Appendix 11A. Tables

Table 11-1. Parameters Used in Calculating Maximum Reactor Coolant Activities

1.	Core thermal power, Mwt	3,565
2.	Failed fuel fraction	.01
3.	Reactor coolant volume, ft^3	11,293
4.	Purification flow rate (normal), gpm	75
5.	Effective cation demineralizer flow, gpm	7.5
6.	Fission product escape rate coefficients: (sec^{-1})	
	a. Noble gases	6.5×10^{-8}
	b. Br, Rb, I, and Cs	1.3×10^{-8}
	c. Mo	2.0×10^{-9}
	d. Te	1.0×10^{-9}
	e. Sr and Ba	1.0×10^{-11}
	f. All others	1.6×10^{-12}
7.	Mixed bed demineralizer decontamination factors:	
	a. Noble gases, Cs-134, 136, 137, Y-90, 91, and Mo-99	1
	b. All other isotopes	10
8.	Cation bed demineralizer decontamination factors:	
	a. Cs-134, Cs-137, Y-90, and Y-91	10
	b. All others	1
9.	Volume Control Tank stripping fractions:	
	Kr-85	2.3×10^{-5}
	Kr-85m	2.7×10^{-1}
	Kr-87	6.0×10^{-1}
	Kr-88	4.3×10^{-1}
	Xe-131m	1.0×10^{-2}
	Xe-133	1.6×10^{-2}
	Xe-133m	3.7×10^{-2}
	Xe-135	1.8×10^{-1}
	Xe-135m	8.0×10^{-1}
	Xe-138	1.0
10.	Initial Boron Concentration	
	a. B_o (initial cycle), ppm	905
	b. B_o (equilibrium cycle), ppm	1100

Table 11-2. Design Basis Reactor Coolant Radioactivity Concentrations

Isotope	Activity $\left(\frac{\mu Ci}{gm}\right)$	Isotope	Activity $\left(\frac{\mu Ci}{gm}\right)$
H-3	2.5	Cs-136	5.5
Br-84	4.5×10^{-2}	Cs-137	1.5
Rb-88	3.9	Cs-138	1.0
Rb-89	1.1×10^{-1}	Ba-140	4.3×10^{-3}
Sr-89	3.3×10^{-3}	La-140	1.5×10^{-3}
Sr-90	1.8×10^{-4}	Ce-144	4.5×10^{-4}
Sr-91	2.0×10^{-3}	Pr-144	4.5×10^{-4}
Sr-92	7.8×10^{-4}	Kr-85	1.0×10^{1}
Y-90	2.2×10^{-4}	Kr-85m	2.2
Y-91	6.1×10^{-3}	Kr-87	1.3
Y-92	7.5×10^{-4}	Kr-88	3.9
Zr-95	6.9×10^{-4}	Xe-131m	1.9
Nb-95	7.0×10^{-4}	Xe-133	3.0×10^{2}
Mo-99	5.7	Xe-133m	3.6
I-131	2.5	Xe-135	7.6
I-132	.9	Xe-135m	.9
I-133	4.2	Xe-138	.7
I-134	.5	Cr-51	4.2×10^{-3}
I-135	2.2	Mn-54	3.4×10^{-4}
Te-132	.26	Mn-56	1.6×10^{-2}
Te-134	3.1×10^{-2}	Co-58	1.1×10^{-2}
Cs-134	2.2	Co-60	1.2×10^{-3}

Table 11-3. Parameters Used in Calculating Normal Primary and Secondary Coolant Activities

1.	Core thermal power, Mwt		3,565
2.	Failed fuel fraction		.0012
3.	Reactor coolant volume, ft^3		11,293
4.	Purification flow rate (normal), gpm		75
5.	Effective cation demineralizer flow, gpm		7.5
6.	Shim bleed rate (yearly average), gpm		.7
7.	Volume control tank stripping fractions:[1]		
	Kr-83m		0.0
	Kr-85m		.32
	Kr-85		.23
	Kr-87		.60
	Kr-88		.43
	Kr-89		0.0
	Xe-131m		.25
	Xe-133m		.26
	Xe-133		.25
	Xe-135m		.80
	Xe-135		.30
	Xe-137		0.0
	Xe-138		1.0
8.	Primary to secondary leak rate, lbs/day		100
9.	Steam flow rate, lbs/hr		1.588×10^7
10.	Water mass in each steam generator	- Liquid	98,000
		- Steam	8,500
11.	Steam generator blowdown flow rate, gpm		280
12.	Flow rate thru condensate demineralizer, lbs/hr		1.096×10^7

Note:

1. Assumes 40% stripping efficiency

Table 11-4. Primary and Secondary Activity During Normal Operation

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED

Primary Coolant	$\left(\frac{\mu Ci}{gm}\right)$	***Secondary Coolant***	$\left(\frac{\mu Ci}{gm}\right)$
Isotope	***Water***	***Water***	***Steam***
H-3	*1.0*	*1.0 E-3*	*1.0 E-3*
Br-83	*6.18E-3*	*7.69E-8*	*7.69E-11*
Br-84	*3.47E-3*	*2.04E-8*	*2.04E-11*
Br-85	*4.05E-4*	*3.06E-10*	*3.06E-13*
Rb-86	*8.90E-5*	*4.88E-9*	*4.88E-12*
Rb-88	*2.69E-1*	*1.14E-6*	*1.14E-9*
Sr-89	*3.62E-4*	*1.28E-8*	*1.28E-11*
Sr-90	*1.03E-5*	*2.55E-10*	*2.55E-13*
Y-90	*1.29E-6*	*5.42E-11*	*5.42E-14*
Sr-91	*7.69E-4*	*1.68E-8*	*1.68E-11*
Y-91	*6.62E-5*	*1.92E-9*	*1.92E-12*
Y-91m	*4.77E-4*	*1.31E-8*	*1.31E-11*
Y-93	*4.01E-5*	*8.30E-10*	*8.30E-13*
Zr-95	*6.21E-5*	*2.56E-9*	*2.56E-12*
Nb-95	*5.18E-5*	*2.56E-9*	*2.56E-12*
Mo-99	*8.99E-2*	*2.70E-6*	*2.70E-9*
Tc-99m	*5.86E-2*	*2.75E-6*	*2.75E-9*
Ru-103	*4.66E-5*	*1.28E-9*	*1.28E-12*
Rh-103m	*5.94E-5*	*2.58E-9*	*2.58E-12*
Ru-106	*1.03E-5*	*2.55E-10*	*2.55E-13*
Te-125m	*3.00E-5*	*6.39E-10*	*6.39E-13*
Te-127m	*2.90E-4*	*6.38E-9*	*6.38E-12*
Te-127	*1.01E-3*	*2.53E-8*	*2.53E-11*
Te-129m	*1.45E-3*	*3.84E-8*	*3.84E-11*
Te-129	*2.10E-3*	*7.53E-8*	*7.53E-11*
I-130	*2.47E-3*	*4.12E-8*	*4.12E-10*
Te-131m	*2.76E-3*	*7.18E-8*	*7.18E-11*
Te-131	*1.47E-3*	*2.83E-8*	*2.83E-11*

Primary Coolant	$\left(\frac{\mu Ci}{gm}\right)$	***Secondary Coolant***	$\left(\frac{\mu Ci}{gm}\right)$
Isotope	***Water***	***Water***	***Steam***
I-131	*2.87E-1*	*5.26E-6*	*5.26E-8*
Te-132	*2.88E-2*	*6.71E-7*	*6.71E-10*
I-132	*1.29E-1*	*2.13E-6*	*2.13E-8*
I-133	*4.33E-1*	*7.58E-6*	*7.58E-8*
I-134	*6.23E-2*	*4.88E-7*	*4.88E-9*
Cs-134	*2.59E-2*	*1.43E-6*	*1.43E-9*
I-135	*2.32E-1*	*3.66E-6*	*3.66E-8*
Cs-136	*1.37E-2*	*7.46E-7*	*7.46E-10*
Cs-137	*1.87E-2*	*1.03E-6*	*1.03E-9*
Ba-137m	*2.16E-2*	*1.38E-6*	*1.38E-9*
Ba-140	*2.29E-4*	*6.46E-9*	*6.46E-12*
La-140	*1.63E-4*	*4.90E-9*	*4.90E-12*
Ce-141	*7.26E-5*	*2.56E-9*	*2.56E-12*
Ce-143	*4.40E-5*	*1.42E-9*	*1.42E-12*
Pr-143	*5.21E-5*	*1.29E-9*	*1.29E-12*
Ce-144	*3.41E-5*	*1.28E-9*	*1.28E-12*
Pr-144	*4.43E-5*	*1.45E-10*	*1.45E-13*
Cr-51	*1.97E-3*	*5.77E-8*	*5.77E-11*
Mn-54	*3.20E-4*	*1.28E-8*	*1.28E-11*
Fe-55	*1.65E-3*	*5.10E-8*	*5.10E-11*
Fe-59	*1.04E-3*	*3.84E-8*	*3.84E-11*
Co-58	*1.66E-2*	*5.11E-7*	*5.11E-10*
Co-60	*2.07E-3*	*5.74E-8*	*5.74E-11*
Np-239	*1.29E-3*	*4.10E-8*	*4.10E-11*
Kr-83m	*2.84E-2*	--	*7.41E-9*
Kr-85m	*1.26E-1*	--	*3.37E-8*
Kr-85	*8.91E-3*	--	*2.36E-9*
Kr-87	*7.41E-2*	--	*1.87E-8*
Kr-88	*2.35E-1*	--	*6.11E-8*
Kr-89	*6.76E-3*	--	*1.79E-9*

Primary Coolant	$\left(\frac{\mu Ci}{gm}\right)$	***Secondary Coolant***	$\left(\frac{\mu Ci}{gm}\right)$
Isotope	***Water***	***Water***	***Steam***
Xe-131m	*1.99E-2*	--	*5.30E-9*
Xe-133m	*1.12E-1*	--	*2.99E-8*
Xe-133	*5.53*	--	*1.45E-6*
Xe-135m	*1.71E-2*	--	*4.48E-9*
Xe-135	*3.53E-1*	--	*9.23E-8*
Xe-137	*1.22E-2*	--	*3.19E-9*
Xe-138	*5.74E-2*	--	*1.48E-8*

Table 11-5. Tritium Source Terms

[HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED]

	Expected Release to Coolant, Ci/yr	
Tritium Source	***Initial Cycle***	***Equilibrium Cycle***
Ternary fission	*1050*	*1050*
Burnable poison rods	*152*	*0*
Control rods	*70*	*70*
Soluble boron	*222*	*309*
Soluble lithium	*107*	*107*
Deuterium	*3*	*3*
Total	*1604*	*1539*

Table 11-6. Maximum Expected Daily Flows to Liquid Radwaste System

Subsystem		Max. Daily Flow (GPD) (2 Units)	% NC Activity
REACTOR COOLANT DRAIN TANK (per unit)			
RCP Seal Leakoffs 3/unit @ 3.03gph each, 1/unit @ 0.5GPM (failed)		1876	
Valve Leakoffs 45 valves/unit @ 1GPD each		90	
	Total	1966	100.
WASTE DRAIN TANK			
Equipment Flushes (3 x component volume)		1800	3.3
Through Line Leakage		100	1.0
	Total	1900	3.2
WASTE EVAPORATOR FEED TANK			
Reactor Coolant Leakage in Containment		640	100.
Cold Lab Drains & Hot Lab Rinses		200	.2
Sample Sink Drains		80	100.
Equipment Drains		600	.1
Valve Leakoffs (100 valves @ 1GPD)		100	10.
Through Line Leakage		100	1.
	Total	1720	42.9
LAUNDRY AND HOT SHOWER TANK SUBSYSTEM			
Showers and Laundry Machines		1350	
Lab Dishwasher		120	
Lavatory Sinks		100	
	Total	1570	Note 1
FLOOR DRAIN TANK (includes FDT Sumps A & B)			
50% of Aux. Bldg. Floor Drains		1000	10.
Ice Condenser Defrost		50	0.
Through Line Leakage		100	1.
Groundwater Inleakage		10	0.
Decon Sinks - Aux. Bldg. & Reactor Bldg.		200	1.
	Total	1360	7.6
MIXING AND SETTLING TANK			

Subsystem		**Max. Daily Flow (GPD) (2 Units)**	**% NC Activity**
Ultrasonic Cleaner and Turbulator Drains		100	
	Total	100	100.
CONTAINMENT VENT. UNIT CONDENSATE DRAIN TANK			
Unit 1 - Summer Operation w/Purge		16800	
Unit 2 - Normal Operation		9600	
	Total	26400	.0
NON-RADIATION AREA FDT SUMPS C & D			
All Aux. Bldg. Ventilation Unit Condensate (summer max. operation)		26450	
50% Aux. Bldg. Floor Drains		1000	
	Total	27450	.0
STEAM GENERATOR DRAIN TANK		Annual Flow (gallons)	
Drain Steam Generator Contents		25000	See Table 11-4
Flush Steam Generator		75000	
	Total	100000	

Note:

1. From Table 2-20 of Nureg-0017

Table 11-7. Makeup Demineralized Water Chemistry. (Requirements for WL Evaporator Distillate Suitable for Recycle)

pH	6.0 - 8.0
Conductivity, mmho	0.5 max, 0.1 avg
Phosphate (PO_4), ppm	10.0 max
Chloride, ppm	0.15 max
Fluoride, ppm	0.15 max
Iron, ppm	0.01 max
Copper, ppm	0.01 max
Silica, ppm	0.02 max, 0.01 avg
Oxygen, ppm	0.1 max
Carbon Dioxide, ppm	2.0 max
Total Solids, ppm	0.5 max

Table 11-8. Liquid Radwaste System Component Design Parameters

Reactor Coolant Drain Tank Subsystem Parameters	
Reactor Coolant Drain Tank Heat Exchanger	
Number per unit	1
Type	Horizontal Shell & U-Tube
Heat transfer rate at normal conditions, BTU/hr	2.23×10^6
Estimated UA, BTU/hr - F	7.0×10^4
Shell Side Data:	
Design pressure, psig	150
Design temperature, °F	250
Pressure loss at operating conditions, psid	15
Nozzle size, inches	4
Material of construction	Carbon Steel
Fluid circulated	Component cooling water
Fouling factor, hr-ft^2 - F/BTU	.0005
Flow, 1bm/hr	1.12×10^5 (225 gpm)
Inlet temperature, °F	105
Outlet temperature, °F	125
Tube Side Data:	
Design pressure, psig	150
Design temperature, °F	250
Pressure loss at operating conditions, psid	10
Nozzle size, inches	3
Material of construction	Stainless Steel
Fluid circulated	Borated reactor coolant
Fouling factor, hr-ft^2 - F/BTU	.0003
Flow, 1bm/hr	4.46×10^4
Inlet temperature, °F	180
Outlet temperature, °F	130
Reactor Coolant Drain Tank	
Number per unit	1
Internal volume, gal.	350
Design pressure, internal, psig	100

Design pressure, external, psig	15
Operating pressure range, psig	2-5
Cover gas	Hydrogen or Nitrogen
Normal operating temperature, °F	170 or less
Material of construction	Stainless Steel
Design temperature, °F	250
Reactor Coolant Drain Tank Pumps	
Number per unit	2
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	100
Developed head @ design flow, ft	300
Incore Instrumentation Room Sump Pumps	
Number	1 (per unit)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless steel
Design flow, gpm	50
Head @ design flow, ft	63
Containment Floor and Equipment Sump Pumps	
Number	4 (per unit)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless steel
Design flow, gpm	50
Head @ design flow, ft	37
Waste Drain Tank Subsystem Parameters	
Waste Drain Tank	

Number	1 (for both units)
Internal volume, gal.	5,000
Design pressure; internal, psig	15
Design temperature, °F	200
Material of construction	Stainless steel
Type	Vertical with diaphragm
Waste Drain Tank Pump	
Number	2 (for both units)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Waste Evaporator Feed Tank	
Number	1 (for both units)
Internal volume, gal.	5,000
Design pressure; internal, psig	15
Design temperature, °F	200
Material of construction	Stainless steel
Type	Horizontal
Waste Evaporator Feed Pump	
Number	2 (for both units)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200

Waste Evaporator Feed Filter	
Number	2 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled -20
Pressure loss at design flow, psid	Unfouled -5
Retention, percent @ 25 micron practical size	98 (100% retention at 49 micron)
Material of construction	Stainless steel
Waste Evaporator Package	
Number	1 (for both units)
Capacity	15 gpm
Bottoms concentration	10 - 2500 ppm B (as dilute boric acid)
Bottoms concentration	7000 - 21,000 ppm B
Waste Evaporator Condensate Demineralizer	
Number	1 (for both units)
Type	Flushable
Resin Type	ROHM & HAAS amberlite 1RN-150 or equivalent (H^+, OH^- form)
Design pressure; internal, psig	150
Design temperature, °F	200
Resin volume, ft^3	30
Design flow - through, gpm	35
Material of construction	Stainless steel
Waste Evaporator Reagent Tank	
Number	1 (for both units)
Internal volume, gal.	5
Design pressure; internal, psig	150
Design pressure, external	Atmospheric
Design temperature, °F	200
Material of construction	Stainless steel
Type	Vertical
Waste Evaporator Condensate Filter	

Number	1 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20 Unfouled - 5
Retention, percent @ 25 micron particle size	98 (100% retention at 49 micron)
Material of construction	Stainless steel
Recycle Monitor Tanks	
Number	2 (for both units)
Internal volume, gal.	5000
Design pressure; internal, psig	15
Design temperature, °F	200
Material of construction	Stainless steel
Type	Vertical
Recycle Monitor Tank Pump	
Number	2 (for both units)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Waste Evaporator Condensate Return Unit	
Number for both units	1
Receiver volume, gal.	100
Design pressure, psig	200
Design temperature, °F	350
Number of pumps	2
Design flow, gpm	25

Design head, ft	65
Waste Evaporator Feed Tank Sump Pump	
Number	2 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless steel
Design flow, gpm	50
Head at design flow, ft	84

Laundry and Hot Shower Tank Subsystem Parameters	
Laundry and Hot Shower Tank	
Number	1 (for both units)
Internal volume, gal.	10,000
Design pressure; internal, psig	15
Design temperature, °F	200
Material of construction	Stainless steel
Type	Horizontal
Laundry and Hot Shower Tank Pre-strainer	
Number	1 (for both units)
Type	Duplex basket
Design pressure, psig	50
Design temperature, °F	200
Maximum flow, gpm	400
Pressure loss at maximum flow (65% plugged), psig	5
Strainer mesh number	20
Material of construction	Stainless steel
Laundry and Hot Shower Tank Strainer	
Number	1 (for both units)
Type	Singlex basket
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35

Pressure loss at design flow (65% plugged), psig	5
Strainer mesh number	40
Material of construction	Stainless steel
Laundry and Hot Shower Tank Pump	
Number	1 (for both units)
Type	Centrifugal with mechanical seals
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Laundry and Hot Shower Tank Primary Filters A and B	
Number	2 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20 Unfouled - 5
Retention, percent @ 25 microns particle size	98 (100% retention at 49 microns)
Material of construction	Stainless steel
Laundry and Hot Shower Tank Secondary Filter	
Number	1 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20 Unfouled - 5
Retention, percent @ 3 microns particle size	98 (100% retention at 23 microns)
Material of construction	Stainless steel

Laundry and Hot Shower Tank Carbon Filter	
Number	1 (for both units)
Type	Flushable
Design pressure; internal, psig	150
Design temperature, °F	200
Activated carbon volume, ft^3	50
Design flow-through, gpm	35
Material of construction	Stainless steel
Bed depth, ft	4
Waste Monitor Tank Demineralizer	
Number	1 (for both units)
Type	Flushable
Resin type	Duolite S-37
Design pressure; internal, psig	150
Design temperature, °F	200
Resin volume, ft^3	30
Design flow-through, gpm	35
Material of construction	Stainless steel
Waste Monitor Tank Filter	
Number	1 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow, psid	Fouled - 20 Unfouled - 5
Retention, percent @ 25 micron particle size	98 (100° retention at 49 micron)
Material of construction	Stainless steel
Waste Monitor Tanks	
Number	2 (for both units)
Internal volume, gal.	5000
Design pressure; internal, psig	15

Design temperature, °F	200
Material of construction	Stainless steel
Type	Horizontal
Waste Monitor Tank Pumps	
Number per unit	2 (for both units)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200

Floor Drain Tank Subsystem Parameters	
Floor Drain Tank	
Number	1 (for both units)
Internal volume, gal.	10,000
Design pressure; internal, psig	15
Design temperature, °F	200
Material of construction	Stainless steel
Type	Horizontal
Floor Drain Tank Pre-strainer A	
Number	1 (for both units)
Type	Duplex
Design pressure, psig	50
Design temperature, °F	200
Maximum flow, gpm	400
Pressure loss at maximum flow (65% plugged), psig	5
Strainer mesh number	20
Material of construction	Stainless steel
Floor Drain Tank Pre-strainer B	
Number	1 (for both units)

Type	Duplex
Design pressure, psig	50
Design temperature, °F	200
Maximum flow, gpm	50
Pressure loss at maximum flow (65% plugged), psig	1.5
Strainer mesh number	20
Material of construction	Stainless steel
Floor Drain Tank Strainer	
Number	1 (for both units)
Type	Singlex basket
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35
Pressure loss at design flow (65% plugged), psig	5
Strainer mesh number	40
Material of construction	Stainless steel
Floor Drain Tank Pump	
Number	1 (for both units)
Type	Centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Floor Drain Tank Filter	
Number	1 (for both units)
Type	Disposable Cartridge
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	35

Pressure loss at design flow, psid	Fouled – 20 Unfouled - 5
Retention, percent @ 25 micron particle size	98 (100% retention at 49 micron)
Material of construction	Stainless steel
Floor Drain Tank Sump Pumps 1A1, 1A2, 1B1, 1B2	
Number	4 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	50
Head at design flow, ft	42
Floor Drain Tank Sump Pumps 2C1, 2C2, 1D1, 1D2	
Number	4 (for both units)
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	50
Head at design flow, ft	91
Auxiliary Feedwater Pump Pit Sump Pump	
Number per unit	4
Type	Vertical Sump Pump
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	50
Head at design flow, ft	90
Upper Head Injection Room Sump Pump	
Number	1 per unit
Type	Vertical sump pump
Design pressure, psig	50
Design temperature, °F	125

Material of construction	Stainless steel
Design flow, gpm	25
Head at design flow, ft	18
Containment Spray and Residual Heat Removal Pump Room Sump Pump	
Number per unit	2
Type	Vertical sump pump
Design pressure, psig	150
Design temperature, °F	180
Material of construction	Stainless steel
Design flow, gpm	100
Head at design flow, ft	100
Sump Pump Bearing Lube Injection Strainers (for Auxiliary Fdw. Pump Pit Sump Pumps and NS & ND Pump Room Sump Pumps)	
Number per unit	6
Type	Centrifugal Separator
Design pressure, psig	100
Design temperature, °F	200
Available pressure drop - normal psig	40
Maximum psig	52
Minimum psig	20
Flow range, gpm	0.5 to 1.5 at clean water outlet
Required particle retention size, in	.003
Material of construction	Stainless steel

Mixing and Settling Tank Subsystem Parameters	
Mixing and Settling Tank	
Number	1 (for both units)
Type	Vertical cylindrical with conical bottom
Capacity, gal.	800
Design pressure; internal, psig	15
Design temperature, °F	200
Normal operating temperature, °F	65
Material of construction	Stainless steel
Accessories (list) - See Below	Electric motor mixer

	Steam panel coils
Mixing and Settling Tank Pump	
Number per unit	1 (for both units)
Type	Canned centrifugal
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Mixing and Settling Tank Sludge Pump	
Number	1 (for both units)
Type	Canned centrifugal with external flushing
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	Condition 1: 35 Condition 2: 100
Developed head, ft	Condition 1: 250 Condition 2: 200
Required flushing/cooling water, gpm	3 ± 1
Mixing and Settling Tank Reagent Tank	
Number	1 (for both units)
Internal volume, gal.	20
Design pressure; internal, psig	150
Design pressure, external	Atmospheric
Design temperature, °F	200
Material of construction	Stainless steel
Mixing and Settling Tank Metering Pump	
Number	1 (for both units)
Type	Positive displacement with metered capacity
Design pressure, psig	150

Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gph	3 to 30
Mixing and Settling Tank Condensate Strainer	
Number	1 (for both units)
Type	Y-strainer
Design flow, gpm	10
Design pressure, psig	150
Design temperature, °F	200
Pressure loss at design flow	
Strainer mesh number	40 Stainless steel
Material of construction	Stainless Steel
Mixing and Settling Tank Steam Panel Coil	
Number	1 (for both units)
Type	Embossed steam panel coil
Material of construction	Stainless steel
Heat duty required, BTU per hour	365,200
Initial temperature of tank contents, °F	70
Final temperature of tank contents, °F	180
Tank diameter, ft.	5
Steam pressure, saturated, psig	50
Method of attachment to tank	Heat transfer cement adhesive and straps
Mixing and Settling Tank Mixer	
Number	1 (for both units)
Type	Electric motor mixer with paddle
Flange size for mixer attachment, in.	6
Design pressure inside tank, psig	15
Design temperature, °F	200
Material of construction	All wetted parts to be stainless steel

Ventilation Unit Condensate Drain Tank Subsystem Parameters	
Ventilation Unit Condensate Drain Tank	
Number	1 (for each unit)
Internal volume, each, gal.	5000

Design pressure, internal	Atmospheric
Design temperature, °F	125
Material of construction	Stainless steel
Ventilation Unit Condensate Drain Tank Pumps	
Number	2 (for each unit)
Type	Centrifugal - Vertical inline
Design pressure, psig	150
Design temperature, °F	125
Material of construction	Stainless steel
Design flow, gpm	50
Developed head, ft	135

Steam Generator Drain Tank Subsystem Parameters	
Steam Generator Drain Tank	
Number	2 (for both units)
Internal volume, each, gal.	50,000
Design pressure, internal	Atmospheric - 2" H_20
Design temperature, °F	200
Material of construction	Stainless steel
Type	Stainless steel lined concrete building with stainless lined roof
Accessories	Filtered air inlet on roof
Steam Generator Drain Pump	
Number	1 per unit
Type	Centrifugal - Vertical inline
Design pressure, psig	150
Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	200
Developed head, ft	75
Steam Generator Drain Tank Pumps	
Number	2 shared
Type	Centrifugal with mechanical seals
Design pressure, psig	150

Design temperature, °F	200
Material of construction	Stainless steel
Design flow, gpm	50
Developed head, ft	230

Table 11-9. Normal Expected Daily Flows to Liquid Radwaste System (2 Units)

Subsystem		Normal Daily Flow (GPD) (2 Units)	% NC Activity
REACTOR COOLANT DRAIN TANK			
RCP Seal Leakoffs 4/unit @ 3.03gph		582	
Valve Leakoffs 45 valves/unit @ 1GPD each		90	
	Total	672	100.
WASTE DRAIN TANK			
Equipment Flushes (3 x component volume)		1800	3.3
Through Line Leakage		100	1.0
	Total	1900	3.2
WASTE EVAPORATOR FEED TANK			
Reactor Coolant Leakage in Containment		40	100.
Cold Lab Drains & Hot Lab Rinses		200	.2
Sample Sink Drains		80	100.
Equipment Drains		600	1.
Valve Leakoffs (100 valves @ 1GPD)		100	10.
Through Line Leakage		100	1.
	Total	1120	12.3
LAUNDRY AND HOT SHOWER TANK SUBSYSTEM			
Showers and Laundry Machines		1350	
Lab Dishwasher		120	
Lavatory Sinks		100	
	Total	1570	.0
FLOOR DRAIN TANK (includes FDT Sumps A & B)			
50% of Aux. Bldg. Floor Drains		400	10.
50% of Aux. Bldg. Floor Drains		600	0.
Ice Condenser Defrost		50	0.
Through Line Leakage		100	1.
Groundwater Inleakage		10	0.
Decon Sinks - Aux. Bldg. & Reactor Bldg.		200	1.
	Total	1360	3.2
MIXING AND SETTLING TANK			

Subsystem		**Normal Daily Flow (GPD) (2 Units)**	**% NC Activity**
Ultrasonic Cleaner and Turbulator Drains		100	
	Total	100	100.
CONTAINMENT VENT. UNIT CONDENSATE DRAIN TANK			
Unit 1 - Summer Operation w/Purge		16800	
Unit 2 - Normal Operation		9600	
	Total	26400	.0
NON-RADIATION AREA FDT SUMPS C & D			
All Aux. Bldg. Ventilation Unit Condensate (summer max. operation)		26450	
50% Aux. Bldg. Floor Drains		1000	
	Total	27450	.0
STEAM GENERATOR DRAIN TANK			
		Annual Flow (gallons)	
Drain Steam Generator Contents		25000	See Table 11-4
Flush Steam Generator		75000	
	Total	100000	

Table 11-10. Tanks Outside Containment Which Contain Potentially Radioactive Liquids

Tank	System	Figure	Location (Building - Elevation, ft)	Level Indication	High Level Alarm	Overflow
Volume Control	NV	9-90	AB-560	Yes	Yes	Input diverts to Recycle Holdup Tank on High Level
Boric Acid	NV	9-100	AB-560	Yes	Yes	Overflows to Waste Evaporator Feed Tank
Boron Recycle Holdup Tanks A & B	NB	9-101	AB-543	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump A
Reactor Makeup Water Storage	NB	9-104	YD	Yes	Yes	Overflows to Containment Spray and Residual Heat Removal Pump Room Sump
Laundry and Hot Shower	WL	11-3	AB-543	Yes	Yes	Overflows via vent to Floor Drain Sump B
Waste Monitor Tanks A & B	WL	11-3, 11-4	AB-543	Yes	Yes	Overflows via vent to Floor Drain Sump B
Floor Drain	WL	11-4	AB-543	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump B
Mixing & Settling	WL	11-4	AB-543	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump B
Waste Drain	WL	11-5	AB-543	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump B
Waste Evaporator Feed	WL	11-5	AB-543	Yes	Yes	Overflows to Floor Drain Sump A
Recycle Monitor Tanks A & B	WL	11-7	AB-543	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump B
Ventilation Unit Condensate Drain	WL	11-12	AB-543	Yes	Yes	Overflows via vent to Floor Drain Sump D

Tank	System	Figure	Location (Building - Elevation, ft)	Level Indication	High Level Alarm	Overflow
BFT's 2A & 2B	NV	9-268	UH2-550	Yes	Yes	Overflows to opposite BFT
Steam Generator Drain Tanks A & B	WL	11-17	YD	Yes	Yes	Overflows via vent header to Waste Evaporator Feed Tank
Spent Resin Storage Tanks A & B	WS	11-30	AB-543	Yes	Yes	Overflows vent relief valve to Floor Drain Sump B
Chemical Drain	WS	11-32	AB-537	Yes	Yes	Overflows to Waste Evaporator Feed Tank Sump B
Radwaste Batching	WS	11-33	AB-577	Yes	Yes	Overflows to Mixing and Settling Tank (WL System)
Evaporator Concentrates Holdup	WS	11-33	AB-577	Yes	Yes	Overflows to Waste Evaporator Feed Tank (WL System)
Evaporator Concentrates Batch	WS	11-35	AB-577	Yes	Yes	Overflows to Waste Evaporator Feed Tank (WL System)
Refueling Water Storage	FW	9-62	YD	Yes	Yes	Overflows to Waste Evaporator Feed Tank
Steam Generator Blowdown	BB	10-29	YD	Yes	Yes	Influent control valves fail closed on high level precluding overflow
Auxiliary Monitor Tanks A, B, C	WL	11-38	MTB-594	Yes	Yes	Overflows to Monitor Tank Building Sump

Table 11-11. Catawba Nuclear Station Estimated Radioactive Releases in Liquid Effluents (curies/year/unit)

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED

Isotope	*Boron Recycle System*	*Liquid Radwaste System*	*Turbine Building Drains*	*Steam Generator Drain Tank* [1]	*Laundry Waste*	*Total* [2]
Cr-51	*1.5E-5*	*8.9E-7*	*5.7E-7*	*1.1E-5*	*0.0*	*4.0E-4*
Mn-54	*3.1E-6*	*1.5E-7*	*1.3E-7*	*2.4E-6*	*5.0E-8*	*8.1E-5*
Fe-55	*1.6E-5*	*7.7E-7*	*5.1E-7*	*9.6E-6*	*0.0*	*4.2E-4*
Fe-59	*8.9E-6*	*4.7E-7*	*3.8E-7*	*7.3E-6*	*0.0*	*2.3E-4*
Co-58	*1.5E-4*	*7.6E-6*	*5.1E-6*	*9.7E-5*	*2.0E-7*	*3.9E-3*
Co-60	*2.1E-5*	*9.6E-7*	*5.7E-7*	*1.1E-5*	*4.3E-7*	*5.2E-4*
Zr-95	*5.6E-7*	*2.8E-8*	*2.5E-8*	*4.8E-7*	*0.0*	*1.5E-5*
Nb-95	*5.3E-7*	*2.4E-8*	*2.6E-8*	*4.8E-7*	*0.0*	*1.4E-5*
Np-239	*1.7E-6*	*4.1E-6*	*3.8E-7*	*7.8E-6*	*0.0*	*6.4E-5*
Br-83	*4.4E-11*	*7.3E-7*	*1.4E-6*	*1.5E-5*	*0.0*	*6.3E-5*
Rb-86	*1.6E-6*	*3.9E-8*	*4.8E-8*	*9.2E-7*	*0.0*	*4.0E-5*
Sr-89	*3.2E-5*	*1.7E-7*	*1.3E-7*	*2.4E-6*	*0.0*	*8.2E-5*
Y -91	*6.4E-7*	*3.2E-8*	*1.9E-8*	*3.6E-7*	*0.0*	*1.6E-5*
Mo-99	*1.4E-4*	*3.0E-5*	*2.5E-5*	*5.1E-4*	*0.0*	*5.1E-3*
Tc-99m	*1.4E-4*	*2.8E-5*	*2.5E-5*	*5.2E-4*	*0.0*	*4.9E-3*
I- 134	*1.7E-16*	*7.0E-7*	*4.3E-7*	*9.2E-5*	*0.0*	*1.2E-4*
Te-127m	*2.7E-6*	*1.3E-7*	*6.3E-8*	*1.2E-6*	*0.0*	*6.8E-5*
Te-127	*2.7E-6*	*1.9E-7*	*1.8E-7*	*4.8E-6*	*0.0*	*7.6E-5*
Te-129m	*1.2E-5*	*6.6E-7*	*3.8E-7*	*7.3E-6*	*0.0*	*3.0E-4*
Te-129	*7.6E-5*	*4.3E-7*	*2.6E-7*	*1.4E-5*	*0.0*	*2.0E-4*

Isotope	*Boron Recycle System*	*Liquid Radwaste System*	*Turbine Building Drains*	*Steam Generator Drain Tank* [1]	*Laundry Waste*	*Total* [2]
I -130	*5.5E-8*	*2.9E-6*	*2.9E-6*	*7.8E-6*	*0.0*	*1.4E-4*
Te-131m	*1.4E-6*	*6.5E-7*	*6.2E-7*	*1.4E-5*	*0.0*	*7.5E-5*
Te-131	*2.6E-7*	*1.2E-7*	*1.1E-7*	*5.4E-6*	*0.0*	*1.7E-5*
I -131	*3.4E-4*	*1.2E-3*	*5.1E-4*	*1.0E-3*	*3.1E-9*	*4.8E-2*
Te-132	*5.5E-5*	*1.0E-5*	*6.3E-6*	*1.3E-4*	*0.0*	*1.8E-3*
I -132	*5.7E-5*	*5.8E-5*	*4.0E-5*	*4.0E-4*	*0.0*	*4.0E-3*
I -133	*3.1E-5*	*8.0E-3*	*6.2E-4*	*1.4E-3*	*0.0*	*3.5E-2*
Cs-134	*7.4E-4*	*1.2E-5*	*1.4E-5*	*2.7E-4*	*6.5E-7*	*1.8E-2*
I -135	*7.5E-7*	*1.3E-4*	*2.0E-4*	*6.9E-4*	*0.0*	*8.3E-3*
Cs-136	*2.1E-4*	*5.9E-6*	*7.3E-6*	*1.4E-4*	*0.0*	*5.2E-3*
Cs-137	*5.4E-4*	*8.7E-6*	*1.0E-5*	*2.0E-4*	*1.2E-6*	*1.3E-2*
Ba-137m	*5.0E-4*	*8.1E-6*	*9.6E-6*	*2.6E-4*	*0.0*	*1.2E-2*
Ba-140	*1.4E-6*	*9.9E-8*	*6.3E-8*	*1.2E-6*	*0.0*	*3.6E-5*
La-140	*1.6E-6*	*8.6E-8*	*5.0E-8*	*9.3E-7*	*0.0*	*4.0E-5*
Ce-141	*5.8E-7*	*3.3E-8*	*2.5E-8*	*4.8E-7*	*0.0*	*1.5E-5*
Others	*2.6E-6*	*2.6E-7*	*2.75E-7*	*2.3E-4*	*0.0*	*2.3E-4*
Total	*3.01E-3*	*2.3E-3*	*1.5E-3*	*6.1E-3*	*3.1E-6*	*1.6E-1*

Notes:

1. *One Steam Generator Drain Tank Volume (50,000 gallons at secondary coolant concentration) is assumed to be released per year with no processing.*
2. *Total is adjusted to include 0.15 curies attributable to operational occurrences that result in unplanned releases.*
3. *Tritium Release is 710 curies/yr/unit*

Table 11-12. Estimated Doses from Radioactive Liquid Effluents Released from the Station

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED

		Design Objectives	
	Dose	***Annex to Appendix I***	***Appendix I***
Maximum total body dose from all pathways of exposure (mrem)	*2.6 (adult)*	*5*	*6*
Maximum organ dose from all pathways of exposure (mrem)	*3.4 (adult-liver)*	*5*	*20*
Total curies	*0.3*	*10*	*----*
Population Dose (man-rem)	*4.3*	*--*	*----*

Table 11-13. Waste Gas System Component Data

Waste Gas Compressors	
Quantity (per plant)	2
Design temperature, °F	180
Design pressure, psig	150
Operating suction pressure, psig	0.5
Design flow (N_2 at 140°F and 110 psi discharge), scfm	40
Material	SS
Operating temperature, °F	70-130
Operating pressure, psig	25-100
Catalytic Hydrogen Recombiner	
Quantity (per plant)	2
Design temperature, °F	Note 1
Design pressure, psig	150
Design flow, scfm	50
Catalyst bed design life, yrs	1
Material	SS
Operating Conditions, Inlet	
Temperature, °F	70-140
Pressure, psig	25-100
Operating Conditions, Outlet	
Temperature, °F	70-140
Pressure, psig	20
Waste Gas Decay Tanks	
(Normal Power Service Tanks)	
Quantity	6
Type	Vertical cylindrical
Design temperature, °F	180
Design pressure, psig	150
Volume, ft^3	600
Material	CS
Shutdown/Startup Tanks	
Quantity	2

Type	Vertical cylindrical
Design temperature, °F	180
Design pressure, psig	150
Volume, ft^3	600
Material	CS

Note:

1. Varies by component, but exceeds component operating temperature by 100°F.

Table 11-14. Estimated Annual Airborne Effluent Releases. (curies/yr/unit)

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED

Isotope	*Waste Gas Decay Tanks*	*Reactor Building Purge*	*Auxiliary Building Ventilation*	*Turbine Building Steam Leaks*	*Air Ejector*	*Total*
Kr-83m	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Kr-85m	*0.0*	*1.8*	*2.7*	*0.0*	*1.7*	*6.2*
Kr-85	*2.7E+2*	*5.0*	*0.0*	*0.0*	*0.0*	*2.8E+2*
Kr-87	*0.0*	*0.0*	*1.6*	*0.0*	*0.0*	*1.6*
Kr-88	*0.0*	*2.2*	*5.0*	*0.0*	*3.1*	*1.0E+1*
Kr-89	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Xe-131m	*3.3*	*7.1*	*0.0*	*0.0*	*0.0*	*1.0E+1*
Xe-133m	*0.0*	*1.6E+1*	*2.4*	*0.0*	*1.5*	*1.9E+1*
Xe-133	*1.3*	*1.4E+3*	*1.2E+2*	*0.0*	*7.3E+1*	*1.5E+3*
Xe-135m	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Xe-135	*0.0*	*1.0E+1*	*7.5*	*0.0*	*4.7*	*2.3E+1*
Xe-137	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Xe-138	*0.0*	*0.0*	*1.2*	*0.0*	*0.0*	*1.2*
I-131	*0.0*	*7.3E-3*	*4.5E-3*	*0.0*	*2.8E-3*	*1.5E-2*
I-133	*0.0*	*2.3E-3*	*6.8E-3*	*0.0*	*4.3E-3*	*1.4E-2*
Mn-54	*4.5E-3*	*1.8E-4*	*1.8E-4*	-	-	*4.9E-3*
Fe-59	*1.5E-3*	*6.3E-5*	*6.0E-5*	-	-	*1.6E-3*
Co-58	*1.5E-3*	*6.3E-4*	*6.0E-4*	-	-	*1.6E-2*
Co-60	*7.0E-3*	*2.8E-4*	*2.7E-4*	-	-	*7.6E-3*

Isotope	***Waste Gas Decay Tanks***	***Reactor Building Purge***	***Auxiliary Building Ventilation***	***Turbine Building Steam Leaks***	***Air Ejector***	***Total***
Sr-89	*3.3E-4*	*1.4E-5*	*1.3E-5*	-	-	*3.6E-4*
Sr-90	*6.0E-5*	*2.5E-6*	*2.4E-6*	-	-	*6.5E-5*
Cs-134	*4.5E-3*	*1.8E-4*	*1.8E-4*	-	-	*4.9E-3*
Cs-137	*7.5E-3*	*3.2E-4*	*3.0E-4*	-	-	*8.1E-3*
C-14	-	-	-	-	-	*>8.0*
Ar-41	-	-	-	-	-	*>2.5E+1*
H-3	-	-	-	-	-	*>7.1E+2*

Note:

1. *0.0 Appearing in the table indicates release is less than 1.0 Ci/yr for noble gas, and 0.0001 Ci/yr for iodine.*

Table 11-15. Estimated Doses from Gaseous Effluent Releases from the Station

HISTORICAL INFORMATION IN ITALICS BELOW NOT REQUIRED TO BE REVISED

	Dose from Estimated Releases	***Dose Objectives***	
		Annex to Appendix I	***Appendix I***
Maximum Beta air dose (mrad/yr)	*5.2E-2*	*20*	*40*
Maximum Gamma air dose (mrad/yr)	*2.2E-2*	*10*	*20*
Maximum Skin dose (mrem/yr) to an individual	*4.0E-2*	*15*	*30*
Maximum Whole Body dose (mrem/yr) to an individual	*1.4E-2*	*5*	*10*
Maximum Organ dose (mrem/yr) to an individual	*4.3E-1 (infant thyroid)*	*15*	*30*
Dose to Population within 50 miles (man-rem)	*4.0*	*----*	*----*

Table 11-16. Estimated Maximum Specific Activities Input to Nuclear Solid Waste Disposal System [HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED]

	Evaporator Concentrates Arriving at Storage Tank (µ Ci/cc)	*Spent Resins Arriving at Storage Tank (µ Ci/cc)*
Br84	$<1.0 \times 10^{-10}$	3.7×10^{-1}
Rb88	$<1.0 \times 10^{-10}$	1.1×10^{1}
Rb89	$<1.0 \times 10^{-10}$	2.9×10^{-1}
Sr89	1.3×10^{-2}	6.8 x. 10^{1}
Sr90	7.5×10^{-4}	1.8×10^{1}
Sr91	9.9×10^{-4}	3.3×10^{-1}
Sr92	1.5×10^{-6}	3.6×10^{-2}
Y90	8.7×10^{-4}	2.4×10^{-1}
Y91	2.5×10^{-2}	1.4×10^{2}
Y92	3.2×10^{-5}	4.5×10^{-2}
Zr95	2.8×10^{-3}	1.8×10^{1}
Nb95	2.8×10^{-3}	1.0×10^{1}
Mo99	1.7×10^{-1}	6.5×10^{3}
I131	9.4×10^{0}	7.5×10^{3}
I132	8.6×10^{-1}	3.2×10^{1}
I133	6.5×10^{0}	1.3×10^{3}
I134	1.6×10^{-10}	6.9×10^{0}
I135	4.1×10^{-1}	2.3×10^{1}
Te132	8.3×10^{-1}	3.4×10^{2}
Te134	$<1.0 \times 10^{-10}$	3.7×10^{-1}
Cs134	9.2×10^{0}	1.1×10^{5}
Cs136	$2.1 \times 10^{+1}$	1.7×10^{4}
Cs137	6.3×10^{0}	9.2×10^{4}
Cs138	$<1.0 \times 10^{-10}$	5.6×10^{0}
Ba140	1.6×10^{-2}	2.2×10^{1}
La140	1.0×10^{-2}	1.0×10^{0}
Ce144	1.8×10^{-3}	3.1×10^{1}
Pr144	1.8×10^{-3}	2.2×10^{-3}
Cr51	1.7×10^{-2}	4.7×10^{1}
Mn54	1.4×10^{-3}	2.4×10^{1}

	Evaporator Concentrates Arriving at Storage Tank (μ Ci/cc)	***Spent Resins Arriving at Storage Tank (μ Ci/cc)***
Mn56	2.1×10^{-5}	7.1×10^{-1}
Co58	4.5×10^{-2}	3.1×10^{2}
Co60	5.0×10^{-3}	1.1×10^{2}
Fe59	1.6×10^{-3}	7.3×10^{0}

Table 11-17. Solid Radwaste System Component Data

1. Spent Resin Storage Tanks	
Quantity	2
Tank Volume, Gal.	5000
Resin Storage Volume, Gal.	3800
Design Pressure, PSIG	100
Design Temperature, °F	200
Material	Stainless Steel
2. Chemical Drain Tank	
Quantity	1
Tank Volume, Gal.	600
Holdup Volume, Gal.	600
Design Pressure, PSIG	Atmospheric
Design Temperature, °F	200
Material	Stainless Steel
3. Evaporator Concentrates Holdup Tank	
Quantity	1
Tank Volume, Gal.	3000
Holdup Volume, Gal.	3000
Design Pressure, PSIG	Atmospheric
Design Temperature, °F	200
Material	Stainless Steel
4. Evaporator Concentrates Batch Tank	
Quantity	1
Tank Volume, Gal.	2000
Storage Volume, Gal.	2000
Design Pressure, PSIG	Atmospheric
Design Temperature, °F	200
Material	Stainless Steel
5. Radwaste Batching Tank	
Quantity	1
Tank Volume, Gal.	880
Batch Volume, Gal.	730

Design Pressure, PSIG	Atmospheric
Design Temperature, °F	150
Material	Stainless Steel
6. Binder Storage Tank	
Quantity	1
Tank Volume, Gal.	6000
Useable Volume, Gal.	6000
Design Pressure, PSID	0.1 (internal), 0.2 (external)
Design Temperature, °F	120
Material	Carbon Steel, internally coated with Wisconsin Plastite 3066
7. Disposable Containers (Liners for Low Activity Waste)	
Quantity	As Required
Container size	Various as allowed by the applicable disposal site criteria
Container Volume, Ft^3/Gal.	Various – Typical 120.3/899.9 to 205.8/1539.5
Useable Volume, Ft^3/Gal.	Various – Typical 91/680.7 to 178/1331.5
Weight Full, LBS.	Various as allowed by liner and based on waste density
8. Spent Resin Sluice Pump	
Quantity	1
Type	Canned Horizontal Centrifugal
Design Pressure, PSIG	150
Design Temperature, °F	200
Design Flow, GPM	140
Total Head at Design Flow, Ft	250
Material	Stainless Steel
9. Chemical Drain Tank Pump	
Quantity	1
Type	Canned Horizontal Centrifugal
Design Pressure, PSIG	150
Design Temperature, °F	200
Design Flow, GPM	35/100

Total Head at Design Flow, FT	250/200
Material	Stainless Steel
10. Radwaste Transfer Pump	
Quantity	1
Type	Progressing Cavity Positive Displacement
Capacity, GPM	Variable 2 to 16
Total Head, FT	250
Material	Stainless Steel rotor, Buna-N stator
11. Binder Pump	
Quantity	1
Type	Progressing Cavity Positive Displacement
Design Pressure, PSIG	210
Design Temperature, °F	120
Design Flow, GPM	50 gpm
Total Head at Design Flow, FT	160
Material	Stainless Steel rotor, Viton stator
12. Liner Vault Sump Pump	
Quantity	1
Type	Air-driven, vertical sump pump
Design Pressure, PSIG	50
Design Temperature, °F	200
Design Flow, GPH	50 gpm
Total Head at Design Flow, FT	50
Material	Stainless Steel
13. Dewatering Pump	
Quantity	1
Type	Single Stage Turbine Pump
Design Pressure, PSIG	150
Design Temperature, °F	200
Design Flow, GPM	18
Total Head at Design Flow, FT	300
Material	Stainless Steel

14. Spent Resin Sluice Filter	
Quantity	1
Type	Disposable Cartridge
Design Pressure, PSIG	150
Design Temperature, °F	200
Design Flow, GPM	150
Pressure Loss at Design Flow, PSID	Fouled - 20 Unfouled - 5
Retention, percent, @ 25 micron particle size Material	98 Stainless Steel
15. Resin Batching Tank Mixer	
Quantity	1
Type	Top Entering, Vertically Mounted
Motor, HP	5
Material	Stainless Steel

Table 11-18. Deleted Per 1997 Update

Table 11-19. Liquid Process Radiation Monitoring Equipment

Monitor Identification	Detector Type	Sensitivity[(1)]	Max. Detectable Concentration	Range Counts/Min	Typical Setpoint	Design Service
Turbine Building sump monitor (EMF31)	NaI Scintillator	$3X10^{-8}$ µCi/ml I-31 $2X10^{-8}$ µCi/ml Co-60 $3X10^{-8}$ µCi/ml Cs-137	$2X10^{-2}$ µCi/ml I-131 $1X10^{-2}$ µCi/ml Co-60 $2X10^{-2}$ µCi/ml Cs-137	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.1.1)	Normal operation gross gamma
Deleted Per 2006 Update						
Nuclear service water monitor (EMF45)	NaI Scintillator GM Tube	$3X10^{-8}$ µCi/ml I-131 $2X10^{-8}$ µCi/ml Co-60 $3X10^{-8}$ µCi/ml Cs-137	$1X10^{3}$ µCi/ml I-131 $8X10^{1}$ µCi/ml Co-60 $2X10^{2}$ µCi/ml Cs-137	10^{1} - 10^{7} 10^{1} - 10^{6}(2)	Refer to Section 11.5.1.2.1.4	Normal and Post LOCA gross gamma
Component cooling water monitor (EMF46)	NaI Scintillator	$3X10^{-8}$ µCi/ml I-131 $2X10^{-8}$ µCi/ml Co-60 $3X10^{-8}$ µCi/ml Cs-137	$2X10^{-2}$ µCi/ml I-131 $1X10^{-2}$ µCi/ml Co-60 $2X10^{-2}$ µCi/ml Cs-137	10^{1} - 10^{7}	Refer to Section 11.5.1.2.1.5	Normal operation gross gamma
Boron recycle evaporator condensate monitor (EMF47)	NaI Scintillator	$3X10^{-8}$ µCi/ml I-131 $2X10^{-8}$ µCi/ml Co-60 $3X10^{-8}$ µCi/ml Cs-137	$2X10^{-2}$ µCi/ml I-131 $1X10^{-2}$ µCi/ml Co-60 $2X10^{-2}$ µCi/ml Cs-137	10^{1} - 10^{7}	Refer to Section 11.5.1.2.1.6	Normal operation gross gamma
Waste liquid discharge monitor (EMF49)	NaI Scintillator GM Tube	$5X10^{-7}$ µCi/ml I-131 $3X10^{-7}$ µCi/ml Co-60 $6X10^{-7}$ µCi/ml Cs-137	$1X10^{3}$ µCi/ml I-131 $8X10^{1}$ µCi/ml Co-60 $2X10^{2}$ µCi/ml Cs-137	10^{1} - 10^{7} 10^{1} - 10^{6}(2)	(Refer to Section 11.5.1.2.1.8)	Normal Operation Gross Gamma
Clean area floor drains discharge monitor (EMF52)	NaI Scintillator	$3X10^{-8}$ µCi/ml I-131 $2X10^{-8}$ µCi/ml Co-60 $3X10^{-8}$ µCi/ml Cs-137	$2X10^{-2}$ µCi/ml I-131 $1X10^{-2}$ µCi/ml Co-60 $2X10^{-2}$ µCi/ml Cs-137	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.1.9)	Normal operation gross gamma

Monitor Identification	Detector Type	Sensitivity[(1)]	Max. Detectable Concentration	Range Counts/Min	Typical Setpoint	Design Service
Waste monitor tank building liquid discharge monitor (EMF57)	NaI Scintillator	$3X10^{-7}$ μCi/ml I-131 $2X10^{-7}$ μCi/ml Co-60 $3X10^{-7}$ μCi/ml Cs-137	$1X10^{-1}$ μCi/ml I-131 $6X10^{-2}$ μCi/ml Co-60 $1X10^{-1}$ μCi/ml Cs-137	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.1.10)	Normal operation gross gamma
Auxiliary Building Cooling Water Monitor (EMF89)	NaI Scintillator	$5X10^{-8}$ μCi/ml Co-60 $8X10^{-8}$ μCi/ml Cs-137	$4X10^{-2}$ μCi/ml Co-60 $7X10^{-2}$ μCi/ml Cs-137	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.1.11)	Normal operation gross gamma

Notes:

1. The sensitivity is for the single radionuclide listed; in the event mixtures of radionuclides are present, the sensitivity will vary. Sensitivity will also vary with background radiation and contamination buildup
2. High range (shielded)

Table 11-20. Airborne Process Radiation Monitoring Equipment

Monitor Identification	Detector Type	Sensitivity[1]	Max. Detectable Concentration	Range Counts/Min	Typical Setpoint	Design Service
Unit vent particulate monitor (EMF35)	Plastic Beta Scintillator	$9X10^{-11}$ µCi/ml Sr-90[2] $2X10^{-10}$ µCi/ml Co-60 $4X10^{-10}$ µCi/ml Cs-137	$8X10^{-2}$ µCi/ml Co-60[2] $7X10^{-1}$ µCi/ml Cs-137	10^1 - 10^7 10^1 - 10^6[4]	Refer to Section 11.5.1.2.2.1	Normal operation beta-gamma
Unit vent gas monitor (EMF36)	Plastic Beta Scintillator - GM Tube	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$4X10^3$ µCi/ml Kr-85 $2X10^2$ µCi/ml Xe-133	10^1 - 10^7 10^1 - 10^6[4]	Refer to Section 11.5.1.2.2.1	Normal operation beta-gamma
Deleted Per 2007 Update						
Unit vent high high range monitor (EMF54)	Ion Chamber	$3X10^0$ µCi/ml Xe-133[5]	$5X10^7$ µCi/ml Xe-133	10^0 - 10^8	Refer to Section 11.5.1.2.2.1	Post LOCA gross gamma
Containment air particulate monitor (EMF38)	Plastic Beta Scintillator	$2X10^{-10}$ µCi/ml Sr-90[2] $2X10^{-10}$ µCi/ml Co-60 $7X10^{-10}$ µCi/ml Cs-137	$8X10^{-2}$ µCi/ml Co-60[2] $7X10^{-1}$ µCi/ml Cs-137	10^1 - 10^7	Refer to Section 11.5.1.2.2.2	Normal operation beta-gamma
Containment gas monitor (EMF39)	Plastic Beta Scintillator - GM Tube	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$4X10^3$ µCi/ml Kr-85 $2X10^2$ µCi/ml Xe-133	10^1 - 10^7 10^1 - 10^6[4]	Refer to Section 11.5.1.2.2.2	Normal operation beta-gamma
Deleted Per 2007 Update						
Auxiliary Building ventilation monitor (EMF41)	Plastic Beta Scintillator	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$1X10^{-1}$ µCi/ml Kr-85 $3X10^{-1}$ µCi/ml Xe-133	10^1 - 10^7	Refer to Section 11.5.1.2.2.3	Normal operation beta
Fuel Building ventilation monitor (EMF42)	Plastic Beta Scintillator	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$1X10^{-1}$ µCi/ml Kr-85 $3X10^{-1}$ µCi/ml Xe-133	10^1 - 10^7	Refer to Section 11.5.1.2.2.4	Normal operation beta
Control Room Air intake monitor (EMF43)	Plastic Beta Scintillator	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$1X10^{-1}$ µCi/ml Kr-85 $3X10^{-1}$ µCi/ml Xe-133	10^1 - 10^7	10^{-4} µCi/ml	Normal operation beta

Monitor Identification	Detector Type	Sensitivity(1)	Max. Detectable Concentration	Range Counts/Min	Typical Setpoint	Design Service
Waste gas discharge monitor (EMF50)	Plastic Beta Scintillator - GM Tube	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$4X10^{3}$ µCi/ml Kr-85 $2X10^{2}$ µCi/ml Xe-133	10^{1} - 10^{7} 10^{1} - 10^{6}	(Refer to Section 11.5.1.2.2.6)	Normal operation beta-gamma
condenser air ejector exhaust monitor (EMF33)	Plastic Beta Scintillator	$1X10^{-7}$ µCi/ml Kr-85 $3X10^{-7}$ µCi/ml Xe-133	$1X10^{-1}$ µCi/ml Kr-85 $3X10^{-1}$ µCi/ml Xe-133	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.2.7)	Normal operation beta
Containment high range monitor (EMF53)	Ion Chamber	$2X10^{2}$ µCi/ml Xe-133 (5)	$5X10^{7}$ µCi/ml Xe-133	10^{0} - 10^{8} R/hr	10^{2} R/hr	Post LOCA gross gamma
Technical Support Center air intake monitor (EMF55)	Plastic Beta Scintillator	$2X10^{-7}$ µCi/ml Kr-85 $2X10^{-7}$ µCi/ml Xe-133	$1X10^{-1}$ µCi/ml Kr-85 $2X10^{-1}$ µCi/ml Xe-133	10^{1} - 10^{7}	10^{-4} µCi/ml	Normal operation beta
Waste monitor tank building ventilation monitor (EMF58)	Plastic Beta Scintillator	$5X10^{-7}$ µCi/ml Xe-133 $2X10^{-7}$ µCi/ml KR-85	$5X10^{2}$ µCi/ml Xe-133 $2X10^{2}$ µCi/ml Kr-85	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.2.10)	Normal operation beta
Annulus monitor (EMF60)	Plastic Beta Scintillator	$5X10^{-7}$ µCi/ml Xe-133 $2X10^{-7}$ µCi/ml KR-85	$5X10^{2}$ µCi/ml Xe-133 $2X10^{2}$ µCi/ml Kr-85	10^{1} - 10^{7}	(Refer to Section 11.5.1.2.2.11)	Normal operation beta

Notes:

1. The sensitivity is for the single radionuclide listed; in the event mixtures of radionuclides are present, the sensitivity will vary. Sensitivity will also vary with background radiation and contamination buildup.
2. Based on 15 minute buildup on filter.
3. Based on 1 hour buildup on charcoal cartridge.
4. High range (shielded)
5. Sensitivity value corresponds to typical setpoint listed.

Table 11-21. System Component Design Parameters

TANKS	
Auxiliary Monitor Tanks	
Quantity	3
Total Volume, GAL.	20,000
Design Pressure, internal, PSIG	-0.1
Design Pressure, external, PSID	0.1
Design Temperature, F	150
Material	Stainless Steel
Geometry	Right Cylinder 15'dia. 16' high
Powdex Storage Tank	
Quantity	1
Total Volume, GAL.	30,000
Design Pressure, internal, PSIG	-0.1
Design Pressure, external, PSID	0.1
Design Temperature, F	150
Material	Stainless Steel
Geometry	Right Cylinder Conical Bottom 18' dia 19' high
PUMPS	
Monitor Tank Pumps	
Quantity	3
Design Flow, GPM	200
Total Head, FT	250
Design Pressure, PSIG	150
Design Temperature, F	150
Material	Stainless Steel
Type	Horizontal Centrifugal
Powdex Dewatering Pump	
Quantity	1
Design Flow, GPM	60
Total Head, FT	70
Design Pressure, PSIG	150
Design Temperature, F	150

Material	Stainless Steel
Type	Horizontal Centrifugal
Powdex Transfer Pump	
Quantity	1
Design Flow, GPM	75
Total Head, FT	160
Design Pressure, PSIG	150
Design Temperature, F	150
Material	Stainless Steel
Type	Positive Displacement
Monitor Tank Building Sump Pump	
Quantity	2
Design Flow, GPM	50
Total Head, FT	50
Design Pressure, PSIG	150
Design Temperature, F	150
Material	Stainless Steel
Type	Vertical Centrifugal
Truck Bay Sump Pump	
Quantity	1
Design Flow, GPM	20
Total Head, FT	25
Design Pressure, PSIG	15
Design Temperature, F	100
Material	Cast Iron
Type	Submersible

Table 11-22. Adjacent-to-Line Radiation Monitoring System

Detector Number	Identification	Location	Sensitivity	Range
1EMF48	Reactor Coolant	EL 543 EE, 54	$120 \frac{counts/min}{mR/hr}$	10^{-1}-10^{4} mR/hr
1EMF71	Steam Generator 1A Leakage	EL 594, TB1 1M, 34	Undetermined	10^{0}-10^{5} GPD
1EMF72	Steam Generator 1B Leakage	EL 594, TB1 1E, 34	Undetermined	10^{0}-10^{5} GPD
1EMF73	Steam Generator 1C Leakage	EL 594, TB1 1E, 34	Undetermined	10^{0}-10^{5} GPD
1EMF74	Steam Generator 1D Leakage	EL 594, TB1 1M, 34	Undetermined	10^{0}-10^{5} GPD
2EMF48	Reactor Coolant	EL 543 EE, 61	$120 \frac{counts/min}{mR/hr}$	10^{-1}-10^{4} mR/hr
2EMF71	Steam Generator 2A Leakage	EL 594, TB2 2M, 34	Undetermined	10^{0}-10^{5} GPD
2EMF72	Steam Generator 2B Leakage	EL 594, TB2 2E, 34	Undetermined	10^{0}-10^{5} GPD
2EMF73	Steam Generator 2C Leakage	EL 594, TB2 2E, 34	Undetermined	10^{0}-10^{5} GPD
2EMF74	Steam Generator 2D Leakage	EL 594, TB2 2M, 34	Undetermined	10^{0}-10^{5} GPD