CHAPTER 11

RADIOACTIVE WASTE MANAGEMENT

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CHAPTER 11

RADIOACTIVE WASTE MANAGEMENT

11.1 SOURCE TERMS

This section of the referenced DCD is incorporated by reference with no departures or supplements.

11.2 LIQUID WASTE MANAGEMENT SYSTEMS

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.2.1.2.5.2 Use of Mobile and Temporary Equipment

Add the following information at the end of DCD Subsection 11.2.1.2.5.2:

STD COL 11.2-1 When mobile or temporary equipment is selected to process liquid effluents, the equipment design and testing meets the applicable requirements of Regulatory Guide 1.143. When confirmed through sampling that the radioactive waste contents do not exceed the A_2 quantities for radionuclides specified in Appendix A to 10 CFR Part 71, the mobile or temporary equipment may be installed in the Radwaste Building. When the A_2 quantities are exceeded, liquid effluent is processed in the Seismic Category I auxiliary building.

Mobile or temporary equipment is designed in accordance with the codes and standards listed in Table 1 and Regulatory Position C.1.1.2 of Regulatory Guide 1.143.

Mobile or temporary equipment has the following features:

- Level indication and alarms (high-level) on tanks.
- Screwed connections are permitted only for instrument connections beyond the first isolation valve.
- Remote operated valves are used where operations personnel would be required to frequently manipulate a valve.
- Local control panels are located away from the equipment, in low dose areas.
- Instrumentation readings are accessible from the local control panels (i.e., temperature, flow, pressure, liquid level, etc.).
- Wetted parts are 300 series stainless steel, except flexible hose and gaskets.
- Flexible hose is used only for mobile equipment within the designated “black box” locations between mobile components and at the interface with the permanent plant piping.

- The contents of tanks are capable of being mixed, either through recirculation or with a mixer.

- Grab sample points are located in tanks and upstream and downstream of the process equipment.

Inspection and testing of mobile or temporary equipment is in accordance with the codes and standards listed in Table 1 of Regulatory Guide 1.143 with the following additions:

- After placement in the station, the mobile or temporary equipment is hydrostatically, or pneumatically, tested prior to tie-in to permanent plant piping.

- A functional test, using demineralized water, is performed. Remote operated valves are stroked (open-closed-open or closed-open-closed) under full flow conditions. The proper function of the instrumentation, including alarms, is verified. The operating procedures are verified correct during the functional test.

- Tank overflows are routed to floor drains.

- Floor drains are confirmed to be functional prior to placing mobile or temporary equipment into operation.

11.2.3.3 Dilution Factor

Add the following information at the end of DCD Subsection 11.2.3.3.

VCS COL 11.2-2
VCS COL 11.5-3

The dilution factors used for the maximum exposed individual and the population dose are calculated by the LADTAP II code in accordance with Regulatory Guide 1.113. LADTAP II input requires information on whether effluent discharge is into a river or lake, and the average flow rate.

There is no dilution of the effluent discharge prior to entering the Broad River at the Parr Reservoir. The effluent discharge is diluted by the flow rate of the Broad River. The average flow rate of the Broad River is 4811 cfs. The Parr Reservoir retention time is four days.

The dilution factors and a summary of parameters used to calculate them are presented in Table 11.2-201.

11.2.3.5 Estimated Doses

Replace the information in DCD Subsection 11.2.3.5 with the following paragraphs and subsections.

VCS COL 11.2-2 Dose and dose rate to man was calculated using the LADTAP II computer code. This code is based on the methodology presented in Regulatory Guide 1.109.

VCS COL 11.5-3 Factors common to both estimated individual dose rates and estimated population dose are addressed here. Unique data are discussed in the respective sections.

Activity pathways considered are drinking water, sport fishing, irrigated farm products, and recreational activities.

The irrigated farm products are vegetables, leafy vegetables, milk, and meat.

Drinking water from the Broad River is consumed by half the population of the city of Columbia and all the population of Fort Jackson using data from the state of South Carolina. The farm production is based on data for vegetables, leafy vegetables, milk, and meat from the state of South Carolina. The food production within the 50-mile radius of VCSNS is based on the total food production in each category multiplied by the ratio of the land area within the 50-mile radius (adjusted for nonproduction areas) to the total land area of the state. An irrigation model is used for food products. The food production rate using irrigation water is determined by multiplying the 50-mile production rates by the ratio of population using drinking water to the total population within the 50-mile radius, and the fraction of irrigated to harvested cropland using data from the state of South Carolina.

11.2.3.5.1 Estimated Individual Dose Rate

Dose rates to individuals are calculated for drinking water, sport fish consumption, irrigated farm products, and recreational activities.

Table 11.2-202 contains LADTAP II input data for dose rate calculations. Table 11.2-203 gives the maximum individual dose rates.

The total site doses due to liquid and gaseous effluents from the existing Unit 1 and Units 2 and 3 would be well within the regulatory limits of 40 CFR Part 190, as shown in Table 11.3-206. The values in this table for Unit 1 are representative based on review of the Unit 1 annual radiological operating reports (Reference 202).

11.2.3.5.2 Estimated Population Dose

The population dose is based on the fraction of the 50-mile population that will be exposed to the evaluated pathways. These pathways are drinking water, recreational activities, irrigated farm products, and sport fishing.

The sport fishing harvest is estimated using data from the state of South Carolina. The sport fishing harvest is estimated to be 3.77×10^5 kg/yr. Recreational activities include swimming, boating, and shoreline use. The annual usage for each of these activities is estimated to be 3.59×10^5, 3.59×10^6, and 3.59×10^6 person-hours, respectively.

The population doses are given in Table 11.2-204.

This section adopts NEI 07-11 (Reference 201) which is currently under review by the NRC staff. The application of the methodology of NEI 07-11 satisfies the cost-benefit analysis requirements of 10 CFR Part 50, Appendix I, Section II.D. The augments provided in NEI 07-11 were reviewed and were found not to be cost beneficial due to the low VCSNS population doses.

Table 11.2-204 shows that the whole body and thyroid population doses per unit are approximately 2.1 and 2.3 person-rem per unit, respectively. All the population doses are below the NEI guideline value of 16.83 person-rem for whole body or thyroid from liquid effluents.

11.2.3.6 Quality Assurance

STD SUP 11.2-1 Add the following to the end of DCD Subsection 11.2.3.6:

Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation and testing provisions of the liquid radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

11.2.5 COMBINED LICENSE INFORMATION

11.2.5.1 Liquid Radwaste Processing by Mobile Equipment

STD COL 11.2-1 This COL Item is addressed in Subsection 11.2.1.2.5.2.

11.2.5.2 Cost Benefit Analysis of Population Doses

VCS COL 11.2-2 This COL Item is addressed in Subsections 11.2.3.3, 11.2.3.5, 11.2.3.5.1, and 11.2.3.5.2.

11.2.6 REFERENCES

201. NEI 07-11, “Generic Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors,” Revision 0, September 2007.

202. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2005 – December 31, 2005; April 2006.

Table 11.2-201
VCS COL 11.2-2 Dilution Factor Parameters and Dilution Factors

Parameter	Average Annual Condition
Broad River Flow Rate (cfs)[(a)]	4811
Dilution Factor[(a)]	1

a) Assumed fully mixed model with annual average Broad River flow rate at Alston, SC for 1981–1982 and 1997–2006, United States Geological Survey, 2007.

VCS COL 11.2-2
VCS COL 11.5-3

Table 11.2-202
LADTAP II Input[a] for Individual and Population Doses

Input Parameter	Value
Freshwater Site	Selected
Release source terms	DCD Table 11.2-7
Discharge Flow Rate	4811 ft^3 s^{-1}
Transit time to receptor	0.1, 96 hours[b]
Impoundment reconcentration model	None
50-mile population	FSAR Figures 2.1-211 and 2.1-219[c]
Shore width factor	0.2
Fish consumption	21 kg per year[d]
Drinking water consumption	730 liters per year[d]
Sport fishing harvest	3.77E+05 kg per year[e]
50-mile drinking water population	299,930[f]
50-mile shoreline usage	3.59E+06 person-hours per year[g]
50-mile swimming usage	3.59E+05 person-hours per year[h]
50-mile boating usage	3.59E+06 person-hours per year[i]
Fraction of SC crops irrigated[j]	0.0696
Fraction of population using contaminated water for drinking and food production[k]	0.141
Fraction of SC agricultural products within 50 mi radius	0.258
Irrigation rate for food products[l]	102 liters per square meter per month
Fraction of contaminated water not used for feed or drinking water	0
Total production of vegetables within 50 mi radius[m]	6.86E+07 kg per year
Production rate for irrigated vegetables[n]	6.71E+05 kg per year
Total production of leafy vegetables within 50 mi radius[o]	1.80E+07 kg per year
Production rate for irrigated leafy vegetables[n]	1.76E+05 kg per year

VCS COL 11.2-2
VCS COL 11.5-3

Table 11.2-202
LADTAP II Input[a] for Individual and Population Doses

Input Parameter	Value
Total production of milk within 50 mi radius[p]	6.78E+07 liters per year
Production rate for irrigated milk[n]	6.63E+05 liters per year
Total production of meat within 50 mi radius[q]	9.15E+08 kg per year
Production rate for irrigated meat[n]	8.96E+06 kg per year

a) Input parameters not specified use default LADTAP II values.
b) 0.1 hours assumed for maximally exposed individual (MEI) at the Parr Reservoir. 96 hours for downstream users reflecting reservoir retention time.
c) 2060 population projection.
d) Values in the table are for adult MEI. Average values of fish and water consumption of 6.9 kg and 370 liters per year, respectively, are used for population doses.
e) Boating population x 21 kg per year (adult MEI fish ingestion rate).
f) 2060 population projection.
g) Assumed same as boating usage.
h) Assumed 10% of shoreline usage.
i) Assumed 10% of boats registered in Fairfield, Lexington, Newberry, and Richland counties, 2 persons per boat, 200 hours per year.
j) USDA, National Agricultural Statistics Service, 2002 Census of Agriculture.
k) Fraction of contaminated water users (144,671) divided by the 50-mile population (1,028,075) in 2000.
l) 1 inch of water applied to the crops per week.
m) USDA, National Agricultural Statistics Service, 2005 and 2006, with apples and peaches included but leafy vegetables excluded, and projected to 2060.
n) Food product production rate multiplied by fraction of irrigated crops and fraction of contaminated water users.
o) USDA, Integrated Pest Management Center for leafy vegetables—2001, and projected to 2060.
p) *Milk Production, Disposition, and Income, 2006 Summary*, USDA, National Agricultural Statistics Service, April 2007, and projected to 2060. Density of producer milk is 1.03 kg 1^{-1}.
q) *South Carolina Agricultural Statistics, Crops, Livestock, and Poultry, 2005–2007*, USDA, National Agricultural Statistics Service. The total meat production in SC consists of broilers, turkey, commercial red meat, and young chickens. Projected to 2060.

VCS COL 11.5-3

Table 11.2-203
Individual Dose Rates

	Dose (mrem/yr)[a]			
Annual Dose Total Body[b]	Maximum Organ[c] (GI-LLI)	Maximum Thyroid Dose[d]	Maximum Bone Dose[d]	Dose Limit[e]
5.1E-02	1.7E-01	7.0E-02	4.1E-02	Total Body: 3 Any organ: 10

a) Doses are per AP1000 unit

b) an adult was found to receive the maximum individual total body dose

c) an adult was found to receive the maximum individual organ dose

d) a child was found to receive the maximum individual thyroid and bone doses

e) 10 CFR Part 50, Appendix I

VCS COL 11.2-2

Table 11.2-204[(a)]
Population Doses

	Annual Dose (person-rem)
Total Body	2.1
Thyroid	2.3

a) Doses are per AP1000 unit

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.3.3.4 Estimated Doses

Add the following information at the end of DCD Subsection 11.3.3.4.

VCS COL 11.3-1
VCS COL 11.5-3

The VCSNS site-specific values are bounded by the DCD identified acceptable releases. With the annual airborne releases listed in DCD Table 11.3-3, the site specific air doses at ground level at the site boundary are 0.58 mrad for gamma radiation and 2.4 mrad for beta radiation. These doses are based on the annual average atmospheric dispersion factor from FSAR Section 2.3. These doses are below the 10 CFR Part 50, Appendix I design objectives of 10 mrad per year for gamma radiation or 20 mrad per year for beta radiation.

Dose and dose rate to man was calculated using the GASPAR II computer code. This code is based on the methodology presented in Regulatory Guide 1.109. Factors common to both estimated individual dose rates and estimated population dose are addressed in this subsection. Unique data are discussed in the respective subsections. Activity pathways considered are plume, ground deposition, inhalation, and ingestion of vegetables, meat, and milk (both cow and goat).

Based on site meteorological conditions, the highest rate of plume exposure and ground deposition occurs at the dose evaluation periphery 0.5 miles NE of the Units 2 and 3 power block area circle.

Agricultural products are estimated from U.S. Department of Agriculture (USDA) National Agricultural Statistics Service. GASPAR II evenly distributes the food production over the entire 50 miles when given a total production for calculating dose.

The population doses are based on the population, projected to the year 2060, within a 50-mile radius of the centroid between Units 2 and 3. The population distribution is presented in FSAR Subsection 2.1.3 and Figures 2.1-211 and 2.1-219. Data from these figures are tabulated in Table 11.3-202.

11.3.3.4.1 Estimated Individual Doses

Dose rates to individuals are calculated for airborne decay and deposition, inhalation, and ingestion of milk (cow and goat), meat and vegetables. Dose from plume and ground deposition are calculated as affecting all age groups equally.

Plume exposure approximately 0.50 mile northeast of the Units 2 and 3 power block area circle produced a maximum dose rate to a single organ of 1.8 mrem/yr to skin. The maximum total body dose rate was calculated to be 3.5E-1 mrem/yr.

Ground deposition approximately 0.50 mile northeast of the Units 2 and 3 power block area circle produced a maximum dose rate to a single organ of 2.4E-1 mrem/yr to skin. The maximum total body dose rate was calculated to be 2.0E-1 mrem/yr.

Inhalation dose at the dose evaluation periphery, 0.50 mile northeast of the Units 2 and 3 power block area circle, results in a maximum dose rate to a single organ of 5.3E-1 mrem/yr to a child's thyroid. The maximum total body dose rate is calculated to be 3.9E-2 mrem/yr to a teenager.

Vegetable consumption assumes that the dose is received from gardens, approximately 1.23 miles east of the Units 2 and 3 power block area circle. Site-specific vegetable consumption data is used as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 2.2 mrem/yr to a child's thyroid. The maximum total body dose rate is calculated to be 2.0E-1 mrem/yr to a child.

Meat consumption assumes that the dose is received from an animal, approximately 1.23 miles east of the Units 2 and 3 power block area circle. Milk and meat animals are assumed to be co-located. Site-specific meat consumption data is used as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 1.3E-1 mrem/yr to a child's bone. The maximum total body dose rate is calculated to be 2.7E-2 mrem/yr to a child.

Cow milk consumption assumes that the dose is received from an animal, approximately 1.23 miles east of the Units 2 and 3 power block area circle. Site-specific cow milk consumption data is used as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 6.7 mrem/yr to an infant's thyroid. The maximum total body dose rate is calculated to be 1.9E-1 mrem/yr to an infant.

Goat milk consumption assumes that the dose is received from an animal, approximately 1.23 miles east of the Units 2 and 3 power block area circle. Site-specific goat milk consumption data is used as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 8.9 mrem/yr to an infant's thyroid. The maximum total body dose rate is calculated to be 2.1E-1 mrem/yr to an infant.

The maximum dose rate to any organ considering every pathway is calculated to be 9.1 mrem/yr to an infant's thyroid. The maximum total body dose rate is calculated to be 4.6E-1 mrem/yr to a child. These are below the 10 CFR Part 50, Appendix I design objectives of 5 mrem/yr to total body, and 15 mrem/yr to any organ, including skin.

Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest resident, meat animal, milk animal, garden, and the dose evaluation periphery and power block area circle are described in Section 2.3. Table 11.3-203 contains total organ dose rates based on age group. Table 11.3-204 contains total air dose at each special location.

The total site doses due to liquid and gaseous effluents from Unit 1 and Units 2 and 3 would be well within the regulatory limits of 40 CFR Part 190, as shown in Table 11.3-206. The values in this table for Unit 1 are representative based on review of the Unit 1 annual radiological operating reports (Reference 202).

11.3.3.4.2 Estimated Population Dose

The population dose analysis performed to determine offsite dose from gaseous effluents is based upon the AP1000 generic site parameters included in DCD Chapter 11 and Tables 11.3-1, 11.3-2 and 11.3-4 and population data in Table 11.3-202. The population dose is shown in Table 11.3-205.

This section adopts NEI 07-11 (Reference 201) which is currently under review by the NRC staff. The application of the methodology of NEI 07-11 satisfies the cost-benefit analysis requirements of 10 CFR Part 50, Appendix I, Section II.D. The augments provided in NEI 07-11 were reviewed and were found not to be cost beneficial due to the low VCSNS population doses.

Table 11.3-205 shows that the whole body and thyroid population doses per unit are approximately 1.3 and 3.6 person-rem per unit, respectively. The population doses per unit are below the NEI guideline value of 6.32 person-rem for whole body or thyroid from gaseous effluents.

11.3.3.6 Quality Assurance

STD SUP 11.3-1 Add the following to the end of DCD Subsection 11.3.3.6:

Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation, and testing provisions of the gaseous radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

11.3.5 COMBINED LICENSE INFORMATION

11.3.5.1 Cost Benefit Analysis of Population Doses

VCS COL 11.3-1 This COL Item is addressed in Subsections 11.3.3.4, 11.3.3.4.1, and 11.3.3.4.2.

11.3.6 REFERENCES

201. NEI 07-11, “Generic Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors,” Revision 0, September 2007.

202. Annual Effluent and Waste Disposal Report, Virgil C. Summer Nuclear Station, for the Operating Period January 1, 2005 – December 31, 2005; April 2006.

VCS COL 11.3-1
VCS COL 11.5-3

Table 11.3-201
GASPAR II Input[(a)] for Dose Rates

Input Parameter	Value
Number of Source Terms	1
Read Met data from XOQDOQ-generated file	Selected
Distance from site to NE Corner of the US	1129 mi
Source Term	DCD Table 11.3-3
Population Data	Table 11.3-202
Fraction of the year leafy vegetables are grown	0.583
Fraction of the year milk cows are on pasture	0.75
Fraction of maximally exposed individual's vegetable intake from own garden	0.76
Fraction of milk-cow feed intake from pasture while on pasture	1
Fraction of the year goats are on pasture	0.83
Fraction of goat feed intake from pasture while on pasture	1
Fraction of the year beef cattle are on pasture	0.75
Fraction of beef-cattle feed intake from pasture while on pasture	1
Total Production Rate for the 50-mile area	
-Vegetables	8.66E+07 kg per year
-Milk	6.78E+07 liters per year
-Meat	9.15E+08 kg per year
Special Location Data	Section 2.3

a) Input parameters not specified use default GASPAR II values.

VCS COL 11.3-1
VCS COL 11.5-3

Table 11.3-202
Population Input for Population Dose Rates

	Distance (mi)									
Direction	1	2	3	4	5	10	20	30	40	50
N	0	0	0	0	10	346	873	5086	9609	56103
NNE	0	0	0	10	73	491	651	9504	14976	214038
NE	0	0	115	25	83	155	2060	3485	12585	77448
ENE	0	51	0	19	0	793	12225	1477	2634	19934
E	0	19	147	0	0	915	4637	8552	31951	43930
ESE	117	4	12	133	22	321	6820	106337	19823	10765
SE	0	29	57	0	156	394	48768	343866	58718	14087
SSE	0	0	0	0	0	3242	118703	210614	59842	16596
S	0	6	0	117	102	3020	35109	57548	29388	15465
SSW	0	0	12	44	92	3907	18332	32814	14385	15326
SW	0	0	47	9	57	1576	5334	4697	10615	26568
WSW	0	36	17	0	168	1000	6268	3601	5059	9065
W	0	0	9	24	62	701	23548	2522	7991	79542
WNW	0	18	0	6	54	865	2800	4997	33560	44593
NW	0	0	0	9	0	639	721	4774	5727	20941
NNW	35	0	9	225	23	415	434	2812	23936	15182
Total	152	163	425	621	902	18780	287283	802686	340799	679583

Grand Total 2131394

VCS COL 11.3-1
VCS COL 11.5-3

Table 11.3-203
Individual Dose Rates[a]

	Dose (mrem/yr)			
Age Group	Total Body	Bone	Thyroid	Skin
Adult	2.4E-01	6.3E-01	2.2E+00	5.1E-01
Teenager	2.8E-01	9.0E-01	3.2E+00	5.6E-01
Child	4.6E-01	1.9E+00	6.1E+00	7.2E-01
Infant	3.2E-01	1.0E+00	9.1E+00	6.0E-01

a) Dose rates represent the summation of dose rates from each pathway and are from gaseous releases from one AP1000 unit.

VCS COL 11.3-1
VCS COL 11.5-3

Table 11.3-204[(a)]
Dose in MilliRads at Special Locations

Special Location	Beta Air Dose (millirads/yr)	Gamma Air Dose (millirads/yr)
(millirads/yr)		
EAB	2.4E+00	5.8E-01
Residence/Garden/Meat Animal/Cow/Goat	5.1E-01	1.1E-01

a) Annual dose from gaseous releases from one AP1000 unit.

VCS COL 11.3-1
VCS COL 11.5-3

Table 11.3-205
Population Doses[a]

	Whole Body (person-rem per year)	Thyroid (person-rem per year)
Population Dose	1.3	3.6

a) Annual dose from gaseous releases from one AP1000 unit.

Table 11.3-206
Comparison of Maximally Exposed Individual Doses with
40 CFR Part 190 Criteria

	Dose (mrem/yr)					
	Units 2 and 3			Unit 1[c]	Site Total	Regulatory Limit
	Liq[a]	Gas[b]	Total			
Total Body	0.10	0.91	1.0	1.2	2.2	25
Thyroid	0.14	18.2	18.3	0.040	18.4	75
Other Organ - Bone	0.082	3.8	3.9	0.040	4.0	25

a) Doses from Table 11.2-203 are doubled for two units.

b) Maximum doses (by age group) from Table 11.3-203 are doubled for two units.

c) Unit 1 doses are based on annual effluent reports.

11.4 SOLID WASTE MANAGEMENT

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.4.5 QUALITY ASSURANCE

Add the following to the end of DCD Subsection 11.4.5:

STD SUP 11.4-1 Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation and testing provisions of the solid radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

11.4.6 COMBINED LICENSE INFORMATION FOR SOLID WASTE MANAGEMENT SYSTEM PROCESS CONTROL PROGRAM

Add the following information to the end of DCD Subsection 11.4.6.

This COL Item is addressed below.

STD COL 11.4-1 This section adopts NEI 07-10 (Reference 201) which is currently under review by the NRC staff. The Process Control Program (PCP) describes the administrative and operational controls used for the solidification of liquid or wet solid waste and the dewatering of wet solid waste. Its purpose is to provide the necessary controls such that the final disposal waste product meets applicable federal regulations (10 CFR Parts 20, 50, 61, 71, and 49 CFR Part 173), state regulations, and disposal site waste form requirements for burial at a low level waste (LLW) disposal site that is licensed in accordance with 10 CFR Part 61.

Waste processing (solidification or dewatering) equipment and services may be provided by the plant or by third-party vendors. Each process used meets the applicable requirements of the PCP.

No additional onsite radwaste storage is required beyond that described in the DCD.

Table 13.4-201 provides milestones for PCP implementation.

11.4.6.1 Procedures

STD SUP 11.4-1 Operating procedures specify the processes to be followed to ship waste that complies with the waste acceptance criteria (WAC) of the disposal site, 10 CFR 61.55 and 61.56, and the requirements of third party waste processors.

Each waste stream process is controlled by procedures that specify the process for packaging, shipment, material properties, destination (for disposal or further processing), testing to verify compliance, the process to address non-conforming materials, and required documentation.

Where materials are to be disposed of as non-radioactive waste (as described in DCD Subsection 11.4.2.3.3), final measurements of each package are performed to verify there has not been an accumulation of licensed material resulting from a buildup of multiple, non-detectable quantities. These measurements are obtained using sensitive scintillation detectors, or instruments of equal sensitivity, in a low-background area.

Procedures document maintenance activities, spill abatement, upset condition recovery, and training.

Procedures document the periodic review and revision, as necessary, of the PCP based on changes to the disposal site, WAC regulations, and third party PCPs.

11.4.6.2 Third Party Vendors

Third party equipment suppliers and/or waste processors are required to supply approved PCPs. Third party vendor PCPs describe compliance with Regulatory Guide 1.143, Generic Letter 80-09, and Generic Letter 81-39. Third party vendor PCPs are referenced appropriately in the plant PCP before commencement of waste processing.

11.4.7 REFERENCES

201. NEI 07-10, “Generic FSAR Template Guidance for Process Control Program (PCP) Description,” Revision 1, October 2007.

11.5 RADIATION MONITORING

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.5.1.2 Power Generation Design Basis

Revise the fourth bullet in DCD Subsection 11.5.1.2 as follows.

STD COL 11.5-2

- Data collection and data storage to support compliance reporting for the applicable NRC requirements and guidelines, such as General Design Criterion 64 and Regulatory Guide 1.21 and Regulatory Guide 4.15, Revision 1.

11.5.2.4 Inservice Inspection, Calibration, and Maintenance

Add the following information at the end of DCD Subsection 11.5.2.4:

STD COL 11.5-2

Daily checks of effluent monitoring system operability are made by observing channel behavior. Detector response is routinely observed with a remotely-positioned check source in accordance with plant procedures. Instrument background count rate is also observed to determine proper functioning of the monitors. Any detector whose response cannot be verified by observation during normal operation or by using the remotely-positioned check source can have its response checked with a portable check source. A record is maintained showing the background radiation level and the detector response.

Calibration of the continuous radiation monitors is done with commercial radionuclide standards that have been standardized using a measurement system traceable to the National Institute of Standards and Technology.

11.5.3 EFFLUENT MONITORING AND SAMPLING

Add the following information at the end of DCD Subsection 11.5.3.

VCS COL 11.5-2

SCE&G is extending the existing VCSNS Unit 1 program for quality assurance of radiological effluent and environmental monitoring that is based on Regulatory Guide 4.15, Revision 1, to apply to Units 2 and 3. Regulatory Guide 4.15, Revision 1, is a proven methodology for quality assurance of radiological effluent and environmental monitoring programs that is acceptable to the NRC staff as a method for demonstrating compliance with applicable requirements of 10 CFR Parts 20, 50, 52, 61, and 72. Use of Revision 2 of Regulatory Guide 4.15 would

necessitate conducting two separate programs involving the use of common staff, facilities and equipment, which will create an undue burden and may lead to an increased possibility for human error. Therefore, SCE&G commits to use Regulatory Guide 4.15, Revision 1, methodology for Units 2 and 3 for optimal consistency, efficiency and practicality.

11.5.4 PROCESS AND AIRBORNE MONITORING AND SAMPLING

STD COL 11.5-2 Add the following information at the end of the first paragraph in DCD Subsection 11.5.4.

The sampling program for liquid and gaseous effluents will conform to Regulatory Guide 4.15, Revision 1 (See Appendix 1AA).

Add the following information at the end of DCD Subsection 11.5.4:

11.5.4.1 Effluent Sampling

STD COL 11.5-2 Effluent sampling of potential radioactive liquid and gaseous effluent paths is conducted on a periodic basis to verify effluent processing meets the discharge limits to offsite areas. The effluent sampling program provides the information for the effluent measuring and reporting required by 10 CFR 50.36a and 10 CFR Part 20 and implemented through the Offsite Dose Calculation Manual (ODCM) and plant procedures. The frequency of the periodic sampling and analyses described herein are nominal and may be increased as permitted by procedure. Tables 11.5-201 and 11.5-202 summarize the sample and analysis schedules and sensitivities, respectively. The information contained in Tables 11.5-201 and 11.5-202 are derived from Regulatory Guide 1.21.

Laboratory isotopic analyses are performed on continuous and batch effluent releases in accordance with the ODCM. Results of these analyses are compiled and appropriate portions are utilized to produce the Radioactive Effluent Release Report.

11.5.4.2 Representative Sampling

The pressure head of the fluid, if available, is used for taking samples. If sufficient pressure head is not available to take samples, then sample pumps are used to draw the sample from the process fluid to the detector panels and back to the process.

For obtaining representative samples in unfiltered ducts, isokinetic probes are used as recommended by ANSI N13.1 (Reference 201).

Analytical Procedures

Typically, samples of process and effluent gases and liquids are analyzed in the station laboratory or by an outside laboratory via the following techniques:

- Gross alpha/beta counting
- Gamma spectrometry
- Liquid scintillation counting

"Available" instrumentation and counting techniques change as other instruments and techniques become available. For this reason, the frequency of sampling and the analysis of samples are generalized in this subsection.

Gross alpha/beta analysis may be performed directly on unprocessed samples (e.g., air filters) or on processed samples (e.g., evaporated liquid samples). Sample volume, counting geometry, and counting time are chosen to match measurement capability with sample activity. Correction factors for sample-detector geometry, self-absorption and counter resolving time are applied to provide the required accuracy.

Liquid effluent samples are prepared for alpha/beta counting by evaporation onto steel planchets. Gamma analysis may be done on any type of sample (gas, solid or liquid) in a gamma spectrometer.

Tritiated water vapor samples are collected by condensation or adsorption, and the resultant liquid is analyzed by liquid scintillation counting techniques.

Radiochemical separations are used for the routine analysis of Sr-89 and Sr-90.

Liquid samples are collected in polyethylene bottles to minimize absorption of nuclides onto container walls.

11.5.6.5 Quality Assurance

Add the following information at the end of DCD Subsection 11.5.6.5.

STD COL 11.5-2 The sampling program and the associated monitors conform to Regulatory Guide 4.15, Revision 1 (See Appendix 1AA).

11.5.7 COMBINED LICENSE INFORMATION

STD COL 11.5-1 This section adopts NEI 07-09 (Reference 202), which is currently under review by NRC staff. The ODCM program description contains the methodology and parameters used for calculating doses resulting from liquid and gaseous effluents. The ODCM program description addresses operational setpoints, including planned discharge rates, for radiation monitors and monitoring programs (process and effluent monitoring and environmental monitoring) for the control and assessment of the release of radioactive material to the environment. The ODCM program description provides the limitations on operation of the radwaste systems, including functional capability of monitoring instruments, concentrations of effluents, sampling, analysis, 10 CFR Part 50, Appendix I dose and dose commitments, and reporting. The ODCM program description will be finalized prior to fuel load with site-specific information.

Table 13.4-201 provides milestones for ODCM implementation.

STD COL 11.5-2 This COL Item is addressed in Subsections 11.5.1.2, 11.5.2.4, 11.5.4, 11.5.4.1, 11.5.4.2, and 11.5.6.5.

VCS COL 11.5-2 This COL Item is addressed in Subsection 11.5.3.

STD COL 11.5-3 This COL Item is addressed in Subsection 11.2.3.5 and 11.3.3.4 for liquid and gaseous effluents, respectively.

Add the following subsection after DCD Subsection 11.5.7.

11.5.8 REFERENCES

201. ANSI N13.1-1999, “Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities.”

202. NEI 07-09, “Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description,” Revision 0, September 2007.

STD COL 11.5-2

Table 11.5-201 (Sheet 1 of 2)
Minimum Sampling Frequency

Stream	Sampled Medium	Frequency
Gaseous	Continuous Release	A sample is taken within one month of initial criticality, and at least weekly thereafter to determine the identity and quantity for principal nuclides being released. A similar analysis of samples is performed following each refueling, process change, or other occurrence that could alter the mixture of radionuclides. When continuous monitoring shows an unexplained variance from an established norm. Monthly for tritium.
	Batch Release	Prior to release to determine the identity and quantity of the principal radionuclides (including tritium).
	Filters (particulates)	Weekly. Quarterly for Sr-89 and Sr-90. Monthly for gross alpha.

Table 11.5-201 (Sheet 2 of 2)
STD COL 11.5-2 Minimum Sampling Frequency

Stream	Sampled Medium	Frequency
Liquid	Continuous Releases	Weekly for principal gamma-emitting radionuclides.
		Monthly, a composite sample for tritium and gross alpha.
		Monthly, a representative sample for dissolved and entrained fission and activation gases.
		Quarterly, a composite sample for Sr-89, Sr-90, and Fe-55.
	Batch Releases	Prior to release for principal gamma-emitting radionuclides.
		Monthly, a composite sample for tritium and gross alpha.
		Monthly, a representative sample from at least one representative batch for dissolved and entrained fission and activation gases.
		Quarterly, a composite sample for Sr-89, Sr-90 and Fe-55.

STD COL 11.5-2

Table 11.5-202
Minimum Sensitivities

Stream	Nuclide	Sensitivity
Gaseous	Fission & Activation Gases	1.0E-04 μCi/cc
	Tritium	1.0E-06 μCi/cc
	Iodines & Particulates	Sufficient to permit measurement of a small fraction of the activity that would result in annual exposures of 15 mrem to thyroid for iodines, and 15 mrem to any organ for particulates, to an individual in an unrestricted area.
	Gross Radioactivity	Sufficient to permit measurement of a small fraction of the activity that would result in annual air dose of 1) 10 mrad due to gamma, and 2) 20 mrad of beta at any location near ground level at or beyond the site boundary.
Liquid	Gross Radioactivity	1.0E-07 μCi/ml
	Gamma-emitters	5.0E-07 μCi/ml
	Dissolved & Entrained Gases	1.0E-05 μCi/ml
	Gross Alpha	1.0E-07 μCi/ml
	Tritium	1.0E-05 μCi/ml
	Sr-89 & Sr-90	5.0E-08 μCi/ml
	Fe-55	1.0E-06 μCi/ml