building 707A, Module J.

Similar accidents are applicable to the mediated electrochemical oxidation processes in both buildings. **Table D–141** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of processing combustible residues using the mediated electrochemical oxidation technology at Rocky Flats. **Table D–142** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of combustible residues. The risks associated with this processing technology are summarized in **Table D–143** and **Table D–144**.

Table D–141 Combustible Residue Accident Scenario Parameters at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Combustible Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				MEO Process	
				Building 371	*Building 707A* [a]
Explosion (Acetylene)	0.00005	2 drums	2/0 [b]	1,000 g [c]	4,000 g
Explosion (Ion Exchange Column)	0.0001	Solution	2	0.245 mg [d]	N/A
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [e]
Fire:					
a. Room	0.0005	5-day supply [f]	2	2,626 g	3,000 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	2,000 g [c]	4,000 g
Spill:					
a. Room [g]	–	–	–	–	–
b. Glovebox	0.8	1 feed prep container	2	93.8 g	1,000 g
c. Loading Dock	0.001	1 drum	0	500 g[c]	3,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [f]	0	2,626 g	N/A
b. Building 707A	0.0026	5-day supply [f]	0	N/A	3,000 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall. Consequences enveloped by the earthquake.	–	–	N/A
b. Building 707A	0.00001		–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion (Acetylene):					
a. Building 707A	1.0	0.001	0.1	1.0	Ground
b. Building 371	1.0	0.001	0.1	2.0×10^{-6}	Elevated
Explosion (Ion Exchange Column) [d]	1.0	1.0	1.0	1.0	Elevated
Nuclear Criticality [e, h]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.0005	1.0	0.1	Ground
b. Loading Dock	1.0	0.0005	1.0	0.5	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [j]	1.0 [j]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [j]	1.0 [j]	0.1	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.001 [k]	0.1 [k]	0.1	Ground
Aircraft Crash:					
a. Building 707A [l]	–	–	–	–	–
b. Building 371 [m]	–	–	–	–	–

MEO = mediated electrochemical oxidation N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product drums are transported from Building 371 to Building 707A for processing.

[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.1.0×10^{-6}.

[c] 1 drum contains the maximum plutonium content level (500 g) (SAIC 1998a).

[d] Respirable source term value in milligrams of plutonium released up the stack.

[e] The wet nuclear criticality is not a viable accident scenario for the mediated electrochemical oxidation process in Building 707A.

[f] 3-day supply of feed and 2-day supply of product.
[g] Materials are opened in a glovebox. No room spill is considered.
[h] Refer to Table D–28 for Building 371 mediated electrochemical oxidation criticality accident source term.
[j] The product of ARF×RF = 1.0×10^{-6}.
[k] Add 0.000192 to ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000292).
[l] Consequences enveloped by the earthquake.
[m] The aircraft will not penetrate the building walls.

Table D–142 Summary of the Accident Analysis Doses at Rocky Flats

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371							
Explosion (Acetylene)	2.00×10^{-7}	Metal	6.00×10^{-7}	6.80×10^{-8}	0.0084	0.0002	5.00×10^{-7}
Explosion (Ion Exchange Column)	0.000245	Metal	0.000735	0.0000833	10.3	0.245	0.000613
Criticality (Liquid)	[a]	–	0.79	0.11	6,980	25.2	0.321
Fire (Room)	0.131	Metal	0.473	0.0473	5,510	131	3.68
Fire (Dock)	0.5	Metal	1.80	0.18	21,000	500	14.0
Spill (Glovebox)	1.88×10^{-10}	Metal	5.63×10^{-10}	6.38×10^{-11}	7.88×10^{-6}	1.88×10^{-7}	4.69×10^{-10}
Spill (Dock)	0.0000125	Metal	0.000045	4.50×10^{-6}	0.525	0.0125	0.00035
Earthquake	0.0767	Metal	0.276	0.0276	3,220	76.7	2.15
Building 707A							
Explosion (Acetylene)	0.4	Oxide	0.48	0.052	10,000	240	8.40
Fire (Room)	0.15	Oxide	0.18	0.0195	3,750	90.0	3.15
Fire (Dock)	1.00	Oxide	1.20	0.13	25,000	600	21.0
Spill (Glovebox)	2.00×10^{-9}	Oxide	3.20×10^{-10}	1.20×10^{-10}	0.0000174	9.00×10^{-7}	2.80×10^{-10}
Spill (Dock)	0.000075	Oxide	0.00009	9.75×10^{-6}	1.88	0.045	0.00158
Earthquake	0.0876	Oxide	0.15	0.0114	2,190	52.6	1.84

MEI = maximally exposed individual Met = meteorological data
[a] 1.0×10^{19} fissions.

Table D–143 Summary of the Accident Analysis Risks at Rocky Flats in Terms of Latent Cancer Fatalities per Year

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
Explosion (Acetylene)	0.00005	1.50×10^{-14}	1.70×10^{-15}	2.10×10^{-10}	5.00×10^{-12}	1.00×10^{-14}
Explosion (Ion Exchange Column)	0.0001	3.68×10^{-11}	4.17×10^{-12}	5.15×10^{-7}	1.23×10^{-9}	2.45×10^{-11}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	1.26×10^{-6}	1.28×10^{-8}
Fire (Room)	0.0005	1.18×10^{-7}	1.18×10^{-8}	0.00138	0.0000328	7.35×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.80×10^{-9}	1.80×10^{-10}	0.000021	5.00×10^{-7}	1.12×10^{-8}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Spill (Glovebox)	0.8	2.25×10^{-13}	2.55×10^{-14}	3.15×10^{-9}	7.50×10^{-11}	1.50×10^{-13}
Spill (Dock)	0.001	2.25×10^{-11}	2.25×10^{-12}	2.63×10^{-7}	6.25×10^{-9}	1.40×10^{-10}
Earthquake	0.000094	1.30×10^{-8}	1.30×10^{-9}	0.000151	3.60×10^{-6}	8.07×10^{-8}
Building 707A						
Explosion (Acetylene)	0.00005	1.20×10^{-8}	1.30×10^{-9}	0.00025	6.00×10^{-6}	1.68×10^{-7}
Fire (Room)	0.0005	4.50×10^{-8}	4.88×10^{-9}	0.000938	0.0000225	6.30×10^{-7}
Fire (Dock)	2.0×10^{-6}	1.20×10^{-9}	1.30×10^{-10}	0.0000250	6.00×10^{-7}	3.36×10^{-8}
Spill (Glovebox)	0.8	1.28×10^{-13}	4.80×10^{-14}	6.96×10^{-9}	3.60×10^{-10}	8.96×10^{-14}
Spill (Dock)	0.001	4.50×10^{-11}	4.88×10^{-12}	9.38×10^{-7}	2.25×10^{-8}	6.30×10^{-10}
Earthquake	0.0026	1.37×10^{-7}	1.48×10^{-8}	0.00285	0.0000683	1.91×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–144 Alternative 3 Accident Risks During the Mediated Electrochemical Oxidation Process at Rocky Flats

Combustible Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
Aqueous - Contaminated	0.07	1.21×10^{-8}	1.32×10^{-9}	0.000133	2.67×10^{-6}	5.88×10^{-8}
Organic - Contaminated	0.05	8.63×10^{-9}	9.40×10^{-10}	0.000095	1.91×10^{-6}	4.20×10^{-8}
Dry	0.04	6.90×10^{-9}	7.52×10^{-10}	0.000076	1.53×10^{-6}	3.36×10^{-8}
All Combustible Residues	0.16	2.76×10^{-8}	3.01×10^{-9}	0.000304	6.11×10^{-6}	1.34×10^{-7}
Building 707A						
Aqueous - Contaminated	0.06	1.17×10^{-8}	1.27×10^{-9}	0.000244	5.85×10^{-6}	1.65×10^{-7}
Organic - Contaminated	0.04	7.80×10^{-9}	8.45×10^{-10}	0.000162	3.90×10^{-6}	1.10×10^{-7}
Dry	0.03	5.85×10^{-9}	6.33×10^{-10}	0.000122	2.92×10^{-6}	8.24×10^{-8}
All Combustible Residues	0.13	2.53×10^{-8}	2.74×10^{-9}	0.000528	0.0000127	3.57×10^{-7}
Buildings 371 and 707A						
Aqueous - Contaminated	–	2.38×10^{-8}	2.59×10^{-9}	0.000377	8.52×10^{-6}	2.24×10^{-7}
Organic - Contaminated	–	1.64×10^{-8}	1.79×10^{-9}	0.000257	5.81×10^{-6}	1.52×10^{-7}
Dry	–	1.28×10^{-8}	1.39×10^{-9}	0.000198	4.45×10^{-6}	1.16×10^{-7}
All Combustible Residues	–	5.29×10^{-8}	5.75×10^{-9}	0.000832	0.0000188	4.91×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality

[a] Sum of postulated accident scenario risks

D.3.4.3.4 Alternative 4 – Combination of Processing Technologies

Combustible residue processing technologies considered for this alternative are the neutralization/dry process for the aqueous-contaminated residue, the thermal desorption/steam passivation process for the organic-contaminated residue, and the repackaging process for the dry residue. The process technology accident descriptions, consequences and risks are identical to those presented in Section D.3.4.3.1, Alternative 1 - No Action. Refer to Section D.3.4.3.1 for details.

D.3.4.4 Fluoride Residues

D.3.4.4.1 Alternative 1 – No Action

The fluoride residues processing technology considered for this alternative is the acid dissolution/plutonium oxide recovery process. Most of the acid dissolution/plutonium oxide recovery process will be performed at Rocky Flats in Building 371, Room 3701. The final calcination will be performed at Rocky Flats in Building 707A, Module J.

Similar accidents are applicable to both buildings. **Table D–145** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of using the acid dissolution/plutonium oxide recovery process. **Table D–146** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with this processing technology at Rocky Flats. The risks associated with this processing technology at Rocky Flats are summarized in **Table D–147** and **Table D–148**.

Table D–145 Fluoride Residue Accident Scenario Parameters for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Fluoride Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				Acid Dissolution/Plutonium Oxide Recovery Process	
				Building 371	*Building 707A* [a]
Explosion	0.00005	2 drums	2/0 [b]	4,000 g [c]	2,000 g
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [d]
Fire:					
a. Room	0.0005	5-day supply [e]	2	5,600 g	8,000 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [f]	4,000 g
Spill:					
a. Room	0.008	1 container at the maximum limit [g]	2	3,000 g	N/A [g]
b. Glovebox	0.8	1 feed prep container	2	200 g	1,000 g
c. Loading Dock	0.001	1 drum	0	3,000 g [h]	1,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [e]	0	5,600 g	N/A
b. Building 707A	0.0026	5-day supply [e]	0	N/A	8,000 g

Accident Scenario	*Frequency (per year)*	*Fluoride Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				Acid Dissolution/Plutonium Oxide Recovery Process	
				Building 371	*Building 707A* [a]
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707A	1.0	0.001	0.01	1.0	Ground
b. Building 371	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Nuclear Criticality [d, j]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.001	0.001	0.1	Ground
b. Loading Dock	0.01	0.001	0.001	0.5	Ground
Spill:					
a. Room [k]	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [l]	0.3 [l]	0.1	Ground
Aircraft Crash:					
a. Building 707A [m]	–	–	–	–	–
b. Building 371 [n]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction
LPF = leak path factor

[a] 1,000-g product drums are transported from Building 371 to Building 707A for processing (1 drum per batch).
[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[d] The wet nuclear criticality is not a viable accident scenario for the process in Building 707A.
[e] 3-day supply of feed and 2-day supply of product.
[f] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[g] 1 container per drum of feed.
[h] 1 drum at the maximum plutonium content level.
[j] Refer to Table D–28 for Building 371 criticality accident source term.
[k] Materials are opened in a glovebox in Building 707A. No room spill is considered.
[l] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[m] Consequences enveloped by the earthquake.
[n] The aircraft will not penetrate the building walls.

Table D–146 Summary of the Accident Analysis Doses for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Building 371							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Criticality (Liquid)	[a]	–	0.79	0.11	6,980	252	0.321
Fire (Room)	0.00056	Metal	0.00202	0.000202	23.5	0.56	0.0157
Fire (Dock)	0.00003	Metal	0.000108	0.0000108	1.26	0.03	0.00084
Spill (Room)	1.20×10^{-9}	Metal	3.60×10^{-9}	4.08×10^{-10}	0.0000504	1.20×10^{-6}	3.00×10^{-9}
Spill (Glovebox)	8.00×10^{-11}	Metal	2.40×10^{-10}	2.72×10^{-11}	3.36×10^{-6}	8.00×10^{-8}	2.00×10^{-10}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.444	Metal	1.60	0.16	18,600	444	12.4
Building 707A							
Explosion	0.02	Oxide	0.024	0.0026	500	12.0	0.42
Fire (Room)	0.0008	Oxide	0.00096	0.000104	0.200	0.48	0.0168
Fire (Dock)	0.00002	Oxide	0.000024	2.60×10^{-6}	0.500	0.012	0.00042
Spill (Glovebox)	4.00×10^{-10}	Oxide	6.40×10^{-11}	2.40×10^{-11}	3.48×10^{-6}	1.80×10^{-7}	5.60×10^{-11}
Spill (Dock)	0.001	Oxide	0.0012	0.00013	25.0	0.6	0.021
Earthquake	0.634	Oxide	0.76	0.0824	15,800	380	13.3

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–147 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Building 371						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	5.04×10^{-10}	5.04×10^{-11}	5.88×10^{-6}	1.40×10^{-7}	3.14×10^{-9}
Fire (Dock)	2.0×10^{-6}	1.08×10^{-13}	1.08×10^{-14}	1.26×10^{-9}	3.00×10^{-11}	6.72×10^{-13}
Spill (Room)	0.008	1.44×10^{-14}	1.63×10^{-15}	2.02×10^{-10}	4.80×10^{-12}	9.60×10^{-15}
Spill (Glovebox)	0.8	9.60×10^{-14}	1.09×10^{-14}	1.34×10^{-9}	3.20×10^{-11}	6.40×10^{-14}

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	7.50×10^{-8}	7.50×10^{-9}	0.000876	0.0000208	4.67×10^{-7}
Building 707A						
Explosion	0.00005	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Fire (Room)	0.0005	2.40×10^{-10}	2.60×10^{-11}	5.00×10^{-6}	1.20×10^{-7}	3.36×10^{-9}
Fire (Dock)	2.0×10^{-6}	2.40×10^{-14}	2.60×10^{-15}	5.00×10^{-10}	1.20×10^{-11}	3.36×10^{-13}
Spill (Glovebox)	0.8	2.56×10^{-14}	9.60×10^{-15}	1.39×10^{-9}	7.20×10^{-11}	1.79×10^{-14}
Spill (Dock)	0.001	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Earthquake	0.0026	9.88×10^{-7}	1.07×10^{-7}	0.0206	0.000494	0.0000138

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–148 Alternative 1 Accident Risks During Fluoride Residue Processing

Fluoride Residue	Process Duration (yr)	Risks [a]				
		MEI (LCF)		Population (LCF)		Worker (LCF)
		95% Met	50% Met	95% Met	50% Met	50% Met
Building 371						
All Residues	0.49	5.90×10^{-8}	6.66×10^{-9}	0.000634	0.0000172	2.53×10^{-7}
Building 707A						
All Residues	0.34	3.37×10^{-7}	3.65×10^{-8}	0.00701	0.000168	4.71×10^{-6}
Buildings 371 and 707A						
All Residues	0.83	3.96×10^{-7}	4.31×10^{-8}	0.00765	0.000185	4.96×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.4.2 Alternative 2 – Processing without Plutonium Separation

The fluoride residues processing technology considered for this alternative is blending down. The blend down process will be performed at Rocky Flats in Building 707, Module E. Building 371 is under consideration as an alternate location for the blend down process. The accident analysis evaluates both the primary and alternate locations for the blend down process. **Table D–149** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of fluoride processing technology at Rocky Flats. **Table D–150** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with the processing of fluoride residues. The risks associated with this processing technology are summarized in **Table D–151** and **Table D–152**.

Table D–149 Fluoride Residue Accident Scenario Parameters for the Blend Down Process at Rocky Flats

Accident Scenario	Frequency (per year)	Fluoride Residues	HEPA Banks	Material at Risk (grams)
Explosion	0.00005	2 drums [a]	0/2 [b]	4,000 g
Nuclear Criticality [c]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [d]	2	1,738 g
b. Loading Dock	2.0×10^{-6}	4 drums [e]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the limit [f]	2	600 g
b. Glovebox	0.8	1 feed prep container	2	18.1 g
c. Loading Dock	0.001	1 drum [g]	0	3,000 g
Earthquake:				
a. Building 707	0.0026	5-day supply [d]	0	1,738 g
b. Building 371	0.000094	5-day supply [d]	0	1,738 g
Aircraft Crash:				
a. Building 707	0.00003	Consequences enveloped by the earthquake.	–	–
b. Building 371	0.00004	The aircraft will not penetrate the building walls.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707	1.0	0.001	0.01	1.0	Ground
b. Building 371	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Nuclear Criticality [c]	–	–	–	–	–
Fire:					
a. Room	1.0	0.001	0.001	0.1	Ground
b. Loading Dock	0.01	0.001	0.001	0.5	Ground
Spill:					
a. Room	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.5	0.1	Ground
Earthquake	1.0	0.002 [h]	0.3 [h]	0.10	Ground
Aircraft Crash					
a. Building 707 [j]	–	–	–	–	–
b. Building 371 [k]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] Building 371, 2 HEPA Banks; Building 707, 0 HEPA Banks.

[c] The wet nuclear criticality is not a viable accident scenario for the blend down technology assessment.

[d] 3-day supply of feed and 2-day supply of product.

[e] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[f] 5 containers per drum of feed.

[g] 1 drum at the maximum plutonium content level.

[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[j] Enveloped by the earthquake.

[k] The aircraft will not penetrate the building walls.

Table D–150 Summary of the Accident Analysis Doses for the Blend Down Process at Rocky Flats

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 707							
Explosion	0.04	Metal	0.096	0.0104	1,680	40.0	1.12
Fire (Room)	0.000174	Metal	0.000417	0.0000452	7.30	0.174	0.00487
Fire (Dock)	0.00003	Metal	0.000072	7.80×10^{-6}	1.26	0.03	0.00084
Spill (Room)	2.40×10^{-10}	Metal	7.68×10^{-11}	2.88×10^{-11}	3.60×10^{-6}	1.85×10^{-7}	4.56×10^{-11}
Spill (Glovebox)	7.24×10^{-12}	Metal	2.32×10^{-12}	8.69×10^{-13}	1.09×10^{-7}	5.57×10^{-9}	1.38×10^{-12}
Spill (Dock)	0.003	Metal	0.0072	0.00078	126	3.00	0.084
Earthquake	0.138	Metal	0.330	0.0358	5,780	138	3.85
Building 371							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.0000800	2.00×10^{-7}
Fire (Room)	0.000174	Metal	0.000626	0.0000626	7.30	0.174	0.00487
Fire (Dock)	0.0000300	Metal	0.000108	0.0000108	1.26	0.0300	0.000840
Spill (Room)	2.40×10^{-10}	Metal	7.20×10^{-10}	8.16×10^{-11}	0.0000101	2.40×10^{-7}	6.00×10^{-10}
Spill (Glovebox)	7.24×10^{-12}	Metal	2.17×10^{-11}	2.46×10^{-12}	3.04×10^{-7}	7.24×10^{-9}	1.81×10^{-11}
Spill (Dock)	0.00300	Metal	0.0108	0.00108	126	3.00	0.0840
Earthquake	0.138	Metal	0.496	0.0496	5,780	138	3.85

MEI = maximally exposed individual Met = meteorological data

Table D–151 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Blend Down Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 707						
Explosion	0.00005	2.40×10^{-9}	2.60×10^{-10}	0.000042	1.00×10^{-6}	2.24×10^{-8}
Fire (Room)	0.0005	1.04×10^{-10}	1.13×10^{-11}	1.82×10^{-6}	4.35×10^{-8}	9.73×10^{-10}
Fire (Dock)	2.0×10^{-6}	7.20×10^{-14}	7.80×10^{-15}	1.26×10^{-9}	3.00×10^{-11}	6.72×10^{-13}
Spill (Room)	0.008	3.07×10^{-16}	1.15×10^{-16}	1.44×10^{-11}	7.39×10^{-13}	1.46×10^{-16}
Spill (Glovebox)	0.80	9.27×10^{-16}	3.48×10^{-16}	4.34×10^{-11}	2.23×10^{-12}	4.40×10^{-16}
Spill (Dock)	0.001	3.60×10^{-9}	3.90×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.0026	4.29×10^{-7}	4.65×10^{-8}	0.00752	0.000179	4.01×10^{-6}
Building 371						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Fire (Room)	0.0005	1.56×10^{-10}	1.56×10^{-11}	1.82×10^{-6}	4.35×10^{-8}	9.73×10^{-10}
Fire (Dock)	2.0×10^{-6}	1.08×10^{-13}	1.08×10^{-14}	1.26×10^{-9}	3.00×10^{-11}	6.72×10^{-13}
Spill (Room)	0.008	2.88×10^{-15}	3.26×10^{-16}	4.03×10^{-11}	9.60×10^{-13}	1.92×10^{-15}
Spill (Glovebox)	0.8	8.69×10^{-15}	9.85×10^{-16}	1.22×10^{-10}	2.90×10^{-12}	5.79×10^{-15}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.0000630	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	2.33×10^{-8}	2.33×10^{-9}	0.000272	6.47×10^{-6}	1.45×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–152 Alternative 2 Accident Risks During Fluoride Residue Processing

Fluoride Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 707						
All Residues	1.57	6.84×10^{-7}	7.41×10^{-8}	0.012	0.000285	6.38×10^{-6}
Building 371						
All Residues	1.57	4.53×10^{-8}	4.53×10^{-9}	0.000528	0.0000126	2.82×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.4.3 Alternative 3 – Processing with Plutonium Separation

The fluoride residues processing technologies considered for this alternative are the acid dissolution/plutonium oxide recovery process performed at Rocky Flats and the Purex/plutonium metal (or oxide) recovery process performed at the Savannah River Site. At Rocky Flats, most of the acid dissolution/plutonium oxide recovery process will be performed in Building 371, Room 3701. The final calcination will be performed in Building 707A, Module J. For processing at the Savannah River Site, the packaging of the fluoride residues at Rocky Flats will be performed in Building 371, Room 3701. The Purex/plutonium metal (or oxide) recovery process will be performed in canyon facilities at the Savannah River Site.

Similar accidents are applicable to both processing technologies. **Table D–153** provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of the acid dissolution/plutonium oxide recovery processing technology at Rocky Flats. **Table D–154** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with this processing technology at Rocky Flats. The risks associated with this processing technology at Rocky Flats are summarized in **Table D–155** and **Table D–156**.

Table D–153 Fluoride Residue Accident Scenario Parameters for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Fluoride Residues*	*HEPA Banks*	*Material at Risk (grams)*	
				Acid Dissolution/Plutonium Oxide Recovery Process	
				Building 371	*Building 707A* [a]
Explosion	0.00005	2 drums	2/0 [b]	4,000 g [c]	2,000 g
Nuclear Criticality	0.0001	Solution	2	1.0×10^{19} fissions	N/A [d]
Fire:					
a. Room	0.0005	5-day supply [e]	2	5,600 g	8,000 g
b. Loading Dock	2.0×10^{-6}	4 drums	0	6,000 g [f]	4,000 g
Spill:					
a. Room	0.008	1 container at the maximum limit [g]	2	3,000 g	N/A [h]
b. Glovebox	0.80	1 feed prep container	2	200 g	1,000 g
c. Loading Dock	0.001	1 drum	0	3,000 g [j]	1,000 g
Earthquake:					
a. Building 371	0.000094	5-day supply [e]	0	5,600 g	N/A
b. Building 707A	0.0026	5-day supply [e]	0	N/A	8,000 g
Aircraft Crash:					
a. Building 371	0.00004	The aircraft will not penetrate the building wall.	–	–	N/A
b. Building 707A	0.00001	Consequences enveloped by the earthquake.	–	N/A	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion:					
a. Building 707A	1.0	0.001	0.01	1.0	Ground
b. Building 371	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Nuclear Criticality [d, k]	–	–	–	–	Elevated
Fire:					
a. Room	1.0	0.001	0.001	0.10	Ground
b. Loading Dock	0.01	0.001	0.001	0.50	Ground
Spill:					
a. Room [h]	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake:					
Buildings 371 and 707A	1.0	0.002 [l]	0.30 [l]	0.10	Ground
Aircraft Crash:					
a. Building 707A [m]	–	–	–	–	–
b. Building 371 [n]	–	–	–	–	–

N/A = not applicable DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1,000-g product drums are transported from Building 371 to Building 707A for processing.
[b] Building 707A, 0 HEPA Banks; Building 371, 2 HEPA Banks.
[c] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.
[d] The wet nuclear criticality is not a viable accident scenario for the process in Building 707A.
[e] 3-day supply of feed and 2-day supply of product.
[f] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.
[g] 1 container per drum of feed.
[h] Materials are opened in a glovebox in Building 707A. No room spill is considered.
[j] 1 drum at the maximum plutonium content level.
[k] Refer to Table D–28 for Building 371 criticality accident source term.
[l] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).
[m] Consequences enveloped by the earthquake.
[n] The aircraft will not penetrate the building walls.

Table D–154 Summary of the Accident Analysis Doses for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Building Source Term (grams)*	*Type*	*MEI (rem) 95% Met*	*MEI (rem) 50% Met*	*Population (person-rem) 95% Met*	*Population (person-rem) 50% Met*	*Worker (rem) 50% Met*
Building 371							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Criticality (Liquid)	[a]	–	0.790	0.110	6,980	252	0.321
Fire (Room)	0.00056	Metal	0.00202	0.000202	23.5	0.560	0.0157
Fire (Dock)	0.00003	Metal	0.000108	0.0000108	1.26	0.03	0.00084
Spill (Room)	1.20×10^{-9}	Metal	3.60×10^{-9}	4.08×10^{-10}	0.0000504	1.20×10^{-6}	3.00×10^{-9}
Spill (Glovebox)	8.00×10^{-11}	Metal	2.40×10^{-10}	2.72×10^{-11}	3.36×10^{-6}	8.00×10^{-8}	2.00×10^{-10}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	0.444	Metal	1.60	0.160	18,600	444	12.4
Building 707A							
Explosion	0.02	Oxide	0.024	0.0026	500	12.0	0.420
Fire (Room)	0.0008	Oxide	0.00096	0.000104	20.0	0.480	0.0168
Fire (Dock)	0.00002	Oxide	0.000024	2.60×10^{-6}	0.500	0.012	0.00042
Spill (Glovebox)	4.00×10^{-10}	Oxide	6.40×10^{-11}	2.40×10^{-11}	3.48×10^{-6}	1.80×10^{-7}	5.60×10^{-11}
Spill (Dock)	0.001	Oxide	0.0012	0.00013	25.0	0.600	0.021
Earthquake	0.634	Oxide	0.760	0.0824	15,800	380	13.3

MEI = maximally exposed individual Met = meteorological data
[a] 1.0×10^{19} fissions.

Table D–155 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Acid Dissolution/Plutonium Oxide Recovery Process at Rocky Flats

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Criticality (Liquid)	0.0001	3.95×10^{-8}	5.50×10^{-9}	0.000349	0.0000126	1.28×10^{-8}
Fire (Room)	0.0005	5.04×10^{-10}	5.04×10^{-11}	5.88×10^{-6}	1.40×10^{-7}	3.14×10^{-9}
Fire (Dock)	2.0×10^{-6}	1.08×10^{-13}	1.08×10^{-14}	1.26×10^{-9}	3.00×10^{-11}	6.72×10^{-13}
Spill (Room)	0.008	1.44×10^{-14}	1.63×10^{-15}	2.02×10^{-10}	4.80×10^{-12}	9.60×10^{-15}
Spill (Glovebox)	0.80	9.60×10^{-14}	1.09×10^{-14}	1.34×10^{-9}	3.20×10^{-11}	6.40×10^{-14}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	7.50×10^{-8}	7.50×10^{-9}	0.000876	0.0000208	4.67×10^{-7}
Building 707A						
Explosion	0.00005	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Fire (Room)	0.0005	2.40×10^{-10}	2.60×10^{-11}	5.00×10^{-6}	1.20×10^{-7}	3.36×10^{-9}
Fire (Dock)	2.0×10^{-6}	2.40×10^{-14}	2.60×10^{-15}	5.00×10^{-10}	1.20×10^{-11}	3.36×10^{-13}
Spill (Glovebox)	0.80	2.56×10^{-14}	9.60×10^{-15}	1.39×10^{-9}	7.20×10^{-11}	1.79×10^{-14}
Spill (Dock)	0.001	6.00×10^{-10}	6.50×10^{-11}	0.0000125	3.00×10^{-7}	8.40×10^{-9}
Earthquake	0.0026	9.88×10^{-7}	1.07×10^{-7}	0.0206	0.000494	0.0000138

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–156 Alternative 3 Accident Risks During the Acid Dissolution/Plutonium Oxide Process at Rocky Flats

Fluoride Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Building 371						
All Residues	0.49	5.90×10^{-8}	6.66×10^{-9}	0.000634	0.0000172	2.53×10^{-7}
Building 707A						
All Residues	0.34	3.37×10^{-7}	3.65×10^{-8}	0.00701	0.000168	4.71×10^{-6}
Buildings 371 and 707A						
All Residues	0.83	3.96×10^{-7}	4.31×10^{-8}	0.00765	0.000185	4.96×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

Table D–157 provides the applicable accident scenarios, assumptions, and parameters used in determining the impacts of packaging the fluoride residue at Rocky Flats and of processing the residue using the Purex/plutonium metal (or oxide) recovery process at the Savannah River Site. **Table D–158** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with packaging the residues at Rocky Flats and processing the residues at the Savannah River Site. The risks associated with the packaging at Rocky Flats and the Purex/plutonium metal (or oxide) recovery process at the Savannah River Site are summarized in **Table D–159** and **Table D–160**. The processes at the Savannah River Site could be performed either in the F-Canyon and FB-Line or in the H-Canyon and HB-Line. Data are presented in Table D–157, Table D–158, Table D–159, and Table D–160 for both options.

Table D–157 Fluoride Residue Accident Scenario Parameters for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

Accident Scenario	*Frequency (per year)*	*Fluoride Residues*	*HEPA Banks*	*Material at Risk (grams)*
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site				
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality [b]	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [c]	2	15,750 g
b. Loading Dock	2.0×10^{-6}	4 drums [d]	0	6,000 g
Spill:				
a. Room	0.008	1 container at the maximum limit [e]	2	3,000 g
b. Glovebox	0.80	1 feed prep container	2	375 g
c. Loading Dock	0.001	1 drum [f]	0	3,000 g
Earthquake	0.000094	5-day supply [b]	0	15,750 g
Aircraft Crash	0.00004	The aircraft will not penetrate the building wall.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Nuclear Criticality [b]	–	–	–	–	–
Fire:					
a. Room	1.0	0.001	0.001	0.010	Ground
b. Loading Dock	0.01	0.001	0.001	0.50	Ground
Spill:					
a. Room	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
b. Glovebox	1.0	0.00002	0.01	2.0×10^{-6}	Elevated
c. Loading Dock	0.25	0.00008	0.50	0.10	Ground
Earthquake	1.0	0.002 [g]	0.30 [g]	0.10	Ground
Aircraft Crash [h]	–	–	–	–	–

Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon		
Accident Scenario	*Frequency (per year)*	*Material at Risk (grams)*
Explosion:		
a. Hydrogen	0.000015	4,000 g
b. Ion Exchange Column	0.0001	120.5 mg [j]
Nuclear Criticality [k]	0.0001	1.0×10^{19} fissions
Fire	0.00061	4,000 g

Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon				
Accident Scenario	***Frequency (per year)***		***Material at Risk (grams)***	
Spill [l]	–		–	
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Molten Metal Liquid	0.000125		 12,000 g 1,000 g 1,000 g 1,000 g	
Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [l]	–	–	–	–
Earthquake: a. F-Canyon Liquid b. FB-Line Powder Molten Metal Liquid	 1.0 1.0 1.0 1.0	 0.000047 0.002 0.0022 0.000047	 0.10 0.10 0.10 0.10	 Ground Ground Ground Ground
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon				
Accident Scenario	***Frequency (per year)***		***Material at Risk (grams)***	
Explosion: a. Hydrogen b. Ion Exchange Column	 0.000015 0.0001		 1,000 g 241 mg [j, m]	
Nuclear Criticality [k]	0.0001		1.0×10^{19} fissions	
Fire	0.00061		3,000 g	
Spill [j]	–		–	
Earthquake: a. H-Canyon b. HB-Line Powder Liquid	0.000182		 54,000 g 4,000 g [m] 4,000 g [m]	
Accident Scenario	***DR***	***ARF×RF***	***LPF***	***Release Point***
Explosion: a. Hydrogen b. Ion Exchange Column	 1.0 1.0	 0.001 1.0	 0.005 1.0	 Elevated Elevated
Nuclear Criticality [k]	–	–	–	–
Fire	1.0	0.01	0.005	Elevated
Spill [j]	–	–	–	–

Accident Scenario	*DR*	*ARF×RF*	*LPF*	*Release Point*
Earthquake:				
a. H-Canyon				
Liquid	1.0	0.000047	0.10	Ground
b. HB-Line				
Powder	1.0	0.002	0.010	Ground
Liquid	1.0	0.000047	1.0	Ground

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content.

[b] The wet nuclear criticality is not a viable accident scenario for the residue packaging process in Building 371.

[c] 3-day supply of feed and 2-day supply of product.

[d] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[e] 1 container per drum of feed.

[f] 1 drum at the maximum plutonium content level.

[g] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[h] The aircraft will not penetrate the building walls.

[j] Respirable source term value in milligrams of plutonium released up the stack.

[k] Refer to Table D–28 for criticality accident source term.

[l] Powder spill is not a viable accident scenario for processing fluoride residue at the Savannah River Site.

[m] Duty cycle = 12.5%.

Table D–158 Summary of the Accident Analysis Doses for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

	Building Source Term		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
Accident Scenario	*(grams)*	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site							
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Fire (Room)	0.00158	Metal	0.00567	0.000567	66.2	1.58	0.0441
Fire (Dock)	0.00003	Metal	0.000108	0.0000108	1.26	0.03	0.00084
Spill (Room)	1.20×10^{-9}	Metal	3.60×10^{-9}	4.08×10^{-10}	0.0000504	1.20×10^{-6}	3.00×10^{-9}
Spill (Glovebox)	1.50×10^{-10}	Metal	4.50×10^{-10}	5.10×10^{-11}	6.30×10^{-6}	1.50×10^{-7}	3.75×10^{-10}
Spill (Dock)	0.003	Metal	0.0108	0.00108	126	3.00	0.084
Earthquake	1.25	Metal	4.49	0.449	52,400	1,250	34.9
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon							
Explosion (Hydrogen)	0.02	Metal	0.00068	0.00024	36.0	3.20	0.002
Explosion (Ion Exchange Column)	0.121	Metal-FB	0.00374	0.00133	193	18.1	0.0112
Criticality (Liquid)	[a]	–	0.011	0.0044	310	32.0	0.038
Fire	0.200	Metal	0.0068	0.0024	360	32.0	0.02
Earthquake	0.481	Metal	0.0443	0.00818	1,590	111	10.6
Purex/Plutonium Oxide Recovery Process at the Savannah River Site H-Canyon							
Explosion (Hydrogen)	0.005	Metal	0.00016	0.000048	8.00	0.750	0.0005

Accident Scenario	*Building Source Term*		*MEI (rem)*		*Population (person-rem)*		*Worker (rem)*
	(grams)	*Type*	*95% Met*	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Explosion (Ion Exchange Column)	0.241	Metal-HB	0.00699	0.00212	342	34.0	0.0224
Criticality (Liquid)	[a]	–	0.009	0.003	290	29.0	0.038
Fire	0.150	Metal	0.0048	0.00144	240	22.5	0.015
Earthquake	1.07	Metal	0.074	0.015	3,330	215	23.6

MEI = maximally exposed individual Met = meteorological data

[a] 1.0×10^{19} fissions.

Table D–159 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Purex/Plutonium Metal or Oxide Recovery Process at the Savannah River Site

Accident Scenario	*Accident Frequency (per year)*	*MEI (LCF/yr)*		*Population (LCF/yr)*		*Worker (LCF/yr)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residue for Shipment to the Savannah River Site						
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Fire (Room)	0.0005	1.42×10^{-9}	1.42×10^{-10}	0.0000165	3.94×10^{-7}	8.82×10^{-9}
Fire (Dock)	2.0×10^{-6}	1.08×10^{-13}	1.08×10^{-14}	1.26×10^{-9}	3.00×10^{-11}	6.72×10^{-13}
Spill (Room)	0.008	1.44×10^{-14}	1.63×10^{-15}	2.02×10^{-10}	4.80×10^{-12}	9.60×10^{-15}
Spill (Glovebox)	0.80	1.80×10^{-13}	2.04×10^{-14}	2.52×10^{-9}	6.00×10^{-11}	1.20×10^{-13}
Spill (Dock)	0.001	5.40×10^{-9}	5.40×10^{-10}	0.000063	1.50×10^{-6}	3.36×10^{-8}
Earthquake	0.000094	2.11×10^{-7}	2.11×10^{-8}	0.00246	0.0000586	2.63×10^{-6}
Purex/Plutonium Metal Recovery Process at the Savannah River Site F-Canyon						
Explosion (Hydrogen)	0.000015	5.10×10^{-12}	1.80×10^{-12}	2.70×10^{-7}	2.40×10^{-8}	1.20×10^{-11}
Explosion (Ion Exchange Column)	0.000100	1.87×10^{-10}	6.63×10^{-11}	9.64×10^{-6}	9.04×10^{-7}	4.48×10^{-10}
Criticality (Liquid)	0.0001	5.50×10^{-10}	2.20×10^{-10}	0.0000155	1.60×10^{-6}	1.52×10^{-9}
Fire	0.00061	2.07×10^{-9}	7.32×10^{-10}	0.00011	9.76×10^{-6}	4.88×10^{-9}
Earthquake	0.000125	2.77×10^{-9}	5.11×10^{-10}	0.0000992	6.92×10^{-6}	5.29×10^{-7}
Purex Process/Plutonium Oxide Recovery at the Savannah River Site H-Canyon						
Explosion (Hydrogen)	0.000015	1.20×10^{-12}	3.60×10^{-13}	6.00×10^{-8}	5.63×10^{-9}	3.00×10^{-12}
Explosion (Ion Exchange Column)	0.0001	4.37×10^{-11}	1.33×10^{-11}	2.14×10^{-6}	2.12×10^{-7}	1.12×10^{-10}
Criticality (Liquid)	0.0001	4.50×10^{-10}	1.50×10^{-10}	0.0000145	1.45×10^{-6}	1.52×10^{-9}
Fire	0.00061	1.46×10^{-9}	4.39×10^{-10}	0.0000732	6.86×10^{-6}	3.66×10^{-9}
Earthquake	0.000182	2.24×10^{-9}	4.54×10^{-10}	0.0001	6.48×10^{-6}	1.14×10^{-6}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–160 Alternative 3 Accident Risks During Packaging at Rocky Flats and the Purex Process at Savannah River Site

Fluoride Residue	*Process Duration (yr)*	*Risks* [a]				
		MEI (LCF)		*Population (LCF)*		*Worker (LCF)*
		95% Met	*50% Met*	*95% Met*	*50% Met*	*50% Met*
Rocky Flats Packaging of Residue for Shipment to Savannah River Site						
All Residues	0.17	3.70×10^{-8}	3.70×10^{-9}	0.000432	0.0000103	4.54×10^{-7}
Purex/Plutonium Metal Recovery at Savannah River Site F-Canyon						
All Residues	0.75	4.19×10^{-9}	1.15×10^{-9}	0.000176	0.0000144	4.02×10^{-7}
Purex/Plutonium Oxide Recovery at Savannah River Site H-Canyon						
All Residues	1.58	6.63×10^{-9}	1.67×10^{-9}	0.000301	0.0000237	1.81×10^{-6}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks

D.3.4.4.4 Alternative 4 – Combination of Processing Technologies

The fluoride residue is not under consideration for Alternative 4.

D.3.4.5 Filter Media Residues

D.3.4.5.1 Alternative 1 – No Action

The filter media residues processing technology considered for this alternative is neutralize/dry. This process will be conducted within glovebox lines in Building 371, Room 3701, at Rocky Flats.

Table D–161 provides the applicable accident scenarios, assumptions, and parameters used in determining the impact of using the neutralization/dry processing technology for filter media residues. **Table D–162** summarizes the consequences to the maximally exposed individual, the public, and workers resulting from the accidental releases associated with using the neutralization/dry processing technology for filter media residues. The risks associated with this processing technology are summarized in **Table D–163** and **Table D–164**.

Table D–161 Filter Media Residue Accident Scenario Parameters for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	*Frequency (per year)*	*Filter Media Residues*	*HEPA Banks*	*Material at Risk (grams)*
Explosion	0.00005	2 drums [a]	2	4,000 g
Nuclear Criticality	–	–	–	–
Fire:				
a. Room	0.0005	5-day supply [b]	2	1,540 g
b. Loading Dock	2.0×10^{-6}	4 drums [c]	0	6,000 g
Spill:				
a. Room [d]	–	–	–	–
b. Glovebox	0.80	1 feed prep container	2	220 g
c. Loading Dock	0.001	1 drum [e]	0	3,000 g
Earthquake	0.000094	5-day supply [b]	0	1,540 g
Aircraft Crash	0.00004	Consequences enveloped by the earthquake.	–	–

Accident Scenario	*DR*	*ARF*	*RF*	*LPF*	*Release Point*
Explosion	1.0	0.001	0.01	2.0×10^{-6}	Elevated
Nuclear Criticality [f]	–	–	–	–	–
Fire:					
a. Room	1.0	0.006	0.01	0.10	Ground
b. Loading Dock	0.01	0.006	0.01	0.50	Ground
Spill:					
a. Glovebox	1.0	1.0×10^{-6} [g]	1.0 [g]	2.0×10^{-6}	Elevated
b. Loading Dock	0.25	1.0×10^{-6} [g]	1.0 [g]	0.10	Ground
Earthquake	1.0	0.002 [h]	0.30 [h]	0.10	Ground
Aircraft Crash [j]	–	–	–	–	–

DR = damage ratio ARF = airborne release fraction RF = respirable fraction LPF = leak path factor

[a] 1 drum at the maximum plutonium content level (3,000 g) and 1 drum at the administrative control level (1,000 g) for plutonium content

[b] 3-day supply of feed and 2-day supply of product.

[c] 1 drum at the maximum plutonium content level and 3 drums at the administrative control level for plutonium content.

[d] Materials are opened in a glovebox. No room spill is considered.

[e] 1 drum at the maximum plutonium content level.

[f] The wet nuclear criticality is not a viable accident scenario for the neutralize/dry process in Building 371.

[g] The product of ARF×RF = 1.0×10^{-6}.

[h] Add 0.000192 to all ARF×RF values for the resuspension of respirable particulates after the earthquake (e.g., ARF×RF + 0.000192 = 0.000792).

[j] Consequences enveloped by the earthquake.

Table D–162 Summary of the Accident Analysis Doses for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	Building Source Term (grams)	Building Source Term Type	MEI (rem) 95% Met	MEI (rem) 50% Met	Population (person-rem) 95% Met	Population (person-rem) 50% Met	Worker (rem) 50% Met
Explosion	8.00×10^{-8}	Metal	2.40×10^{-7}	2.72×10^{-8}	0.00336	0.00008	2.00×10^{-7}
Fire (Room)	0.00924	Metal	0.0333	0.00333	388	9.24	0.259
Fire (Dock)	0.0018	Metal	0.00648	0.000648	75.6	1.80	0.0504
Spill (Glovebox)	4.40×10^{-10}	Metal	1.32×10^{-9}	1.50×10^{-10}	0.0000185	4.40×10^{-7}	1.10×10^{-9}
Spill (Dock)	0.000075	Metal	0.00027	0.000027	3.15	0.075	0.0021
Earthquake	0.122	Metal	0.439	0.0439	5,120	122	3.42

MEI = maximally exposed individual Met = meteorological data

Table D–163 Summary of the Accident Analysis Risks in Terms of Latent Cancer Fatalities per Year for the Neutralization/Dry Process at Rocky Flats

Accident Scenario	Accident Frequency (per year)	MEI (LCF/yr) 95% Met	MEI (LCF/yr) 50% Met	Population (LCF/yr) 95% Met	Population (LCF/yr) 50% Met	Worker (LCF/yr) 50% Met
Explosion	0.00005	6.00×10^{-15}	6.80×10^{-16}	8.40×10^{-11}	2.00×10^{-12}	4.00×10^{-15}
Fire (Room)	0.0005	8.32×10^{-9}	8.32×10^{-10}	0.000097	2.31×10^{-6}	5.17×10^{-8}
Fire (Dock)	2.0×10^{-6}	6.48×10^{-12}	6.48×10^{-13}	7.56×10^{-8}	1.80×10^{-9}	4.03×10^{-11}
Spill (Glovebox)	0.80	5.28×10^{-13}	5.98×10^{-14}	7.39×10^{-9}	1.76×10^{-10}	3.52×10^{-13}
Spill (Dock)	0.001	1.35×10^{-10}	1.35×10^{-11}	1.58×10^{-6}	3.75×10^{-8}	8.40×10^{-10}
Earthquake	0.000094	2.06×10^{-8}	2.06×10^{-9}	0.000241	5.73×10^{-6}	1.28×10^{-7}

MEI = maximally exposed individual LCF = latent cancer fatality Met = meteorological data

Table D–164 Alternative 1 Accident Risks During Filter Media Residue Processing

Filter Media Residue	Process Duration (yr)	Risks [a] MEI (LCF) 95% Met	Risks [a] MEI (LCF) 50% Met	Risks [a] Population (LCF) 95% Met	Risks [a] Population (LCF) 50% Met	Risks [a] Worker (LCF) 50% Met
HEPA Filter Media (IDC 338)	1.13	3.29×10^{-8}	3.29×10^{-9}	0.000384	9.13×10^{-6}	2.05×10^{-7}
HEPA Filter Media (All other IDCs)	0.02	5.82×10^{-10}	5.82×10^{-11}	6.79×10^{-6}	1.62×10^{-7}	3.62×10^{-9}
FUL-FLO Filter Media (IDC 331)	0.24	6.98×10^{-9}	6.98×10^{-10}	0.0000815	1.94×10^{-6}	4.34×10^{-8}
All Filter Media Residues	1.39	4.04×10^{-8}	4.04×10^{-9}	0.000472	0.0000112	2.52×10^{-7}

MEI = maximally exposed individual Met = meteorological data LCF = latent cancer fatality
[a] Sum of postulated accident scenario risks