APPENDIX A

OCONEE NUCLEAR STATION

SITE SPECIFIC INFORMATION

APPENDIX A TABLE OF CONTENTS

A1.0 OCONEE NUCLEAR STATION RADWASTE SYSTEMS

A1.1 LIQUID RADWASTE PROCESSING

The liquid radwaste system at Oconee Nuclear Station (ONS) is used to collect and treat fluid chemical and radiochemical by-products of unit operation. The systems produce effluents which can be reused in the plant or discharged in small, dilute quantities to the environment. The means of treatment vary with waste type and desired product in the various systems:

A) Filtration - all waste sources are filtered prior to processing except from #3 Chemical Treatment Pond.

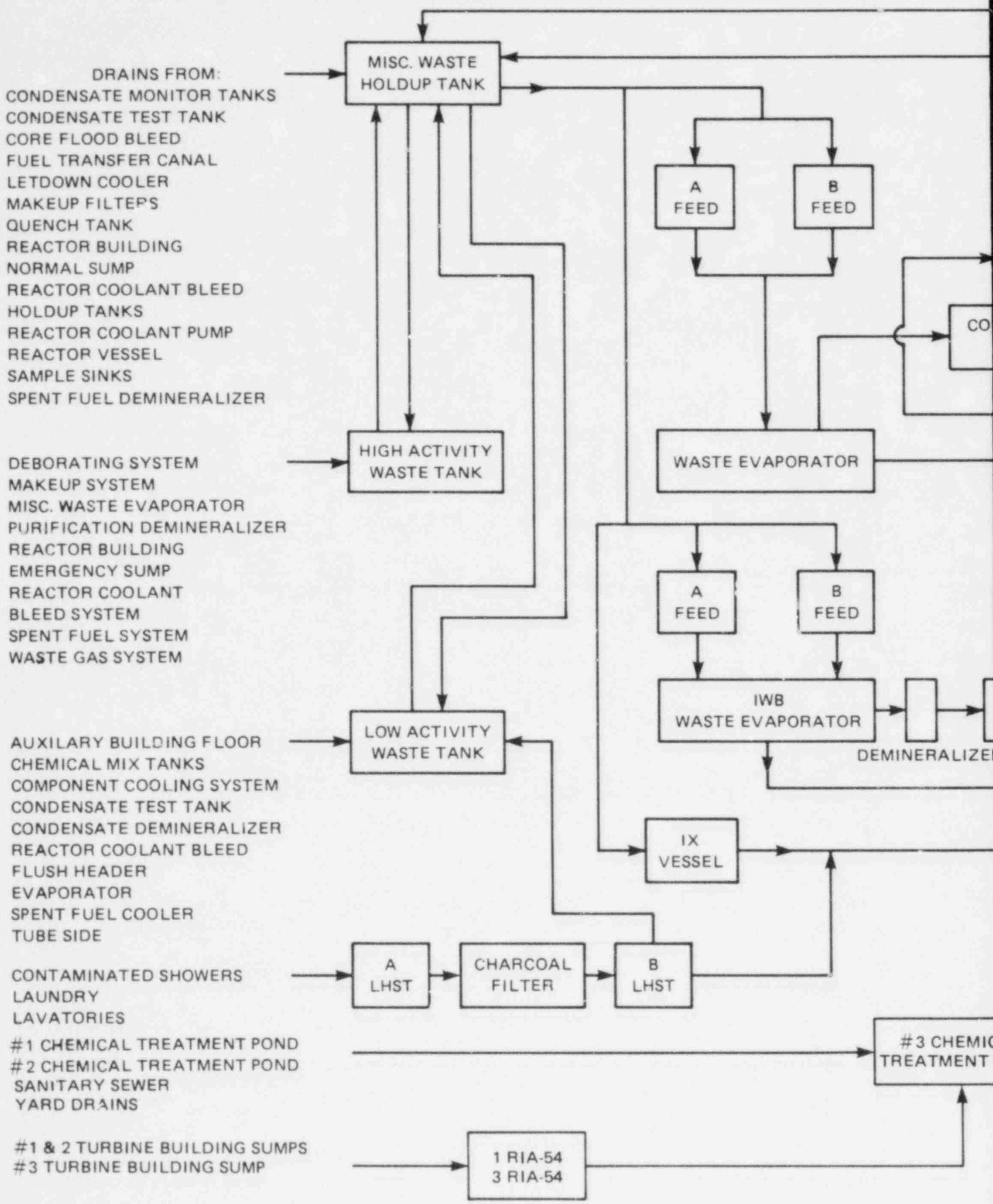
B) Ion Exchange - ion exchange is used to remove radioactive ions from solution. Also, ion exchange is normally used in removing cations (cobalt, manganese) and anions (chloride, flouride) from evaporator distillates in order to purify the distillates for reuse as makeup water. Distillate from the Waste Evaporator System or the RC Bleed Evaporator in the Boron Recycle System can be treated by this method, as well as MWHUT Waste.

C) Gas Stripping - removal of gaseous radioactive fission products is accomplished in all Evaporators.

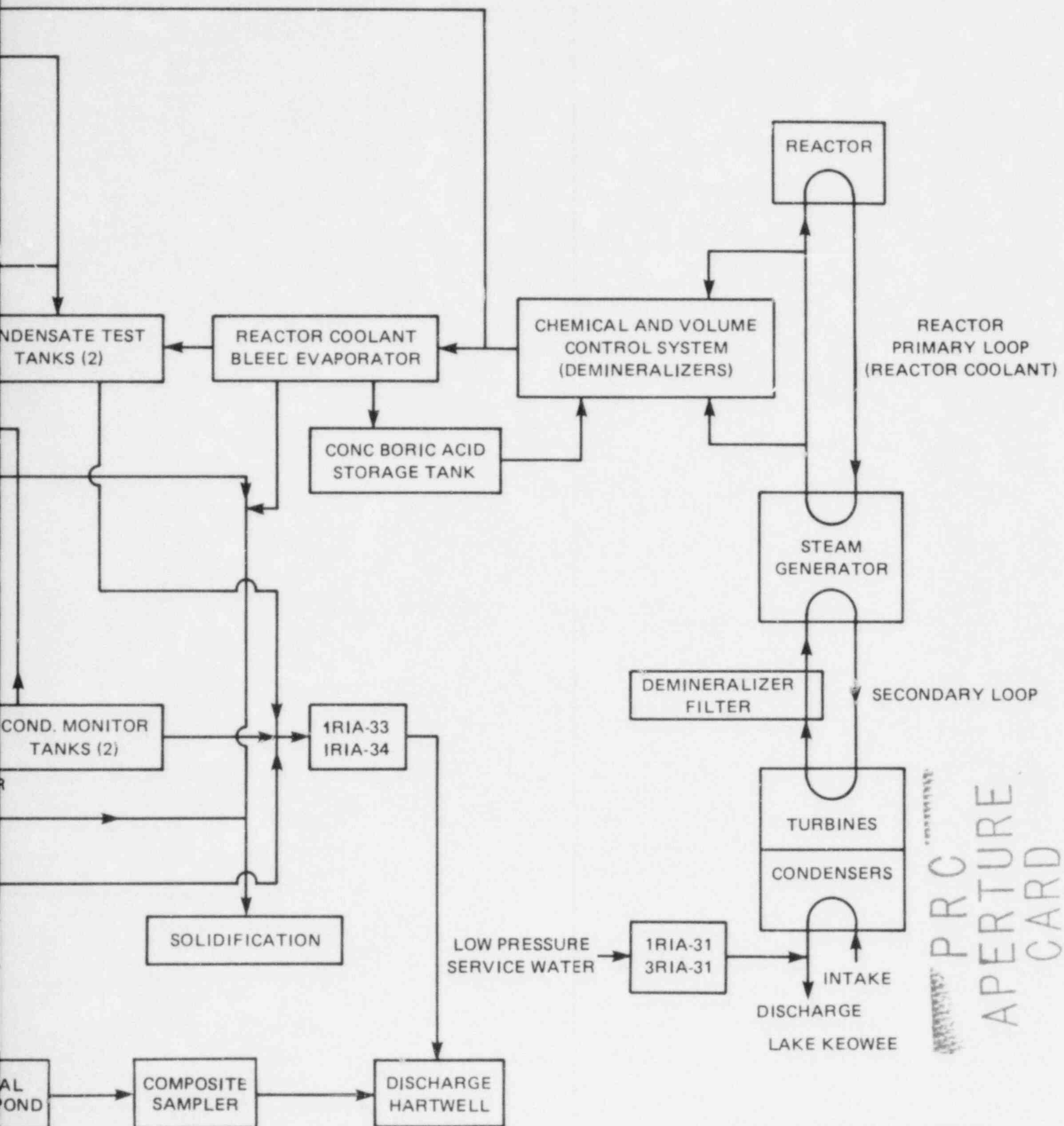
D) Distillation - production of pure water from the waste by boiling it away from the contaminated solution which originally contained it is accomplished by both evaporators. Proper control of the process will yield water which can be reused for makeup. Polishing of this product can be achieved by ion exchange as pointed out above.

E) Concentration - in all Evaporators, dissolved chemicals are concentrated in the lower shell as water is boiled away. In the case of the Waste Evaporator, the volume of water containing waste chemicals and radioactive cations is reduced so that the waste may be more easily and cheaply solidified and shipped for burial.

Figure A1.0-1 is a schematic representation of the liquid radwaste system at Oconee.



DRAINS FROM:
CONDENSATE MONITOR TANKS
CONDENSATE TEST TANK
CORE FLOOD BLEED
FUEL TRANSFER CANAL
LETDOWN COOLER
MAKEUP FILTERS
QUENCH TANK
REACTOR BUILDING
NORMAL SUMP
REACTOR COOLANT BLEED
HOLDUP TANKS
REACTOR COOLANT PUMP
REACTOR VESSEL
SAMPLE SINKS
SPENT FUEL DEMINERALIZER
MISC. WASTE HOLDUP TANK
A FEED
B FEED
CO
WASTE EVAPORATOR
DEBORATING SYSTEM
MAKEUP SYSTEM
MISC. WASTE EVAPORATOR
PURIFICATION DEMINERALIZER
REACTOR BUILDING
EMERGENCY SUMP
REACTOR COOLANT
BLEED SYSTEM
SPENT FUEL SYSTEM
WASTE GAS SYSTEM
HIGH ACTIVITY WASTE TANK
A FEED
B FEED
IWB WASTE EVAPORATOR
DEMINERALIZER
AUXILARY BUILDING FLOOR
CHEMICAL MIX TANKS
COMPONENT COOLING SYSTEM
CONDENSATE TEST TANK
CONDENSATE DEMINERALIZER
REACTOR COOLANT BLEED
FLUSH HEADER
EVAPORATOR
SPENT FUEL COOLER
TUBE SIDE
LOW ACTIVITY WASTE TANK
IX VESSEL
CONTAMINATED SHOWERS
LAUNDRY
LAVATORIES
A LHST
CHARCOAL FILTER
B LHST
#1 CHEMICAL TREATMENT POND
#2 CHEMICAL TREATMENT POND
SANITARY SEWER
YARD DRAINS
#3 CHEMIC
TREATMENT P
#1 & 2 TURBINE BUILDING SUMPS
#3 TURBINE BUILDING SUMP
1 RIA-54
3 RIA-54



LIQUID RADWASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-1

A1.2 GASEOUS WASTE PROCESSING

The purpose of the gaseous waste disposal system is to:

(1) Maintain a non-oxidizing cover gas of nitrogen in tanks and equipment that contain potentially radioactive gas.

(2) Hold up radioactive gas for decay.

(3) Release gases (radioactive or non-radioactive) to the atmosphere under controlled conditions.

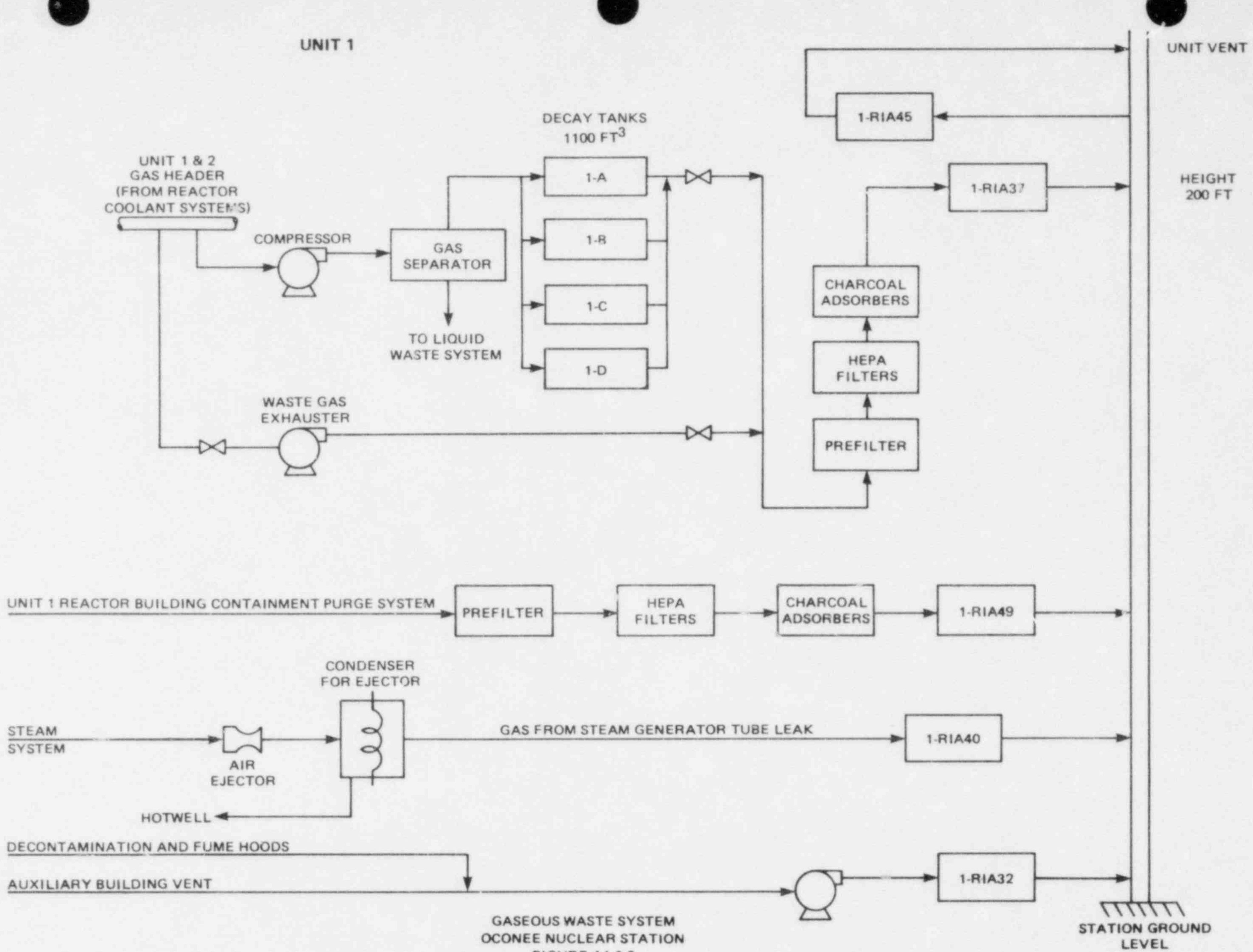
During power operation of the facilities, radioactive materials released to the atmosphere in gaseous effluents include low concentrations of fission product noble gases (krypton and xenon), halogens (mostly iodines), tritium contained in water vapor and particulate material including both fission products and activated corrosion products.

The primary source of gaseous radioactive wastes is from the degassing of the primary coolant during letdown of the cooling water into the various holding tanks. Additional sources of gaseous waste activity include the auxiliary building exhaust, spent fuel area exhaust, the discharge from the steam jet air ejectors, purging of the reactor containment building and ventilation air exhausted from the turbine building.

All components that can contain potentially radioactive gases are vented to a vent header. The vent gases are subsequently drawn from this vent header by one of three waste gas compressors or a waste gas exhauster. The waste gas compressor discharges through a waste gas separator to one of seven waste gas tanks. The waste gas tanks and the waste gas exhauster discharge to the unit vent after passing through a filter bank consisting of a prefilter, an absolute filter, and a charcoal filter.

Radioactive gases may be released inside the reactor containment building when components of the primary system are opened to the building atmosphere for operational reasons or where minor leaks occur in the primary system. Prior to access, the reactor containment atmosphere will be monitored for activity and, when necessary, purged through prefilters, high-efficiency particulate air (HEPA) filters and charcoal adsorbers and released to atmosphere through the unit vent. The purge equipment is sized for a flow rate of 50,000 cfm providing approximately 1.5 air changes per hour in the reactor building. Units 1, 2 & 3 have a separate vent stack from each reactor building.

The gaseous waste handling and treatment systems for the Oconee Nuclear Station are shown schematically in Fig. A1.0-2.



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
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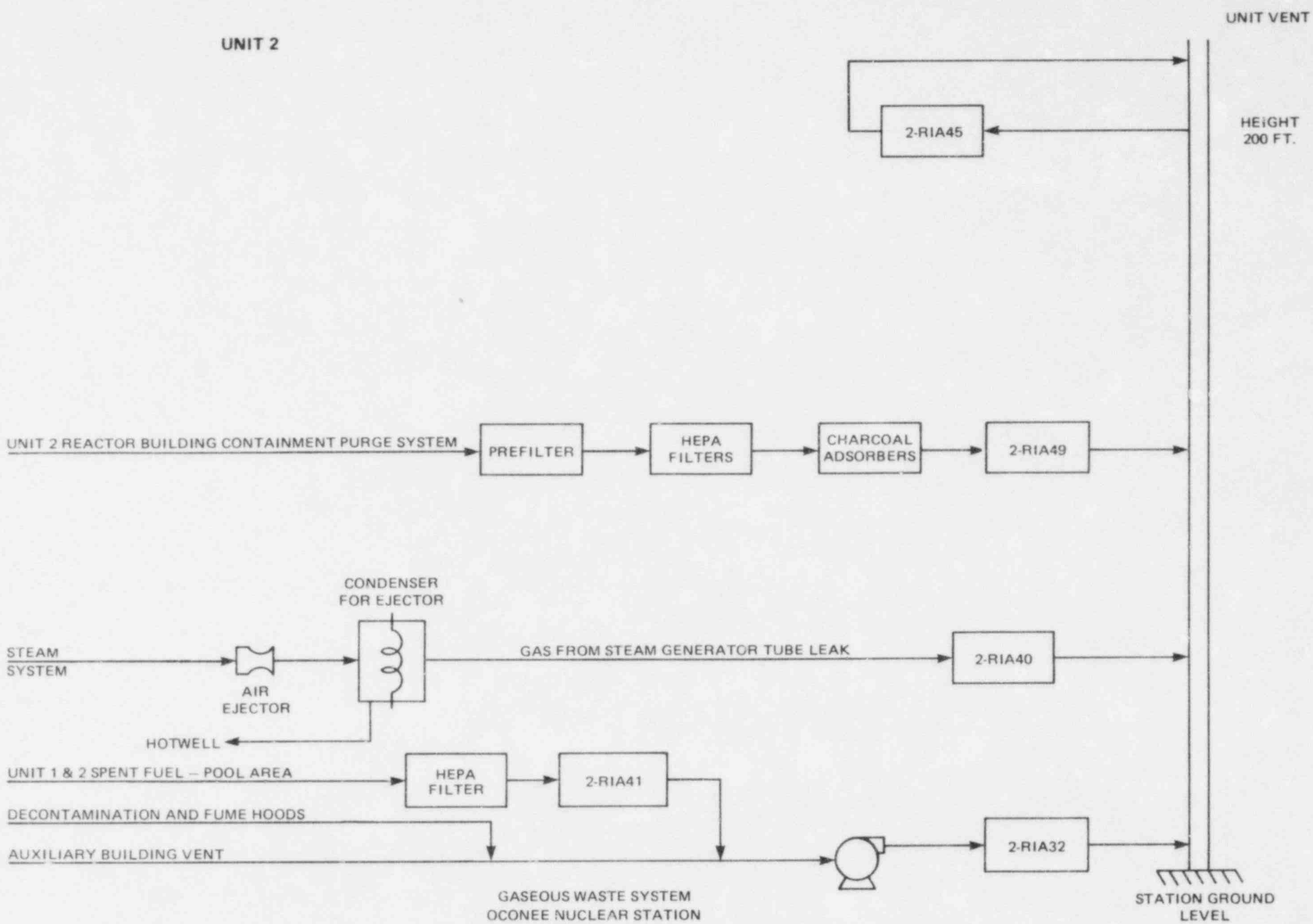
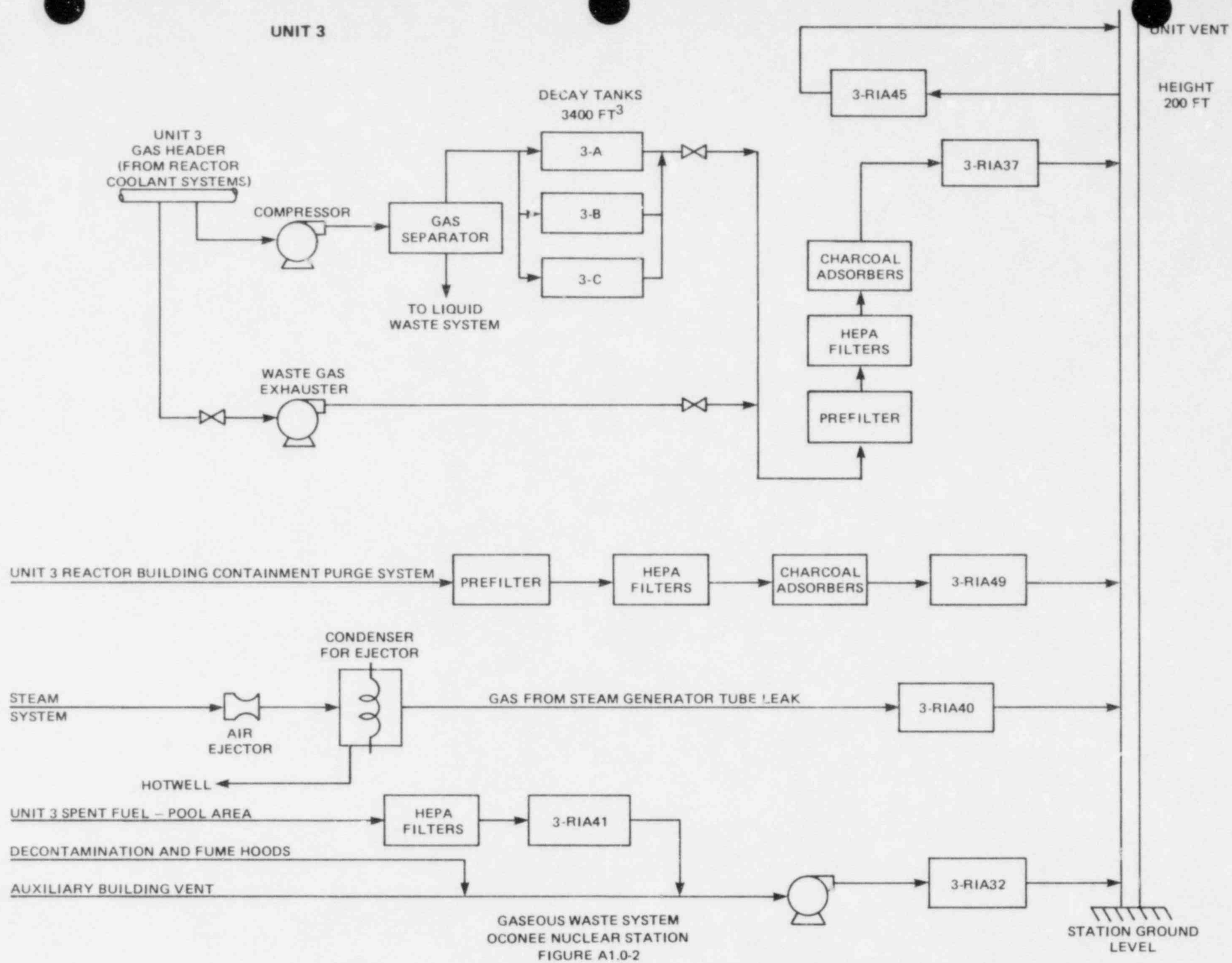
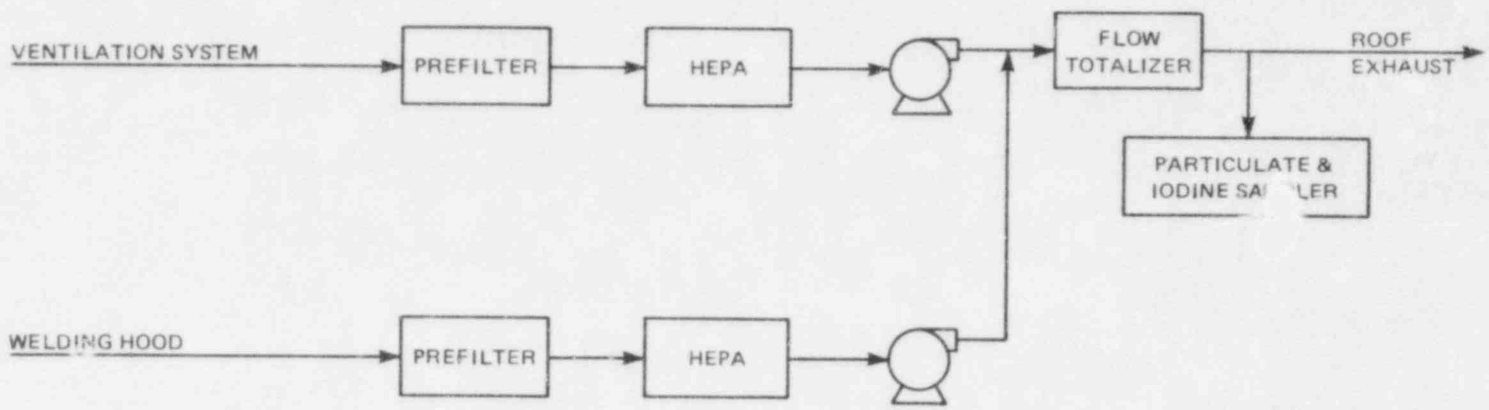


GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 2 OF 4

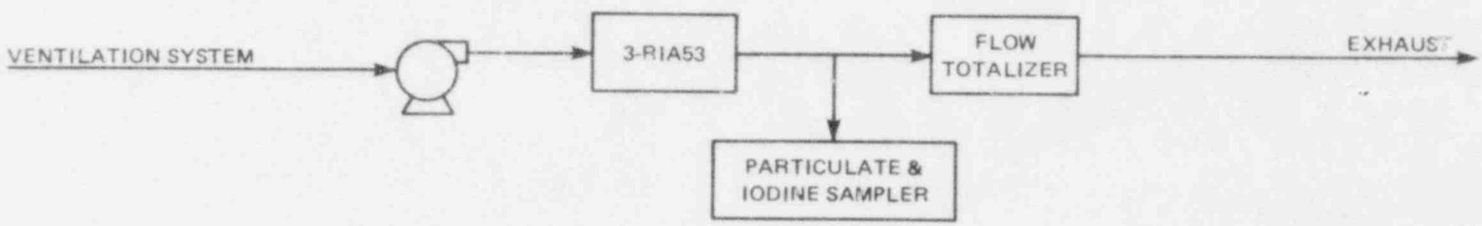


GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
PAGE 3 OF 4

HOT MACHINE SHOP



INTERIM RADWASTE FACILITY



GASEOUS WASTE SYSTEM
OCONEE NUCLEAR STATION
FIGURE A1.0-2
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A2.0 RELEASE RATE CALCULATION

Generic release rate calculations are presented in Section 1.0; these calculations will be used to calculate release rates from Oconee Nuclear Station.

A2.1 LIQUID RELEASE RATE CALCULATIONS

There are two potential release points at Oconee, the liquid radwaste effluent line to the Keowee Hydroelectric Unit Tailrace and the #3 Chemical Treatment Pond effluent line to the Keowee River.

A2.1.1 Liquid Radwaste Effluent Line

To simplify calculations for the liquid radwaste effluent line, it is assumed that no activity above background is present in the #3 Chemical Treatment Pond effluent. This assumption shall be confirmed by radiation monitoring measurements on the turbine building sumps and by periodic analysis of the composite sample collected at the #3 Chemical Treatment Pond discharge. For the liquid radwaste effluent line, one of the following calculations shall be performed for discharge flow, (f_1 or f_2), in gpm, depending on hydro-electric unit operation:

$$f_1 \leq 1.7E+4 \div \sum_{i=1}^{n} \frac{C_i}{MPC_i}$$

$$f_2 \leq 2.9E+6 \div \sum_{i=1}^{n} \frac{C_i}{MPC_i}$$

where:

C_i = the concentration of radionuclide, 'i', in undiluted effluent as determined by laboratory analyses, in μCi/ml.

MPC_i = the concentration of radionuclide, 'i', from 10CFR20, Appendix B, Table II, Column 2. If radionuclide, 'i', is a dissolved noble gas, the MPC_i = 2.0E-4 μCi/ml.

F = the dilution flow available depending on hydroelectric unit operation, in gpm:

F_1 = 1.7E+4 gpm (based on a leakage rate of 38 cfs, the minimum flow available)

F_2 = 2.9E+6 gpm (when hydro is operating or 6600 cfs)

σ = the recirculation factor at equilibrium is 1.0.

The liquid radwaste effluent discharge is located downstream of Keowee Hydroelectric Station, and therefore, has no reconcentration (recirculation) factor associated with it. (See Section 1.1).

A2.1.2 #3 Chemical Treatment Pond Effluent Line

The #3 Chemical Treatment Pond effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements on the turbine building sumps and by periodic analyses of the composite sample collected at the #3 Chemical Treatment Pond. Radiation monitoring alarm/trip setpoints assure that Specification 3.9.1 is not exceeded.

A2.1.3 Low Pressure Service Water Effluent Line

The Low Pressure Service water effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements. Radiation monitoring alarm setpoints, in conjunction with administrative controls, assure that release limits are not exceeded.

A2.2 GASEOUS RELEASE RATE CALCULATIONS

The unit vent is the release point for waste gas decay tanks, containment building purges, the condenser air ejector, and auxiliary building ventilation. The condenser air ejector effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measureable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring measurements and by analyses of periodic samples collected on that line. Radiation monitoring alarm/trip setpoints in conjunction with administrative controls assure that release limits are not exceeded; see section on radiation monitoring setpoints.

The following calculations, when solved for flowrate, are the release rates for noble gases and for radioiodines, particulates and other radionuclides with half-lives greater than 8 days; the most conservative of release rates calculated in A2.2.1 and A2.2.2 shall control the release rates for a single release point.

A2.2.1 Release rate limit for noble gases:

$$\sum_{1} K_i \, [(\overline{X/Q})\tilde{Q}_i] < 500 \text{ mrem/yr, and}$$

$$\sum_{1} (L_i + 1.1\, M_i) \, [(\overline{X/Q})\tilde{Q}_i] < 3000 \text{ mrem/yr}$$

where the terms are defined below:

A2.2.2 Release rate limit for all radioiodines and radioactive materials in particulate form and radionuclides other than noble gases:

$$\sum_{1} P_i \, [W \, \tilde{Q}_i] < 1500 \text{ mrem/yr}$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 1.2-1 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway, in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in m^2 (mrem/yr) per $\mu Ci/sec$ from Table 1.1-2. The dose factors are based on the critical individual organ and most restrictive age group (child or infant).

$\tilde{Q}_i$ = The release rate of radionuclides, i, in gaseous effluent from all release points at the site, in $\mu Ci/sec$.

$\overline{X/Q}$ = 4.1E-7 sec/m^3. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary.

W = The highest calculated annual average dispersion parameter for estimating the dose to an individual at the controlling location:

W = 4.5E-9 sec/m^3, for the inhalation pathway. The location is the unrestricted area in the S sector.

W = 2.5E-9 m^{-2}, for the food and ground plane pathways. The location is the unrestricted area boundary in the SSW sector (nearest residence, cow, and vegetable garden)

$$\tilde{Q}_i = k_1 C_i f \div k_2 = 4.72E+2\ C_i f$$

where:

C_i = the concentration of radionuclide, i, in undiluted gaseous effluent, in $\mu Ci/ml$.

f = the undiluted effluent flow, in cfm

k_1 = conversion factor, 2.83E+04 ml/ft^3

k_2 = conversion factor, 6.0E+01 sec/min

A3.0 RADIATION MONITOR SETPOINTS

Using the generic calculations presented in Section 2.0, radiation monitoring setpoints are calculated for monitoring as required by the Technical Specifications.

All final effluent radiation monitors for Oconee are off-line. These monitors alarm on low flow; the minimum flow alarm level for the liquid monitors is 3 gallons per minute and for the gas monitors is 7 standard cubic feet per minute. These monitors measure the activity in the liquid or gas volume exposed to the detector and are independent of flow rate if a minimum flow rate is assured.

Radiation monitoring setpoints calculated in the following sections are expressed in activity concentrations; in reality the monitor readout is in counts per minute. The relationship between concentration and counts per minute shall be established by station procedure using the following relationship:

$$c = \frac{r}{2.22 \times 10^6 e\ V}$$

where:

c = the gross activity, in μCi/ml
r = the count rate, in cpm
2.22×10^6 = the disintegration per minute per μCi
e = the counting efficiency, cpm/dpm
v = the volume of fluid exposed to the detector, in ml.

A3.1 LIQUID RADIATION MONITORS

A3.1.1 Liquid Radwaste Effluent Line

As described in Section A2.1.1 of this manual on release rate calculations for the waste liquid effluent, the release is controlled by limiting the flow rate of effluent from the station. Although the release rate is flow rate controlled, the radiation monitor setpoint shall be set to terminate the release if the effluent activity should exceed that determined by laboratory analyses and that used to calculate the release rate.

A3.1.2 Turbine Building Sump Discharge Line

As described in Section A2.1.2 of this manual on release rate calculations for the turbine building sump effluent, the effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring and by routine analysis of the composite sample collected at the #3 Chemical Treatment Pond. Since the system discharges automatically, the maximum system concentration, which also is the radiation monitor setpoint, is calculated to assure compliance with release limits.

A typical setpoint is calculated as follows:

$$c \leq \frac{MPC \times F}{\sigma f} = 4.5E\text{-}6\ \mu Ci/ml$$

where:

c = the gross activity in undiluted effluent, in µCi/ml.

f = the flow rate of undiluted effluent which may vary from 0-375 gpm, but is assumed to be 375 gpm.

MPC = 1.0E-07 µCi/ml, the MPC for an unidentified mixture.

σ = 1 (See Section A2.1.1)

F = the flow may vary from 38 to 6,600 cfs, but is conservatively estimated at 38 cfs (1.7E+4 gpm), the minimum flow available.

A3.1.3 Low Pressure Service Water Discharge Line

As described in Section A2.1.3 of this manual on release rate calculations for the Low Pressure Service water effluent, the effluent is normally considered nonradioactive; that is, it is unlikely the effluent will contain measurable activity above background. It is assumed that no activity is present in the effluent until indicated by radiation monitoring equipment. Since the system discharges automatically, the maximum system concentration which is also the radiation monitor setpoint, is calculated to assure compliance with release limits.

A typical monitor setpoint is calculated as follows:

$$C \leq \frac{MPC \times F}{\sigma f} = 1.16E\text{-}5\ \mu Ci/ml$$

where:

C = the gross activity in undiluted effluent, in µCi/ml.

f = the flow rate of undiluted effluent which may vary from 0 to 10,500 gpm but is assumed to be 10,500 gpm.

MPC = 1.0E-07 µCi/ml, the MPC for an unidentified mixture.

σ = recirculation factor for Lake Keowee, 1.02.

F = the flow rate of the condensate cooling water is based on having seven CCW pumps in operation, 1.24E+06 gpm. Should the number of operating pumps decrease, the setpoint must be recalculated.

A3.2 GAS MONITORS

The following equation shall be used to calculate noble gas radiation monitor setpoints based on Xe-133:

$$K(\overline{X/Q})\tilde{Q}_i < 500 \text{ (See Section A2.2.1)}$$

$$\tilde{Q}_i = 4.72E+2\ C_i f \text{ (See Section A2.2.2)}$$

$$C_i < 8.79E+3/f$$

where:

C = the gross activity in undiluted effluent, in μCi/ml

f = the flow from the tank or building and varies for various release sources, in cfm

K = from Table 1.2-1 for Xe-133, 2.94E+2 mrem/yr per μCi/m^3

$\overline{X/Q}$ = 4.1E-7 sec/m^3, as defined in section A2.2.2.

A3.2.1 Unit Vent

As stated in Section A2.2, the unit vent is the release point for waste gas decay tanks, containment building purges, the condenser air ejector, and auxiliary building ventilation. Since all of these releases are through the unit vent, the radiation monitor on the unit vent may be used to assure that station release limits are not exceeded. Depending on the stack flow, a typical radiation monitor setpoint may be calculated as follows:

$$C < 8.79E+3/f = 9.25E-2 \mu Ci/ml$$

where:

f = 45,000 cfm (auxiliary building) + 50,000 cfm (containment purge) = 95,000 cfm

or may be:

$$C < 8.79E+3/f = 1.95E-1\ \mu Ci/ml$$

where:

f = 45,000 cfm (auxiliary building ventilation)

A3.2.2 Interim Radwaste Building Ventilation Exhaust

Ventilation exhaust from the Interim Radwaste Building is not released through the unit vent and is considered a separate release point. This exhaust is normally considered non-radioactive; that is, it is possible but unlikely that the effluent will contain measurable activity above background. Since the exhaust is continuous, a maximum concentration of gases in the exhaust, which also is the radiation monitor setpoint, is calculated to assure compliance with release limits. A typical radiation monitor setpoint may be calculated as follows:

$$C < 8.79E+3/f = 5.98E-1\ \mu Ci/ml$$

where:

$f = 1.47E+04$ cfm

A3.2.3 Hot Machine Shop Building Ventilation Exhaust

Ventilation exhaust from the Hot Machine Shop is not released through the unit vent and is considered to be a separate release point. This filtered exhaust is sampled and analyzed for particulates and radioiodines to assure that the effluent released has not exceeded station release limits. Since it is assumed that no noble gases will be generated by machine shop work, no provision for monitoring noble gas releases are provided.

A3.2.4 Contaminated Oil Burning In Auxiliary Boiler

Contaminated oil is burned in the auxiliary boiler which is not released through the unit vent and is considered a separate release point. The contaminated oil is filtered, mixed, and sampled to determine the total activity to be released and the allowable release (burn) rate.

By Technical Specification, releases from the auxiliary boiler from incineration of contaminated oil must meet the instantaneous release rate for iodines and particulates given in Section A2.2.2. Also, the total dose due to these releases must be less than 0.1% of the allowable yearly dose from particulate gaseous effluents.

Doses from incineration of contaminated oil are calculated for all organs and all pathways using the models provided in Section 3.1.2.2 of this manual and the GASPAR computer program. Doses are calculated quarterly at a minimum.

All the activity in the contaminated oil is assumed to be released during incineration and the total is added to the station's quarterly and annual release records.

A4.0 DOSE CALCULATIONS

A4.1 FREQUENCY OF CALCULATIONS

Dose contributions to the maximum individual shall be calculated at least every 31 days, quarterly, semiannually, and annually (or as required by Technical Specifications) using the methodology in the generic information sections. This methodology shall also be used for any special reports. Dose projections may be performed using simplified dose estimates.

Fuel cycle dose calculations shall be performed annually or as required by special reports. Dose contributions shall be calculated using the methodology in the appropriate generic information sections.

A4.2 DOSE MODELS FOR MAXIMUM EXPOSED INDIVIDUAL

A4.2.1 Liquid Effluents

For dose contributions from liquid radioactive effluent releases, it is assumed that the maximum exposed individual is an adult who consumes fish caught in the discharge area and drinks water from the nearest downstream water supply.

A4.2.2 Gaseous Effluents

A4.2.2.1 Noble Gases

For dose contributions from exposure to beta and gamma radiations from noble gases, it is assumed that the maximum exposed individual is an adult on the site boundary in each meteorological sector.

A4.2.2.2 Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 days

For dose contributions from radioiodines, particulates, and other radionuclides; it is assumed that the maximum exposed individual is an infant who breathes the air and consumes milk from the nearest goat or cow in each meteorological sector.

A4.3 SIMPLIFIED DOSE ESTIMATES

A4.3.1 Liquid Effluents

For dose estimates, a simplified calculation using the assumptions presented in Section A4.2.1 and operational source term data is presented below. Dose calculations used to evaluate Appendix I to 10CFR50 compliance indicate that the maximum exposed individual is an adult who consumes fish caught in the discharge area and that 90% of the dose is from Cesium-134 and Cesium-137.

$$D_{WB} = 6.38E+5 \sum_{\ell=1}^{m} (F_\ell)(T_\ell)\,(C_{Cs-134} + 0.59\, C_{Cs-137})$$

where:

$$6.38E+05 = 1.14E+05\ (U_{aw}\ /D_w + U_{af}\ BF_i)\ DF_{ai\tau} \quad (1.10)$$

where:

$1.14E+05 = 10^6 pCi/\mu Ci \times 10^3 ml/kg \div 8760\ hr/yr$

U_{aw} = 730 kg/yr, adult water consumption

D_w = 27.5, dilution factor from the near field area to the potable water intake.

U_{af} = 21 kg/yr, adult fish consumption

BF_i = 2.00E+03, bioaccumulation factor for Cesium (Table 3.1-1)

$DF_{ai\tau}$ = 1.21E-04, adult, total body, ingestion dose factor (Table 3.1-2)

1.10 = factor derived from the assumption that 90% of dose is from Cs-134 and Cs-137 or 100% ÷ 90% = 1.10

where:

$$F_\ell = \frac{f\sigma}{F + f}$$

f = liquid radwaste flow, in gpm

σ = recirculation factor at equilibrium, 1.0

F = dilution flow, in gpm

and where:

T_ℓ = the length of time, in hours, over which C_{Cs-134}, C_{Cs-137}, and F_ℓ are averaged

C_{Cs-134} = the average concentration of Cs-134 in undiluted effluent, in µCi/ml, during the time period considered.

C_{Cs-137} = the average concentration of Cs-137 in undiluted effluent, in µCi/ml, during the time period considered.

0.59 = the ratio of the adult total body ingestion dose factors for Cs-134 and Cs-137 or 7.14E-05 ÷ 1.21E-04 = 0.59

A4.3.2 Gaseous Effluents

Meteorological data is provided in Table A4.0-1 and A4.0-2.

A4.3.2.1 Noble Gases

For dose estimates, simplified dose estimates using the assumptions in A4.2.2.1 and operational source term data is presented below. These calculations further assume that the annual average dispersion parameter is used and that Xenon-133 contributes 45% of the dose.

$$D_\gamma = 4.59E-12\ [\ \tilde{Q}\ ]_{Xe-133} \quad (2.22)$$

$$D_\beta = 1.36E-11 \, [\tilde{Q}]_{Xe-133} \, (2.22)$$

where:

4.59E-12 = (3.17E-8) (353) (X/Q), derived from equation presented in Section 3.1.2.1.

1.36E-11 = (3.17E-8) (1050) (X/Q), derived from equation presented in Section 3.1.2.1.

$[\tilde{Q}]_{Xe-133}$ = the total Xenon-133 activity released in μCi

X/Q = 4.1E-07 sec/m^3, as defined in Section A2.2.2

2.22 = factor derived from the assumption that 45% of the dose is contributed by Xe-133

A4.3.2.2. Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 Days

For dose estimates, simplified dose estimates using the assumptions in A4.2.2.2 and operational source term data is presented below. These calcualations further assume that the annual average dispersion/deposition parameter is used and that 95% of the dose is from Iodine-131 concentrated in cow's milk. The simplified dose estimate to the thyroid of an infant is:

$$D = 1.67E+04w \, (\tilde{Q})_{I-131} \, (1.05)$$

where:

w = 3.0E-10 (D/Q) for food and ground plane pathway, in m^{-2} from Table A4.0-2 for the location of the nearest real cow (ESE @ 2.8 miles).

$(\tilde{Q})_{I-131}$ = the total Iodine-131 activity released in μCi.

1.67E+04 = (3.17E-08) R^C [D/Q] with the appropriate substitutions for cow's milk in the grass-cow-milk-pathway factor, R_i^C [D/Q], for Iodine-131. See Section 3.1.2.2.

1.05 = factor derived from the assumption that 95% of the dose is contributed by I-131.

A4.3 FUEL CYCLE CALCULATIONS

These calculations shall be performed using models presented in generic information Section 3.3

TABLE A4.0-1

OCONEE NUCLEAR STATION
(1 of 1)

DISPERSION PARAMETER (X/Q) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

	Distance to the control location, in miles									
Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			6.5E-8	4.8E-8	4.7E-8	4.7E-8	4.7E-8	6.3E-8	5.9E-8	5.6E-8
NNE			1.1E-7	9.3E-8	8.7E-8	8.9E-8	9.2E-8	9.2E-8	7.2E-8	5.9E-8
NE			7.5E-8	7.2E-8	6.8E-8	5.8E-8	6.1E-8	6.4E-8	6.0E-8	5.7E-8
ENE			6.0E-8	6.4E-8	5.9E-8	6.1E-8	5.7E-8	5.7E-8	5.6E-8	5.6E-8
E			4.1E-8	3.7E-8	5.7E-8	4.8E-8	5.2E-8	4.9E-8	4.7E-8	4.5E-8
ESE			3.0E-8	4.0E-8	6.7E-8	5.8E-8	4.3E-8	5.3E-8	4.9E-8	4.7E-8
SE			2.8E-8	2.8E-8	6.0E-8	5.1E-8	4.1E-8	3.7E-8	3.8E-8	3.8E-8
SSE			2.3E-7	2.0E-7	3.2E-7	2.5E-7	3.7E-7	2.9E-7	2.7E-7	2.5E-7
S			2.6E-7	3.0E-7	2.1E-7	2.1E-7	3.6E-7	4.1E-7	3.7E-7	3.6E-7
SSW			3.2E-7	3.1E-7	2.9E-7	2.7E-7	2.0E-7	1.7E-7	1.7E-7	1.7E-7
SW			7.3E-8	7.1E-8	7.1E-8	5.9E-8	3.9E-8	4.4E-8	4.5E-8	4.5E-8
WSW			5.3E-8	5.2E-8	5.3E-8	4.2E-8	4.8E-8	4.3E-8	4.2E-8	4.2E-8
W			2.7E-8	3.2E-8	3.7E-8	3.7E-8	3.9E-8	3.9E-8	3.7E-8	3.6E-8
WNW			2.3E-8	2.5E-8	3.5E-8	3.5E-8	3.3E-8	3.2E-8	3.0E-8	2.9E-8
NW			3.2E-8	3.7E-8	3.1E-8	3.3E-8	3.0E-8	3.1E-8	2.9E-8	2.8E-8
NNW			6.8E-8	7.7E-8	8.3E-8	7.7E-8	7.8E-8	6.5E-8	6.3E-8	6.2E-8

* Inside Exclusion Area Boundary (EAB)

TABLE A4.0-2

OCONEE NUCLEAR STATION
(1 of 1)

DEPOSITION PARAMETER (D/Q) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Distance to the control location, in miles

Sector	0-0.5*	0.5-1.0*	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0
N			2.4E-9	1.4E-9	8.7E-10	6.0E-10	4.7E-10	3.6E-10	2.8E-10	2.3E-10
NNE			4.1E-9	2.2E-9	1.4E-9	9.6E-10	7.4E-10	5.7E-10	4.4E-10	3.6E-10
NE			2.7E-9	1.5E-9	9.7E-10	6.6E-10	5.0E-10	3.9E-10	3.1E-10	2.5E-10
ENE			1.5E-9	8.4E-10	5.4E-10	3.7E-10	2.8E-10	2.2E-10	1.7E-10	1.4E-10
E			1.6E-9	8.7E-10	5.6E-10	3.9E-10	3.0E-10	2.3E-10	1.8E-10	1.5E-10
ESE			1.3E-9	7.0E-10	4.5E-10	3.0E-10	2.3E-10	1.8E-10	1.4E-10	1.1E-10
SE			8.0E-10	4.4E-10	2.9E-10	2.0E-10	1.5E-10	1.2E-10	8.9E-11	7.3E-11
SSE			2.7E-9	1.6E-9	1.1E-9	7.5E-10	6.0E-10	4.6E-10	3.6E-10	3.0E-10
S			4.5E-9	2.6E-9	1.7E-9	1.2E-9	9.0E-10	7.0E-10	5.5E-10	4.5E-10
SSW			4.3E-9	2.5E-9	1.6E-9	1.1E-9	8.5E-10	6.5E-10	5.0E-10	4.2E-10
SW			1.4E-9	8.4E-10	5.5E-10	3.9E-10	3.0E-10	2.3E-10	1.8E-10	1.5E-10
WSW			1.6E-9	9.1E-10	6.0E-10	4.1E-10	3.2E-10	2.5E-10	1.9E-10	1.6E-10
W			1.4E-9	7.9E-10	5.1E-10	3.6E-10	2.7E-10	2.1E-10	1.6E-10	1.3E-10
WNW			7.7E-10	4.4E-10	2.9E-10	2.0E-10	1.5E-10	1.2E-10	9.2E-11	7.4E-11
NW			1.1E-9	5.9E-10	3.8E-10	2.6E-10	2.0E-10	1.6E-10	1.2E-10	9.9E-11
NNW			1.9E-9	1.0E-9	6.6E-10	4.5E-10	3.5E-10	2.7E-10	2.1E-10	1.7E-10

* Inside Exclusion Area Boundary (EAB)

OCONEE NUCLEAR STATION
ADULT $A_{ai\tau}$ DOSE PARAMETERS

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LII
H 3	0.0	5.44E-01	5.44E-01	5.44E-01	5.44E-01	5.44E-01	5.44E-01
NA 24	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02	4.12E+02
CR 51	0.0	0.0	1.28E+00	7.66E-01	2.82E-01	1.70E+00	3.22E+02
MN 54	0.0	4.39E+03	8.38E+02	0.0	1.31E+03	0.0	1.34E+04
MN 56	0.0	1.10E+02	1.96E+01	0.0	1.40E+02	0.0	3.53E+03
FE 55	6.67E+02	4.61E+02	1.07E+02	0.0	0.0	2.57E+02	2.64E+02
FE 59	1.05E+03	2.47E+03	9.48E+02	0.0	0.0	6.91E+02	8.24E+03
CO 58	0.0	9.14E+01	2.05E+02	0.0	0.0	0.0	1.85E+03
CO 60	0.0	2.63E+02	5.79E+02	0.0	0.0	0.0	4.93E+03
NI 63	3.15E+04	2.18E+03	1.06E+03	0.0	0.0	0.0	4.56E+02
NI 65	1.28E+02	1.66E+01	7.59E+00	0.0	0.0	0.0	4.22E+02
CU 64	0.0	1.02E+01	4.80E+00	0.0	2.58E+01	0.0	8.71E+02
ZN 65	2.32E+04	7.38E+04	3.33E+04	0.0	4.93E+04	0.0	4.65E+04
ZN 69	4.93E+01	9.44E+01	6.56E+00	0.0	6.13E+01	0.0	1.42E+01
BR 83	0.0	0.0	4.05E+01	0.0	0.0	0.0	5.84E+01
BR 84	0.0	0.0	5.25E+01	0.0	0.0	0.0	4.12E-04
BR 85	0.0	0.0	2.16E+00	0.0	0.0	0.0	0.0
RB 86	0.0	1.01E+05	4.71E+04	0.0	0.0	0.0	1.99E+04
RB 88	0.0	2.90E+02	1.54E+02	0.0	0.0	0.0	4.01E-09
RB 89	0.0	1.92E+02	1.35E+02	0.0	0.0	0.0	1.12E-11
SR 89	2.31E+04	0.0	6.62E+02	0.0	0.0	0.0	3.70E+03
SR 90	2.87E+05	0.0	7.71E+04	0.0	0.0	0.0	1.64E+04
SR 91	4.24E+02	0.0	1.71E+01	0.0	0.0	0.0	2.02E+03
SR 92	1.61E+02	0.0	6.96E+00	0.0	0.0	0.0	3.19E+03
Y 90	6.05E-01	0.0	1.62E-02	0.0	0.0	0.0	6.41E+03
Y 91M	5.72E-03	0.0	2.21E-04	0.0	0.0	0.0	1.68E-02
Y 91	8.87E+00	0.0	2.37E-01	0.0	0.0	0.0	4.88E+03
Y 92	5.31E-02	0.0	1.55E-03	0.0	0.0	0.0	9.31E+02

* Methodology for table provided by: M. E. Wrangler, RAB:NRR:NRC on 3/17/83

TABLE A4.0-3

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OCONEE NUCLEAR STATION
ADULT A_{aiT} DOSE PARAMETERS

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LII
Y 93	1.69E-01	0.0	4.65E-03	0.0	0.0	0.0	5.34E+03
ZR 95	3.32E-01	1.07E-01	7.21E-02	0.0	1.67E-01	0.0	3.38E+02
ZR 97	1.84E-02	3.70E-03	1.69E-03	0.0	5.59E-03	0.0	1.15E+03
NB 95	4.47E+02	2.49E+02	1.34E+02	0.0	2.46E+02	0.0	1.51E+06
MO 99	0.0	1.16E+02	2.21E+01	0.0	2.63E+02	0.0	2.69E+02
TC 99M	9.62E-03	2.72E-02	3.46E-01	0.0	4.13E-01	1.33E-02	1.61E+01
TC 101	9.89E-03	1.43E-02	1.40E-01	0.0	2.57E-01	7.28E-03	4.28E-14
RU 103	4.99E+00	0.0	2.15E+00	0.0	1.90E+01	0.0	5.82E+02
RU 105	4.15E-01	0.0	1.64E-01	0.0	5.37E+00	0.0	2.54E+02
RU 106	7.42E+01	0.0	9.38E+00	0.0	1.43E+02	0.0	4.80E+03
AG 110M	1.37E+00	1.26E+00	7.50E-01	0.0	2.48E+00	0.0	5.15E+02
TE 125M	2.57E+03	9.33E+02	3.45E+02	7.74E+02	1.05E+04	0.0	1.03E+04
TE 127M	6.50E+03	2.32E+03	7.93E+02	1.66E+03	2.64E+04	0.0	2.18E+04
TE 127	1.06E+02	3.79E+01	2.29E+01	7.83E+01	4.30E+02	0.0	8.34E+03
TE 129M	1.10E+04	4.12E+03	1.75E+03	3.79E+03	4.61E+04	0.0	5.56E+04
TE 129	3.02E+01	1.13E+01	7.35E+00	2.32E+01	1.27E+02	0.0	2.28E+01
TE 131M	1.66E+03	8.13E+02	6.77E+02	1.29E+03	8.23E+03	0.0	8.07E+04
TE 131	1.89E+01	7.91E+00	5.98E+00	1.56E+01	8.29E+01	0.0	2.68E+00
TE 132	2.42E+03	1.57E+03	1.47E+03	1.73E+03	1.51E+04	0.0	7.41E+04
I 130	2.94E+01	8.68E+01	3.43E+01	7.36E+03	1.35E+02	0.0	7.48E+0[illegible]
I 131	1.62E+02	2.32E+02	1.33E+02	7.59E+04	3.97E+02	0.0	6.11E+01
I 132	7.90E+00	2.11E+01	7.40E+00	7.40E+02	3.37E+01	0.0	3.97E+00
I 133	5.53E+01	9.62E+01	2.93E+01	1.41E+04	1.68E+02	0.0	8.64E+01
I 134	4.13E+00	1.12E+01	4.01E+00	1.94E+02	1.78E+01	0.0	9.77E-03
I 135	1.72E+01	4.52E+01	1.67E+01	2.98E+03	7.24E+01	0.0	5.10E+01
CS 134	2.98E+05	7.09E+05	5.80E+05	0.0	2.29E+05	7.62E+04	1.24E+04
CS 136	3.12E+04	1.23E+05	8.86E+04	0.0	6.85E+04	9.39E+03	1.40E+04
CS 137	3.82E+05	5.22E+05	3.42E+05	0.0	1.77E+05	5.89E+04	1.01E+04
CS 138	2.64E+02	5.22E+02	2.59E+02	0.0	3.84E+02	3.79E+01	2.23E-03
BA 139	1.22E+00	8.71E-04	3.58E-02	0.0	8.14E-04	4.94E-04	2.1[illegible]E+00

TABLE A4.0-3

(3 of 3)

OCONEE NUCLEAR STATION
ADULT $A_{ai\tau}$ DOSE PARAMETERS

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA 140	2.56E+02	3.21E-01	1.68E+01	0.0	1.09E-01	1.84E-01	5.27E+02
BA 141	5.94E-01	4.49E-04	2.00E-02	0.0	4.17E-04	2.55E-04	2.80E-10
BA 142	2.58E-01	2.76E-04	1.69E-02	0.0	2.33E-04	1.56E-04	3.78E-19
LA 140	1.57E-01	7.92E-02	2.09E-02	0.0	0.0	0.0	5.82E+03
LA 142	8.05E-03	3.66E-03	9.12E-04	0.0	0.0	0.0	2.67E+01
CE 141	5.07E-02	3.43E-02	3.89E-03	0.0	1.59E-02	0.0	1.31E+02
CE 143	8.94E-03	6.61E+00	7.32E-04	0.0	2.91E-03	0.0	2.47E+02
CE 144	2.65E+00	1.11E+00	1.42E-01	0.0	6.56E-01	0.0	8.94E+02
PR 143	5.78E-01	2.32E-01	2.87E-02	0.0	1.34E-01	0.0	2.53E+03
PR 144	1.89E-03	7.86E-04	9.62E-05	0.0	4.43E-04	0.0	2.72E-10
ND 147	3.95E-01	4.57E-01	2.74E-02	0.0	2.67E-01	0.0	2.19E+03
W 187	2.96E+02	2.48E+02	8.66E+01	0.0	0.0	0.0	8.11E+04
NP 239	3.21E-02	3.16E-03	1.74E-03	0.0	9.84E-03	0.0	6.47E+02

A5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

The radiological environmental monitoring program shall be conducted in accordance with Technical Specification 4.11.

The monitoring program locations and analyses are given in Tables A5.0-1 through A5.0-3 and Figure A5.0-1.

Site specific characteristics make ground water sampling, special low-level I-131 analyses on drinking water, and food product sampling unnecessary. Ground water recharge is from precipitation and the ground water gradient is toward the effluent discharge area; therefore, contamination of ground water from liquid effluents is highly improbable. Special low level I-131 analyses in drinking water will not be performed routinely since the expected I-131 dose from this pathway is less than 1 mrem/year. Food products will not be sampled since lake water irrigation of crops is not practiced in the vicinity.

The laboratory performing the radiological environmental analyses shall participate in an interlaboratory comparison program which has been approved by the NRC. This program is the Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparison Studies (Crosscheck) Program, our participation code is CP.

TABLE A5.0-1

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS

(TLD LOCATIONS)

SAMPLING LOCATION DESCRIPTION *			SAMPLING LOCATION DESCRIPTION *		
020	SITE BOUNDARY	(0.2 MILES N)	040	4-5 MILE RADIUS	(4.5 MILES E)
021	SITE BOUNDARY	(0.2 MILES NNE)	041	4-5 MILE RADIUS	(4.0 MILES ESE)
022	SITE BOUNDARY	(0.5 MILES NE)	042	4-5 MILE RADIUS	(5.0 MILES SE)
023	SITE BOUNDARY	(0.9 MILES ENE)	043	4-5 MILE RADIUS	(4.0 MILES SSE)
024	SITE BOUNDARY	(0.8 MILES E)	044	4-5 MILE RADIUS	(4.0 MILES S)
025	SITE BOUNDARY	(0.6 MILES ESE)	045	4-5 MILE RADIUS	(5.0 MILES SSW)
026	SITE BOUNDARY	(0.3 MILES SE)	046	4-5 MILE RADIUS	(4.5 MILES SW)
027	SITE BOUNDARY	(0.3 MILES SSE)	047	4-5 MILE RADIUS	(4.0 MILES WSW)
028	SITE BOUNDARY	(0.5 MILES S)	048	4-5 MILE RADIUS	(4.0 MILES W)
029	SITE BOUNDARY	(0.6 MILES SSW)	049	4-5 MILE RADIUS	(4.0 MILES WNW)
030	SITE BOUNDARY	(0.4 MILES SW)	050	4-5 MILE RADIUS	(4.0 MILES NW)
031	SITE BOUNDARY	(0.2 MILES WSW)	051	4-5 MILE RADIUS	(4.5 MILES NNW)
032	SITE BOUNDARY	(0.2 MILES W)	052	SPECIAL INTEREST	(12.0 MILES ENE)
033	SITE BOUNDARY	(0.2 MILES WNW)	053	SPECIAL INTEREST	(11.0 MILES E)
034	SITE BOUNDARY	(0.2 MILES NW)	054	SPECIAL INTEREST	(9.5 MILES ESE)
035	SITE BOUNDARY	(0.1 MILES NNW)	055	SPECIAL INTEREST	(9.5 MILES SSE)
036	4-5 MILE RADIUS	(4.0 MILES N)	056	SPECIAL INTEREST	(8.5 MILES SSW)
037	4-5 MILE RADIUS	(4.5 MILES NNE)	057	SPECIAL INTEREST	(9.0 MILES SW)
038	4-5 MILE RADIUS	(4.0 MILES NE)	058	SPECIAL INTEREST	(10.0 MILES WSW)
039	4-5 MILE RADIUS	(4.0 MILES ENE)	059	SPECIAL INTEREST	(9.0 MILES NW)

* All sampling locations are collected quarterly

TABLE A5.0-2
(1 of 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS
(OTHER SAMPLING LOCATIONS)

CODE:

W - Weekly
SM - Semimonthly
M - Monthly   SA - Semiannually

	SAMPLING LOCATION DESCRIPTION	Air Radioiodines and Particulates	Surface Water	Drinking Water	Shoreline Sediment	Milk	Fish	Broadleaf Vegetation
028	Site Boundary (0.5 miles S)							M
060	New Greenville Water Intake Rd. (2.5 miles NNE)	W						
061	Old Hwy. 183 (1.5 miles SSW)	W						
062	Lake Kewoee/Hydro Intake (0.7 mile ENE) (CONTROL)		M					
063	Lake Hartwell - Hwy 183 Bridge (0.8 mile ESE) (000.7)		M				SA	
064	Seneca (6.7 miles SW) (004.1) (CONTROL)			M			SA	
065	Clemson (8.1 miles SSE) (006.1)			M				
066	Anderson (19.0 miles SSE) (012) (CONTROL FOR MILK ONLY)			M		SM		
067	Lawrence Ramsey Bridge, Hwy 27 (4.2 miles SSE) (005.2)				SA			
068	High Falls County Park (2.0 miles W) (CONTROL)				SA			
069	Powell Residence (4.5 miles WNW) (002.1)					SM		
070	(Deleted)							
071	Clemson Dairy (10.3 miles SSE) (006.3)					SM		
072	Hwy 130 (1.7 miles S)	W						
073	Tamassee Dar School (9.0 miles NW) (CONTROL)	W						M
074	Keowee Kee Resort (1.7 miles NNW)	W						

TABLE A5.0-3
(1 of 1)

OCONEE RADIOLOGICAL MONITORING PROGRAM ANALYSES

SAMPLE MEDIUM	ANALYSIS SCHEDULE	ANALYSES GAMMA ISOTOPIC	TRITIUM	LOW LEVEL I-131	GROSS BETA	TLD
1. Air Radioiodine and Particulates	Weekly	X				
2. Direct Radiation	Quarterly					X
3. Surface Water	Monthly	X				
	Quarterly Composite		X			
4. Drinking Water	Monthly	X			X	
	Quarterly Composite		X			
5. Shoreline Sediment	Semiannually	X				
6. Milk	Semimonthly	X		X		
7. Fish	Semiannually	X				
8. Broadleaf Vegetation	Monthly	X				

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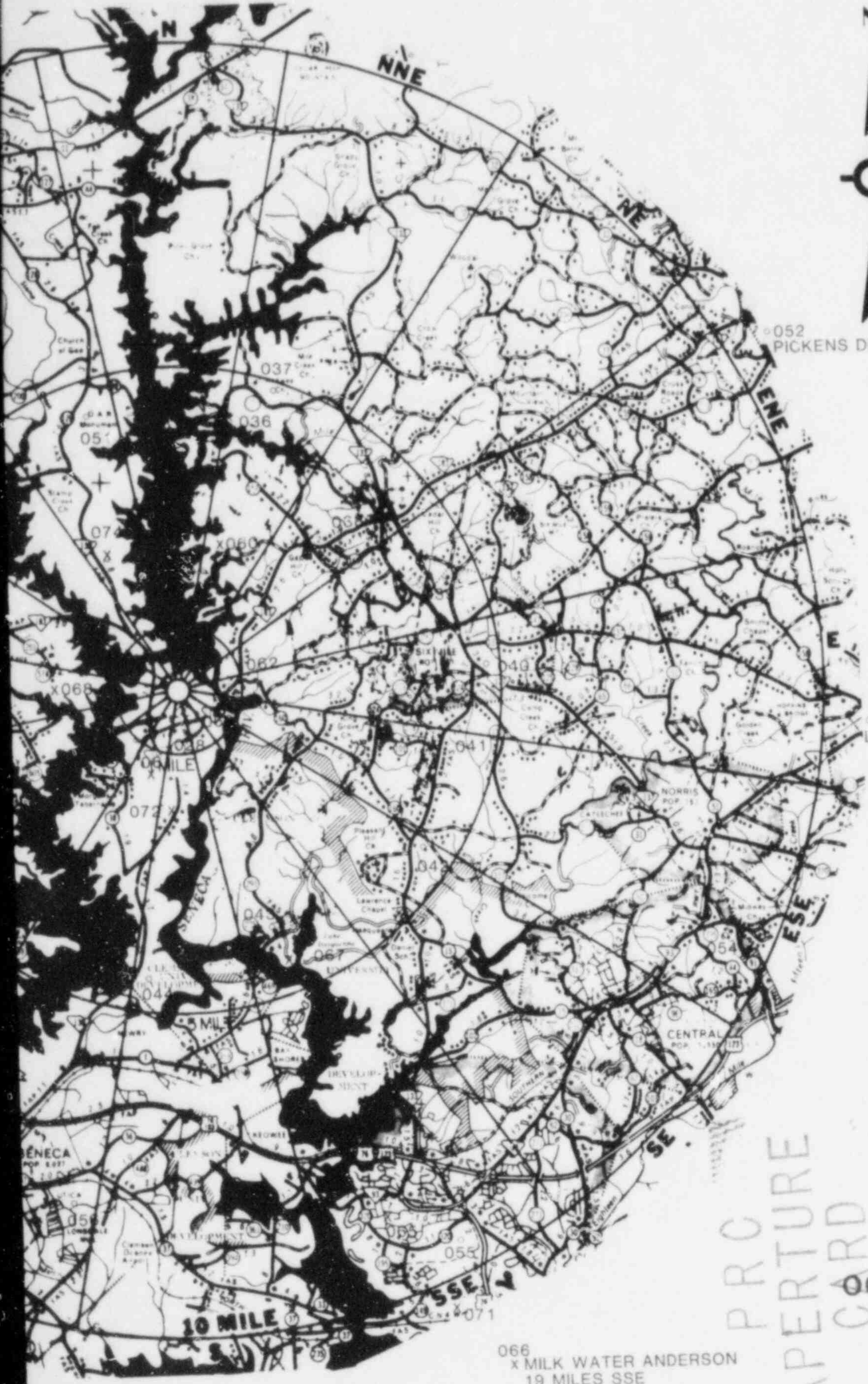
NNW
NW
WNW
WSW
SW
073
050
049
069
048
047
064
057
WEST UNION



Also Available On
Aperture Card

○ TLD LOCATIONS
x ALL OTHER LOCATIONS

SCALE OF MILES

PRC
APERTURE
CARD

FIGURE A5.0-1
(1 OF 2)
OCONEE NUCLEAR STATION

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RADIOLOGICAL MONITORING
PROGRAM LOCATIONS
OCONEE NUCLEAR STATION
FIGURE A5.0-1
(2 OF 2)