

Table A-4. Product outputs.

Alternative	Annual			Life cycle		
	Solids slurry (and solution) to DWPF (gallons per year)	Salt solution to Grout (million gallons per year)	Grout produced (million gallons per year)	Solids slurry (and solution) to DWPF (million gallons)	Salt solution to Grout (million gallons)	Grout produced (million gallons)
Small Tank Precipitation (13 years) ^a	223,000	8.0	14.5	2.9	104	188
Ion Exchange (13 years) ^b	200,000	6.6	12.0	2.6 ^f	86	156
Solvent Extraction (13 years) ^c	677,000 ^e	7.5	13.5	8.8 ^e	97	175
Direct Disposal in Grout (13 years) ^d	154,000	5.9	10.8	2.0	77	141

- a. WSRC (1998i; 2000b).
- b. WSRC (1998m).
- c. WSRC (1998n; 2000b).
- d. WSRC (1998k).
- e. Includes 154,000 gal/yr solids slurry and 523,000 gal/yr solution (strip effluent without evaporation) (WSRC 1998e).
- f. Includes 2 million gallons monosodium titanate slurry and 600,000 gallons crystalline silicotitanate slurry (WSRC 1998e,m).

Note: Material balance estimates are ± 25 percent.

Radionuclide	Concentration in Saltstone (Ci/m ³)	Concentration Limit (Ci/m ³)		
		Class A	Class B	Class C
Long-Lived Activities				
Technetium-99	0.07	0.3	-	3.0
Iodine-129	0.00002	0.008	-	0.08
Total alpha	0.0002	0.02	-	0.2
Short-Lived Activities				
Tritium	0.02	40	(a)	(a)
Strontium-90	0.0004	0.04	150	7,000
Cesium-137	225	1	44	4,600

a. No limit.
Ci/m³ = curies per cubic meter.

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A.5 Process Facilities

A.5.1 PROCESS BUILDINGS

New shielded process buildings (WSRC 1998e,o) would be constructed for each salt processing alternative. The process buildings for the Small Tank Precipitation, Ion

Exchange, and Solvent Extraction alternatives would be at Site B in S Area and for the Direct Disposal in Grout alternative, in Z Area.

In each case, the process buildings would be constructed of reinforced concrete and include the shielding required for handling highly radioactive materials. The facilities would be sized to

contain large feed, storage, and product hold tanks to ensure an average processing rate of 25,000 gallons per day of salt solution. The size of the tanks would also serve to decouple or buffer the continuous flows of the Small Tank Precipitation, Ion Exchange, and Solvent Extraction processes from the batch flows of the tank farms, and ensure the capability to process the expected average 6 million gallons-per-year of salt solution.

The building specifications would be similar for each of the four salt processing alternatives. Preliminary design dimensions are provided in Table A-5. The buildings would range from 60 to 70 feet above ground level, with crane maintenance bays up to 110 feet high. They would extend down to as much as 40 feet below ground level, allowing shielded, remotely operated, chemical processing cells to be located partially below grade. Site requirements for each alternative process facility are presented in Table A-6.

Adjacent operating areas above grade would extend around the perimeter of the processing cells and contain chemical feed pumps

and tanks, radioactive and non-radioactive laboratories for sample testing, electrical and mechanical equipment areas, and a truck unloading area. Shielded maintenance areas would be provided for remote equipment laydown, equipment decontamination, and crane maintenance. Figure A-10 presents the floor plan for the Small Tank Precipitation facility, and Figure A-11 presents the elevation for the facility. Figures A-12 and A-13 present the corresponding plans for the Ion Exchange facility, Figures A-14 and A-15 for the Solvent Extraction facility, and Figures A-16 and A-17 for the Direct Disposal in Grout facility.

The process cells would contain equipment required for the respective process alternatives. These include precipitate and sorption reactor tanks; chemical storage, feed, and product hold tanks with associated transfer and sample pumps; pass-through filter assemblages; and grout mixers and transfer equipment. In the case of the Ion Exchange alternative, the ion exchange columns for cesium removal would also be housed in the process cells. In the case of the Solvent Extraction alternative, the centrifugal contactors would be housed in the process cells.

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Table A-5. Building specifications for each action alternative.

	Process Alternative ^a			
	Small Tank Precipitation	Ion Exchange	Solvent Extraction	Direct Disposal in Grout
Length, ft.	310	280	300	220
Width, ft.	140	140	120	120
Height, ft.	60 (100 ft. bay)	60 (100 ft. bay)	70 (110 ft. bay)	60 (90 ft. bay)
Depth below grade, ft.	40	40	40	20
Floor Area, ft. ²				
including processing cells	66,000	60,000	62,000	54,000
excluding processing cells	50,000	48,000	48,000	43,000
Volume, ft. ³				
including processing cells	4,500,000	4,200,000	4,500,000	1,800,000
excluding processing cells	4,500,000	3,600,000	3,900,000	1,200,000
Processing cell floor area, ft. ²	16,000	12,000	13,000	11,000
Processing cell volume, ft. ³	640,000	550,000	600,000	570,000

Source: WSRC (1998o, 2000c).

a. Building specifications rounded to two significant figures.

Table A-6. Site requirements for the process building and required support facilities.

Small Tank Precipitation, Ion Exchange, and Solvent Extraction Alternatives	Direct Disposal in Grout Alternative
Clear 23 acres in S Area	Clear 15 acres in Z Area
Construct 5,000 linear feet of access roads	Same
Construct 1,000 linear feet of site roads	Same
Construct a paved parking area for 200 cars (40,000 square feet)	Same
Construct a storm sewer system	Same
Construct site security fence with two vehicle gates	Same
Construct a security fence around the substation	Same
Construct 2,500 feet of sewer line to tie into the existing sewer system	Same
Construct 3,000 feet of water line to tie into the existing potable water system	Construct 2,000 feet of water line
Construct 7,500 feet of power line	Construct 700 feet of power line
Construct a 13.8-kV to 480-V switchyard	Same
Install yard piping for water and sewer distribution systems	Same
Install electrical ductbank distribution system	Same
Install security lighting	Same

Source: WSRC (1998o).

Sumps with leak detection and collection capability would be provided in the cells. The cells would be protected by concrete cell covers and accessible by a remotely-operated crane. The building configurations would allow crane or manipulator access to all shielded process, maintenance, and sampling areas. The cell components would be designed for remote maintenance, replacement, and later decommissioning.

Safety features for each salt processing alternative incorporated into facility design would include:

- Systems to detect leaks in processing piping and vessels
- Structurally strengthened process buildings and process cells to protect process vessels and equipment in case of seismic or other natural phenomena hazard events
- Process vessel vent or purge systems
- Systems to cover process vessels with inert gases, to prevent catastrophic fires

- Leak detection systems and engineered safety features, designed to automatically stop the process before material is released to the environment, if a leak is detected
- Primary confinement of process piping and vessels that could withstand natural phenomena hazard events
- Secondary confinement systems, including ventilation systems, designed to prevent or mitigate unscheduled events and to continue operating, even in the event of a loss of power
- Seismically-qualified equipment, including vessels and piping
- Remote operations
- Adequate shielding
- Temperature monitoring systems to alert operators to any loss of cooling for the Small Tank Precipitation, Ion Exchange, or Solvent Extraction processes
- Radiation and airborne contamination monitors.

