Appendix 11A. Tables

Table 11-1. Potential Radioactive Waste Quantities from Three Units

Waste Source	Quantity/Year[(1)] ($ft.^3$)	Assumptions & Comments
Reactor Coolant System		
Startup Expansion	39,800	Four cold startups per unit
Startup Dilution	49,000	One startup from cold condition at beginning of cycle, 77.5, 155 and 232.5 full power days, respectively, per unit
Lifetime Shim Bleed	43,800	Dilution 1070 to 180 ppm boron in each unit
System Drain	18,300	Drain of each unit to level of outlet nozzles during refueling
Liquid Waste		
Primary System	161,019	3300 gal/day Rate of Input
Spent Fuel Pool	26,349	540 gal/day Rate of Input
Cask Decontamination	17,566	360 gal/day Rate of Input
Component Coolant	17,566	360 gal/day Rate of Input
Service Water	58,553	1200 gal/day Rate of Input
Decontamination Room	87,828	1800 gal/day Rate of Input
Resin Sluice	23,421	480 gal/day Rate of Input
Miscellaneous System Leakage	351,312	5 gal/min Rate of Input
OTSG Tube Leaks	40,140	1 Tube Leak/Unit/yr => 1 Vol Drain + 3 Flush Vols of Secondary Side
LHST	161,019	3300 gal/day Rate of Input
Gaseous Waste		
Waste Gas	131,400	
Solid Waste		
Spent Bead Resins	2,000	
Spent Powdex Resin	5,000	.

Note:

1. Quantities based on data gathered at ONS for years 1977 and 1978, and values found in "Evaluation of compliance with 1OCFR50 Appendix I", June 4, 1976. Actual amounts vary from year to year depending on unit operating history. The actual liquid waste generated is reported in the Oconee Annual Effluent Report. The actual gaseous waste activity that is released is reported in the Oconee Annual Effluent Release Report.

Table 11-2. Estimated Maximum Rate of Accumulation Radioactive Wastes Per Operation

Waste Source	Maximum Rate of Accumulation	Assumptions and Comments
Reactor Coolant System(1)		
Startup Expansion & Dilution	9900 ft^3/22 hrs	Cold startup immediately prior to placing deborating demineralizers into service
Lifetime Shim Bleed(2)	1200 ft^3/10 days	Last 10 days of processing bleed prior to placing deborating demineralizers into service
System Drain	6100 ft^3/refueling	
Liquid Waste		
Demineralizers Sluice	100 ft^3/resin change	One change of purification demineralizer resin
Deborating Demineralizer Regeneration and Rinse	65 ft^3/resin change	One change of deborating demineralizer resin
Gaseous Waste		
Off-Gas from Reactor Coolant System(2)	400 ft^3/22 hrs	Cold startup immediately prior to placing deborating demineralizers into service
Letdown Storage Tank	900 ft^3/purge	
Pressurizer	60 ft^3/purge	
Solid Waste		
Demineralizer Resin	50 ft^3/resin change	One change of purification demineralizer resin

Note:

1. Treated as waste for purpose of evaluation
2. Wastes processed through holdup tanks
3. This table includes estimated values and is not updated (Reference OSC-256). Total effluent quantities are reported in the Annual Radioactive Effluent Release Report in accordance with SLC 16.11.9, "Radiological Effluents Control".

Table 11-3. Yearly Average Activity Concentrations in the Station Effluent for Three Units, Each Operating with One Percent Defective Fuel

Liquid Waste	
Operation	Yearly Average Concentration in Tailrace Discharge Fraction of MPC
Lifetime Shim Bleed Including Startup Expansion and Dilution	0.077
Discharge of Miscellaneous Wastes	0.16
Gaseous Wastes	
Operation	Yearly Average Concentration at Site Boundary, Fraction of MPC
Lifetime Shim Bleed	0.058
Startup Expansion and Dilution	0.18
Venting of Letdown Storage Tank	0.015
Venting of Pressurizer	0.011
Reactor Building Purge	0.11
Steam Generator Tube Leakage of 1 gal/min in one unit	0.089

Note:

1. This table includes estimated values and is not updated (Reference OSC-256). Total effluent quantities are reported in the Annual Radioactive Effluent Release Report in accordance with SLC 16.11.9, "Radiological Effluents Control".

Table 11-4. Escape Rate Coefficients for Fission Product Release

Element	Escape Rate Coefficient, sec^{-1}
Xe	1.0×10^{-7}
Kr	1.0×10^{-7}
I	2.0×10^{-8}
Br	2.0×10^{-8}
Cs	2.0×10^{-8}
Rb	2.0×10^{-8}
Mo	4.0×10^{-9}
Te	4.0×10^{-9}
Sr	2.0×10^{-10}
Ba	2.0×10^{-10}
Zr	1.0×10^{-11}
Ce, and other rare earths	1.0×10^{-11}

Note:

1. This table is included for historical purposes only (Reference OSC-256).

Table 11-5. Reactor Coolant Activity

(Calculated)					
μCi/ml at Operating Conditions					
Time, Full Power Days Isotope	100	150	200	260	310
Kr 85 m	1.5	1.5	1.5	1.5	1.5
Kr 85	8.7	9.7	9.1	6.3	1.3
Kr 87	.85	.85	.85	.85	.84
Kr 88	2.7	2.7	2.7	2.7	2.7
Rb 88	2.7	2.7	2.7	2.7	2.7
Sr 89	.041	.041	.041	.041	.038
Sr 90	.0027	.0028	.0030	.0032	.0031
Sr 91	.046	.046	.046	.046	.045
Sr 92	.017	.017	.017	.017	.017
Xe 131m	2.3	2.2	2.2	2.1	1.2
Xe 133m	2.8	2.8	2.8	2.8	2.3
Xe 133	248	246	242	234	166
Xe 135m	.94	.94	.94	.94	.93
Xe 135	6.6	6.6	6.6	6.6	6.3
Xe 138	.51	.51	.51	.51	.51
I 131	3.2	3.2	3.2	3.2	3.0
I 132	4.8	4.8	4.7	4.6	3.8
I 133	3.8	3.8	3.8	3.8	3.7
I 134	.50	.50	.50	.50	.50
I 135	1.9	1.9	1.9	1.9	1.9
Cs 136	.045	.045	.045	.045	.042
Cs 137	.29	.29	.29	.28	.26
Cs 138	.72	.72	.72	.72	.72
Mo 99	5.4	5.4	5.3	5.2	4.2
Ba 139	.082	.082	.082	.082	.082
Ba 140	.072	.072	.072	.072	.067
La 140	.025	.025	.025	.025	.022
Y 90	.24	.37	.51	.69	.84
Y 91	.18	.20	.20	.17	.076

Ca 144	.0028	.0029	.0029	.0030	.0028
Bleed Rate in Reactor Coolant volume/sec	$6.7x10^{-8}$	$5.7x10^{-8}$	$7.8x10^{-8}$	$1.3x10^{-7}$	$5.1x10^{-7}$

(Experimental)

Nuclide	**Concentration (μCi/cc)[1]**
H 3	2.1
F 18	7.8 (-2)(3)
Na 24	2.0 (-2)
Ar 41	8.9 (-2)
Mn 54	4.1 (-3)
Mn 56	1.9 (-2)
Co 58	7.8 (-3)
Kr 85m	1.6 (-2)
Kr 87	1.4 (-2)
Kr 88	2.2 (-2)
Sr 89	3.6 (-5)
Sr 90	7.3 (-5)
I 131	1.2 (-2)
I 132	7.5 (-2)
I 133	3.7 (-2)
I 134	1.4 (-1)
I 135	7.5 (-2)
Xe 131m	2.1 (-2)
Xe 133	3.1 (-1)
Xe 133m	4.1 (-3)
Xe 135	9.4 (-2)
Cs 134	2.0 (-3)
Cs 137	2.1 (-3)
Ba 139	1.5 (-2)

Note:

1. Concentrations obtained from reactor coolant sample of Unit 1 October 9, 1975
2. This table is included for historical purposes only (Reference OSC-256)
3. Denotes power of 10

Table 11-6. Waste Disposal System Component Data (Component Quantities for Three Units)

Low Activity Waste Tank	
Quantity	2
Volume each, cu. ft	398
Material	Concrete with Stainless Steel Liner
High Activity Waste Tank	
Quantity	2
Volume each, cu. ft.	262
Material	Concrete with Stainless Steel Liner
Misc. Waste Holdup Tank	
Quantity	2
Volume each, cu. ft	2,700 for Units 1 and 2 shared 1,550 for Unit 3
Material	Carbon Steel with Stainless Clad
Design Pressure	Vessel Full Plus 10 ft. Hydro Head
Spent Resin Storage Tank	
Quantity	2
Volume each, cu. ft.	450 for Units 1 and 2 shared 380 for Unit 3
Material	Stainless Steel
High Activity Spent Resin Storage Tank	
Quantity	1 for Unit 3
Volume, cu. ft.	380
Material	Stainless Steel
Reactor Building Normal Sump	
Quantity	3
Volume each, cu. ft.	48 (excluding embedded piping)
Material	Concrete
Reactor Building Emergency Sump	
Quantity	3
Volume each, cu. ft.	540
Material	Concrete
GWD Tank	
Quantity	4

Volume each, cu. ft.	1,098
Material	Carbon Steel
Design Pressure, psig	100
Misc. Waste Evaporator Feed Tank[3]	
Quantity	1
Volume, cu. Ft.	400
Material	Stainless Steel
Design Pressure	Vessel Full Plus 10 ft. Hydro Head
Waste Evaporator[3]	
Quantity	1
Process Rates, lb/hr	5,060
Material	Stainless Steel
Design Pressure, psig	15
Low Activity Waste Tank Pump	
Quantity	4
Capacity each, gal/min	100
Diff. Head, ft.	200
High Activity Waste Tank Transfer Pump	
Quantity	4
Capacity each, gal/min	50
Diff. Head, ft.	200
Misc. Waste Transfer Pump	
Quantity	4
Capacity each, gal/min	50
Diff. Head, ft.	200
"HISTORICAL INFORMATION NOT REQUIRED TO BE REVISED"	
Spent Resin Sluicing Pump	
Quantity	*2*
Capacity each, gal/min	*50*
Diff. Head, ft.	*50*
Spent Resin Transfer Pump	
Quantity	*2*
Capacity each, gal/min	*10*
Diff. Head, ft.	*100*

Reactor Building Normal Sump Pump	
Quantity	6
Capacity each, gal/min	25
Diff. Head, ft.	25
Waste Evaporator Feed Pump[3]	
Quantity	1
Capacity, gal/min	7-1/2
Diff. Head, ft.	60
Waste Evaporator Recirculating Pump[3]	
Quantity	1
Capacity, gal/min	160
Diff. Head, ft.	53
Waste Evaporator Distillate Pump[3]	
Quantity	1
Capacity, gal/min	9-1/2
Diff. Head, ft[4]	62
GWD Filter	
Quantity	2
Rating, scfm	200
Type	Prefilter, Absolute and Charcoal
Material	11 Gauge Galvanized Steel
GWD Exhauster	
Quantity	2
Rating, scfm	200 at 6 in. Water Gauge External Static Pressure
Type	Backward Curved - Centrifugal
GWD Compressor	
Quantity	4
Capacity each, cfm	48 at 85 psig
Type	Centrifugal Displacement
Interim Evaporator Feed Tanks[3]	
Quantity	2
Volume, gal	17,000
Design Pressure	Static head plus 5 psig

Design Temperature, °F	200
Material	304 stainless steel
Interim Evaporator Condensate Monitor Tanks[3]	
Quantity	2
Volume, gal	9,000
Design Pressure	Static head plus 5 psig
Design Temperature, °F	200
Material	304 stainless steel
Interim Evaporator Concentrates Storage Tank[3]	
Quantity	1
Volume, gal	3,000
Design Pressure	Static head plus 5 psig
Design Temperature, °F	200
Material	304 stainless steel
Interim Evaporator Condensate Return Tank[3]	
Quantity	1
Receiver volume, gal	100
Design Pressure	Atmospheric
Design Temperature, °F	212
No. of Pumps	2
Design Flow, gal/min	25
Design Head, ft	65
Interim Evaporator Feed Filter[3]	
Quantity	1
Type	Cage Assembly (disposable synthetic cartridged)
Design Pressure, psig	200
Design Temperature, °F	250
Design Flow Rate, gal/min	35
Pressure Drop at Design Flow, psi	Clean – 5 Fouled - 20
Retention of 25 Microns particles	98%
Material	Stainless Steel
Interim Evaporator Condensate Filter[3]	

Quantity	1
Type	Cage Assembly (disposable synthetic cartridge)
Design Pressure, psig	300
Design Temperature, °F	250
Design Flow Rate, gal/min	150
Pressure Drop at Design Flow, psi	Clean - 5 Fouled - 20
Retention of 25 Micron Particles	98%
Material	Stainless Steel
Interim Evaporator Condensate Demineralizer[3]	
Quantity	1
Type	Non-regenerable
Design Temperature, °F	200
Design Pressure, psig	150
Vessel Volume, ft^3	55
Resin Volume, ft^3	50
Design Flow, gal/min	310
Material	Stainless Steel
Resin Type	Mixed bed
Interim Evaporator Feed Pump[3]	
Quantity	1
Type	Canned centrifugal
Design Flow, gal/min	35
Design Head, ft	250
Design Pressure, psig	150
Design Temperature, °F	200
Operating Temperature, °F	120
Material	Stainless Steel
Interim Condensate Monitor Tank Pumps[3]	
Quantity	2
Type	Canned centrifugal
Design Flow, gal/min	100
Design Head, ft	250
Design Pressure, psig	150

Design Temperature, °F	200
Operating Temperature, °F	120
Material	Stainless Steel
Interim Evaporator Concentrates Transfer Pump[3]	
Quantity	1
Type	Canned centrifugal
Design Flow, gal/min	35
Design Head, ft	250
Design Pressure, psig	150
Design Temperature, °F	200
Operating Temperature, °F	170
Material	Stainless Steel
Low Activity Equipment Drains Sump Pumps	
Quantity	2
Type	Vertical
Design Flow, gal/min	50
Design Head, ft	100
Material	Stainless Steel
High Activity Equipment Drains Sump Pumps	
Quantity	2
Type	Vertical
Design Flow, gal/min	50
Design Head, ft	100
Material	Stainless Steel
Interim Evaporator Distillate Pump[3]	
Quantity	1
Type	Canned Centrifugal
Design Flow, gal/min	15.6
Design Head, ft	208
Design Pressure, psig	150
Design Temperature, °F	220
Operating Temperature, °F	80-110
Material	Stainless Steel

Interim Waste Evaporator Package (Westinghouse)	
Quantity	1
Nominal Capacity, gal/min	15
Steam Supply Pressure, psig	50
Steam Flow, lb/hr	10,500
Cooling Water Flow, gal/min	780
Concentrates Batch Volume, gal	500
Max. Boron Concentration, ppm	21,000
Liquid DF(1)	10^6
Gaseous DF(2)	10^5
Interim GWD Tanks	
Quantity	3
Volume, ft^3	1070
Design Pressure, psig	100
Design Temperature, °F	Material
200	Carbon steel

Notes:

1. DF for liquid = $\frac{\text{activity in concentrates}}{\text{activity in distillate}}$
2. DF for gas = $\frac{\text{activity in feed}}{\text{activity in distillate}}$
3. Component is in a layup condition.
4. Waste Evaporator Distillate Pump data included for historical purposes only.

Table 11-7. Process Radiation Monitors

Channel Number and Function	Type Detector	MDC (Background Equivalent Concentration) and Sensitivity	Range (Monitor Readout)
RIA-31 Monitors LPSW (Multipoint)	NaI 1-½"D x 1"L 4" Pb shield	2.5 mR/hr = 1.6 x 10^{-7} µCi/ml 1.28 x 10^{8} cpm/µCi/ml	(10-10^{7} cpm)
RIA-32 3RIA-32 Aux. Bldg. Gas Monitor	Plastic beta Scint. 2.125"D x .01"T 3" Pb shield	2.5 mR/hr = 3.6 x 10^{-7} µCi/ml 2.94 x 10^{7} cpm/µCi/ml	(10-10^{7} cpm)
RIA-33 Waste Disposal (Normal)	NaI 1½"D x 1"L 4" Pb Shield	2.5 mR/hr = 6.2 x 10^{-8} µCi/ml 1.28 x 10^{8} cpm/µCi/ml	(10-10^{7} cpm)
1RIA-35 2RIA-35 3RIA-35 Total LPSW Discharge Header from Aux. Bldg.	NaI 1-½"D x 1"L 5" Pb Shield	2.5 mR/hr = 6.2 x 10^{-8} µCi/ml 1.28 x 10^{8} cpm/µCi/ml	(10-10^{7} cpm)
RIA-37 3RIA-37 Waste Disposal Gas (Normal)	Plastic beta scint. 2"D x 0.007"T 4" Pb shield	2.5 mR/hr = 1.34 x 10^{-2} µCi/ml 2.38 x 10^{7} cpm/µCi/ml	(10-10^{7} cpm)
RIA-38 3RIA-38 Waste Disposal Gas (High)	G.M. 4"Pb shield	2.5 mR/hr = 1.34 x 10^{-2} µCi/ml 7.47 x 10^{2} cpm/µCi/ml	(10-10^{6} cpm)
RIA-39 3RIA-39 Control Room Gas	Plastic beta scint. 2.125"D x .01"T 3" Pb shield	2.5 mR/hr = 3.6E-7 µCi/m 2.94 x 10^{7} cpm/µCi/ml	(10-10^{7} cpm)
1RIA-40 2RIA-40 3RIA-40 Condenser Air Ejector off gas	Plastic beta scint. 2.125"D x .01"T 3" Pb shield	2.5mR/hr = 3.6E-7 µCi/ml 2.94 x 10^{7} cpm/µCi/ml	(10-10^{7} cpm)

Channel Number and Function	Type Detector	MDC (Background Equivalent Concentration) and Sensitivity	Range (Monitor Readout)
RIA-41 3RIA-41 Spent Fuel Bldg. Gas	Plastic beta scint. 2.125"D x .01"T 3" Pb shield	2.5 mR/hr = 3.6E-7 μCi/ml 2.94 x 10^7 cpm/μCi/ml	(10-10^7 cpm)
RIA-42 3RIA-42 Recirculating Cooling Water	NaI 1-½"D x 1"L 4" Pb lead	2.5 mR/hr = 1.6 x10^7μCi/ml 1.28 x 10^8 cpm/μCi/ml	(10-10^7 cpm)
1RIA-43 2RIA-43 3RIA-43 Unit Vent Particulates	Plastic beta scint. 1-1/8" x 5/8" x .01"T 2.5" Pb shield	2.5 mR/hr = 7.0 x 10^{-12} μCi/ml (2 SCFM Flow) 3.31 x 10^{10} cpm/μCi/ml	(10-10^7 cpm)
1RIA-44 2RIA-44 3RIA-44 Unit Vent Iodine	NaI 2"D x 2"L 3" Pb shield	2.5 mR/hr = 3.1 x 10^{-11} μCi/ml (2 SCFM Flow) 2.72 x 10^9 cpm/μCi/ml	(10-1E7 cpm)
1RIA-45 2RIA-45 3RIA-45 Unit Vent Gas (Normal)	Plastic beta scint. 2"D x .01"T 3" Pb shield	2.5 mR/hr = 5.5 x 10^{-7} μCi/ml 1.41 x 10^7 cpm/μCi/ml	(10-1E7 cpm)
4RIA-45 Radwaste Facility Vent (Normal)	Plastic beta scint. 2"D x .01"T 5" Pb shield	5 mR/hr = 5.5 x 10^{-7} μCi/ml	≃ 2E - 7 to 2E - 1 μCi/ml Xe-133 (readout in μCi/ml)
1RIA-46 2RIA-46 3RIA-46 Unit Vent Gas (High)	Cadmium Telluride (CdTe) 2mm x 5mm x 2mm T 2" Pb shield	3.5 mR/hr = 1.1E-3 μCi/ml 3.15 x 10^3 cpm/μCi/ml	(10-1E7 cpm)
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Channel Number and Function	Type Detector	MDC (Background Equivalent Concentration) and Sensitivity	Range (Monitor Readout)
1RIA-47 2RIA-47 3RIA-47 Reactor Building Particulate	Plastic beta scint. 1 1/8" x 5/8" x .01"T 2.5" Pb shield	2.5 mR/hr=7.0 x 10^{-12} µCi/ml (3 SCFM Flow) 3.31 x 10^{10} cpm/µCi/ml	(10-1E7 cpm)
1RIA-48 2RIA-48 3RIA-48 Reactor Building Iodine	NaI 2"D x 2"L 3" Pb shield	2.5 mR/hr=3.1 x 10^{-11} µCi/ml (3 SCFM Flow) 2.72 x 10^{9} cpm/µCi/ml	(10-1E7 cpm)
1RIA-49 2RIA-49 3RIA-49 Reactor Building Gas	Plastic Beta Scint. 2"D x .01"T 3" Pb shield	2.5 mR/hr=5.5 x 10^{-7} µCi/ml 1.41 x 10^{7} cpm/µCi/ml	(10-1E7 cpm)
1RIA-49A 2RIA-49A 3RIA-49A Reactor Building Gas (High)	Cadmium Telluride (CdTe) 2mm x 5mm x 2mm T 2" Pb shield	3.5 mR/hr=1.1E-3 µCi/ml 3.15 x 10^{3} cpm/µCi/ml	(10-1E7 cpm)
1RIA-50 2RIA-50 3RIA-50 Component Cooling Water	NaI 1-½"D x 1"L 4" Pb shield	2.5 mR/hr = 1.6 x 10^{-7}µCi/ml 1.28 x 10^{8} cpm/µCi/ml	(10-10^{7} cpm)
RIA-53 Interim Radwaste Bldg. Vent Gas	Plastic Beta Scint. 2.125"D x 0.01"T 3" Pb shield	2.5 mR/hr = 3.6 x 10^{-7} µCi/ml 2.94 x 10^{7} cpm/µCi/ml	(10-10^{7} cpm)
RIA-54 Turbine Bldg. Sump 3RIA-54 Turbine Bldg. Sump	NaI Scint. 1-1½"D x 1"L 4" Pb shield	2.5 mR/hr=1.6 x 10^{-7} µCi/ml 1.28 x 10^{8} cpm/µCi/ml	10-10^{7} cpm

Channel Number and Function	Type Detector	MDC (Background Equivalent Concentration) and Sensitivity	Range (Monitor Readout)
1RIA-16 1RIA-17 2RIA-16 2RIA-17 3RIA-16 3RIA-17 Steam Header Gross Activity	G. M. Detector (Low Range)/ 3.2"D x 6.6"L Ion Chamber (High Range) 2.5"D x 9.2"L 3" Pb shield	500 cpm/mR/hr 1.2 E-10 Amp/R/hr	$0.01\text{-}10^{3}$ mR/hr $10^{2}\text{-}10^{7}$ mR/hr
1RIA-56 2RIA-56 3RIA-56 Unit Vent Gas(High High)	Ion Chamber unshielded	1×10^{-11} amp/R/hr	$1\text{-}10^{8}$ R/hr $1\text{-}10^{8}$ R/hr
1RIA-57 2RIA-57 3RIA-57 1RIA-58 2RIA-58 3RIA-58 Reactor Building Gas(High High)	Coaxial Ion Chamber unshielded	1×10^{-11} amp/R/hr	$1\text{-}10^{8}$ R/hr(1)
1RIA-59 1RIA-60 2RIA-59 2RIA-60 3RIA-59 3RIA-60 Steam Header N-16	NAI(Tl) Scintillation unshielded	Not applicable to N-16 Monitors	Configurable 0-1000 gallons/day

Note:

1. RIAs 57/58 are on-scale at approximately 1R/hr.