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April 19, 2011

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Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Enclosed is the South Carolina Electric & Gas Company (SCE&G) Annual Radiological Environmental Operating Report as required by Regulatory Guide 4.8 and Section 6.9.1.6 of the Virgil C. Summer Nuclear Station Technical Specifications.

If there are any questions, please contact Ms. Susan B. Reese at (803) 345-4591.

Very truly yours,

George A. Lippard

SBR/GAL/jg
Enclosure

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RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

VIRGIL C. SUMMER NUCLEAR STATION

FOR THE OPERATING PERIOD

JANUARY 1, 2010 - DECEMBER 31, 2010

April 2011

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EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report describes the V.C. Summer Environmental Monitoring Program and the program results for the calendar year 2010.

Included are the identification of sample locations, descriptions of environmental sampling and type of analysis. Comparisons of present environmental radioactivity levels and pre-operational environmental data, land use census comparisons of doses calculated from environmental measurements, and a summary of environmental radiological sampling results. Quality assurance practices, sampling deviations and unavailable samples are also discussed.

Sampling activities were conducted as prescribed by the Offsite Dose Calculation Manual (ODCM) for V.C. Summer Nuclear Station (VCSNS) and applicable Health Physics Procedures. Required analyses were performed and detection limits met for required samples with exceptions noted. Samples were collected comprising one thousand three hundred sixteen analyses (1,316) performed to compile the data for the 2010 Environmental Report. Supplemental samples comprising one hundred ninety three (193) analyses were performed on some media for additional information. Based on the results from the annual land use census, the current number of sampling sites for V.C. Summer Nuclear Station is sufficient.

Concentrations observed in the environment in 2010 from V.C. Summer related radionuclide concentrations were within the range of concentrations observed in the past. Review of the data indicated that very low tritium concentration in surface water was the only indicator with VCSNS produced radioactivity. This activity was well below the applicable reporting level requirements of the ODCM. It is therefore concluded that VCSNS operations have no significant radiological impact on the health and safety of the public or the environment.

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INTRODUCTION

Virgil C. Summer Nuclear Station (VCSNS) utilizes a pressurized water reactor rated at 2900 MWt (990 MWe gross). The station is located adjacent to the Monticello Reservoir near Jenkinsville, South Carolina and approximately 26 miles northwest of Columbia. VCSNS achieved initial criticality on October 22, 1982, reached 50% power December 12, 1982 and 100% power June 10, 1983 following steam generator feedwater modifications. Steam generators were replaced in the fall of 1994. During the ninth refuel the plant was uprated to 2900 MWt (990 MWe gross). VCSNS is currently operating in the 19^{th} fuel cycle.

VCSNS is operating in conjunction with the adjacent Fairfield Pump Storage Facility (FPSF) which consists of eight reversible pump-turbine units of 60 MWe capacity each. During periods of off-peak power demand, base load generating capacity is used to pump water from Parr Reservoir to Monticello Reservoir. Monticello Reservoir has a surface area of approximately 6800 acres and lies about 150 feet above Parr Reservoir whose full pool area is approximately 4400 acres. The pump-turbine units operate in the generating mode to meet peak system loads while Monticello Reservoir also provides condenser cooling water for VCSNS. Cooling water intake and discharge structures are separated by a jetty to ensure adequate circulation within the reservoir.

VCSNS is located in Fairfield County which, along with Newberry County, makes up the principle area within a 10 mile radius of the plant. This area is mainly forest with only about 30% devoted to small farming activities principally producing small grains, feed crops and beef cattle. Significant portions of Lexington and Richland Counties are encompassed within the 20 mile radius of the plant and exhibit similar agricultural activities. Columbia, the state capital, is the only large city within the 50 mile radius of the plant. Small agricultural concerns are predominant, but make up less than 50% of the land area. The main industrial activity is concentrated around Columbia and is generally greater than 20 miles from the VCSNS.

Liquid effluents from VCSNS are released into the Monticello/Parr Reservoirs at two discharge points: the Circulating Water Discharge Canal (CWDC) and the FPSF Penstocks. Non-nuclear drains are released to the CWDC. Effluent from the liquid waste processing system and processed steam generator blowdown are released through the penstocks. Radioactive gaseous effluents from VCSNS are released from three points: the Main Plant Vent, the Reactor Building Purge Exhaust and the Oil Incineration Facility, all considered to be ground level releases.

Radioactive liquid and gaseous releases from the facility and their potential influence on the surrounding biota and man are the primary concern of the Radiological Environmental Monitoring Program at VCSNS. This report summarizes the results of the Radiological Environmental Monitoring Program conducted during 2010. Data trends, control/indicator and preoperational/operational data intercomparisons, and other data interpretations are presented.

DESCRIPTION OF THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The Radiological Environmental Monitoring Program is carried out in its entirety by South Carolina Electric and Gas Company. The program has been designed to meet the following general commitments:

1. To analyze selected samples in important anticipated pathways for the qualification and quantification of radionuclides released to the environment surrounding VCSNS.

2. To establish correlations between levels of environmental radioactivity and radioactive effluents from VCSNS operation.

The program utilizes the concepts of control/indicator and preoperational /operational intercomparisons in order to establish the adequacy of radioactivity source control and to realistically verify the assessment of environmental radioactivity levels and subsequent radiation dose to man.

Sample media and analysis sensitivity requirements have been established to ensure that the maximum dose pathways are monitored and sensitivities represent a small fraction of annual release limits. Effluent dispersion characteristics, demography, hydrology and land use have been considered in selection of environmental sampling locations. These criteria were used to establish both the preoperational and operational phases of the Radiological Environmental Monitoring Program. Elements of the program monitor the impact of gaseous and liquid effluents released from VCSNS.

Specific methods used in monitoring the pathways of these effluents which may lead to radiation exposure of the public, based on existing demography, are summarized below in Table 1. Requirements of the Radiological Environmental Monitoring Program are specified in the VCSNS Offsite Dose Calculation Manual (ODCM). Elements of the program monitor the impact of gaseous and liquid effluents released from VCSNS.

Table 1 - Monitoring Methods for Critical Radiation Exposure Pathways

Effluent Release Type	Exposure Pathway	Monitoring Media
Gaseous	Immersion Dose and other External Dose Vegetation (Ingestion) Milk (Ingestion)	Thermoluminescent Dosimetry (TLD), Area Monitoring, Air Sampling, Vegetation and Food Crop Sampling, Milk Sampling, Grass (Forage) Sampling
Liquid	Fish (Ingestion) Water & Shoreline Exposure (Ingestion and Immersion) Drinking Water (Ingestion)	Fish Sampling, Surface Water Sampling, Ground Water Sampling, Shoreline and Bottom Sediment Sampling, Drinking Water Sampling

Monitoring sites indicative of plant operating conditions are generally located within a 5 mile radius of the plant. Table 6 provides a list of ODCM required sampling locations. Table 7 provides a list of supplemental sampling locations. Maps showing radiological environmental sampling locations within a radius of approximately 5 miles from VCSNS are presented as Figures 1-2 through 1-5. Figure 1-1 shows monitoring sites at distances greater than 10 miles from the plant. These locations indicate regional fluctuations in background radiation levels.

In addition to preoperational/operational data intercomparisons, control/indicator data intercomparisons are utilized. This is done to assess the probability that any observed abnormal measurement of radioactivity concentration is due to random or regional fluctuations rather than to a true increase in local environmental radioactivity concentration.

Environmental data is gathered through multiple types of sampling and measurements at specific locations. Several multiple sampling combinations are in use around the VCSNS. For example, all air sampling locations serve as environmental dosimetry monitoring locations. At these locations, airborne plant effluents are monitored for gamma immersion dose (noble gases), in addition to air contaminants. Monitoring locations Site 6 (1.0 mi. ESE) and Site 7 (1.0 mi. E) have broadleaf vegetation gardens for monitoring gaseous effluent deposition (ingestion pathway) in the two sectors having the highest deposition coefficients (D/Q) with real potential for exposure. Monitoring location Site 18 (16.5 mi. S) serves as a control location for direct radiation and garden monitoring.

Liquid effluents are monitored using three different monitoring media (fish, bottom sediment and surface water) at the two most probable affected bodies of water around the plant: Site 21, Parr Reservoir (2.7 mi. SSW) and Site 23, Monticello Reservoir (0.5 mi. ESE). The control location for liquid effluent comparisons is at Site 22, Neal Shoals (26.0 mi. NNW) on the Broad River.

Quality of analytical measurements is demonstrated by participation in a laboratory intercomparison program. Results of the intercomparison program with an outside vendor and VCSNS Count Room were satisfactory in 2010. The results of each of these quality control checks of the Radiological Environmental Monitoring program verify the technical credibility of analytical data generated and reported by the program.

LAND USE CENSUS

Annually a land use census is performed within a 5 mile radius of VCSNS to verify the adequacy of sample locations. In addition, the location of the maximum exposed individual (MEI) is identified. The results of the land use census performed in 2010 are included in Table 4. A verification of the maximum exposed individual location is presented in Table 5. Identification of the highest offsite dose locations was performed by calculating a hypothetical dose based on predicted VCSNS source term from the Operating License Environmental Report and 2010 meteorological data. Exposure pathways used in the analysis were those identified during the land use census.

The location and pathway presently used in the ODCM for offsite organ dose calculations (E 1.1 miles - residence/garden) was found to have a calculated dose of 3.78E+0 mrem/yr. In addition, the ODCM required environmental gardens (ESE 1.0 and E 1.0 mile) were found to have a calculated dose of 3.50E+0 and 4.85E+0 mrem/year. There were no milking animals or dairy activity found within 5 kilometers of VCSNS. Therefore, changes to the ODCM gaseous effluent calculations or garden sample locations are not indicated.

MONITORING RESULTS AND DISCUSSION

The results of the Radiological Environmental Monitoring Program for 2010 are summarized in Table 8. For comparison, preoperational data are summarized in Table 9. The Radiological Environmental Program attained a program compliance rate of approximately 99.4%. A listing of program exceptions and their respective causes are included in Table 11. Analysis of the impact of these omissions verified that program quality has not been affected.

Corbicula harvest for possible human consumption was observed in Lake Monticello in 2005. Since that time Corbicula analysis has been incorporated in the Supplemental Sampling Program. Samples were collected and analyzed for gamma emitting isotopes. No measurable gamma emitting nuclides were detected above minimum detectable activity (MDA).

Gross beta activities measured in air particulate samples collected at indicator locations around VCSNS were consistent with preoperational levels and not statistically different from control locations. The highest site-specific mean activity (2.33E-2 pCi/m^3) was measured at indicator location Site 7 (Lab Garden 1.0 mi. E). The results indicate that the operation of VCSNS has not contributed to detectable increases of airborne gross beta activity in the environment.

Gamma spectroscopy measurements of composited air particulate samples and activated charcoal cartridges support the gross beta activity trend. Only natural background activities were detected. The highest MDA levels for ^{134}Cs, ^{137}Cs and ^{131}I were 1.71E-3, 1.93E-3 and 1.74E-2 pCi/m^3, respectively. The average maximum results support the gaseous effluent release data reported in the 2010 Annual Effluent and Waste Disposal Reports for VCSNS. No measurable iodine or particulate were released. 99.7% of the required indicator/control air samples were collected.

Environmental dosimetry measurements did not differ significantly from preoperational measurements. Indicator and control dosimetry measurements also showed no appreciable differences. Comparison with other operational years shows no statistically significant difference. Monitoring location Site 47 (Fairfield Tailrace 1.0 mi. NW), was the indicator location showing the highest mean exposure rate of 1.14E+1 μR/hr. This is similar to the 2009 value of 1.21E+1 μR/hr and consistent with the highest mean exposure rate of 1.40 E+1 μR/hr measured during the preoperational period. 100% of the required TLDs were collected.

Gamma spectroscopy measurements of surface water samples did not indicate the presence of activated corrosion or fission products above the respective MDA for indicator sites. Tritium analysis indicated the presence of tritium above MDA in one indicator sample. Site 21 (Parr Reservoir 2.7 mi. SSW) had a tritium concentration of 1.00E+3 pCi/l. All concentrations were well below the reporting limit. 100% of indicator/control surface water samples were collected.

Gamma spectroscopy measurements of the ODCM required ground water samples did not indicate the presence of activated corrosion or fission products above the respective MDAs. 96.3% of indicator/control ground water samples were collected.

Gamma spectroscopy measurements of drinking water samples collected from the Jenkinsville water supply and Site 17 (Columbia Water Works 25.0 mi. SE) did not indicate the presence of activated corrosion or fission product activity above the respective MDAs. The highest indicator and control site-specific gross beta activity was measured at Site 39 (Lake Murray Water Treatment Plant 14.0 mi. SSE) at a level of 2.92E+0 pCi/l. 100% of indicator/control drinking water samples were collected.

There were no milk samples collected in 2010. Milk sampling is required to be performed at the three highest dose locations within 5 kilometers of the plant or at 5 to 8 kilometers of the plant, if doses are calculated to be greater than 1 mrem per year. Presently there are no locations meeting this criteria for indicator dairies. The closest dairy is approximately 8 kilometers from the plant (see Table 4). Milk samples will be obtained from this dairy if gaseous releases from the plant exceed 5% of quarterly organ dose limits or radionuclides (attributed to the operation of VCSNS) are detected in broadleaf vegetation, grass or air samples at concentrations greater than required LLDs.

Gamma spectroscopy measurement of supplemental grass samples collected indicated ^{137}Cs in eleven of twelve samples at Site 2 (transmission line 1.1 mi. SW) at concentrations ranging from 2.27E+1 to 1.25E+2 pCi/kg. One of twelve samples taken at control Site 18 (Residence/Pine Island 16.5 mi. S) indicated ^{137}Cs at a concentration of 1.04E+1 pCi/kg. The maximum preoperational control activity was 3.4E+2 pCi/kg. A review of Site 2 air sample results indicated that no ^{137}Cs was detected. 100% of indicator/control supplemental grass samples were collected.

Gamma spectroscopy measurements of the broadleaf samples collected did not indicate the presence of activated corrosion or fission products above the respective MDA. All of the required indicator/control broadleaf samples were collected.

Gamma spectroscopy measurements of all non-leafy (other vegetation) supplemental samples collected did not indicate the presence of activated corrosion or fission products above the respective MDA.

Gamma spectroscopy measurements of the fish samples collected did not indicate the presence of activated corrosion or fission products above the respective MDAs for indicator sites. One of six control samples taken from Site 22 (Neal Shoals 26 mi. NNW) indicated ^{137}Cs at a concentration of 1.56E+1 pCi/kg. All of the required indicator/control fish samples were collected.

Gamma spectroscopy measurements of sediment samples indicated the detection of ^{137}Cs in two of four indicator samples. At Site 21 (Parr Res. 2.7 mi. SSW) ^{137}Cs at a concentration of 7.10E+1 pCi/kg was detected. At Site 23 (Lake Monticello Reservoir 0.5 mi. ESE), ^{137}Cs at a concentration of 9.06E+1 pCi/kg was detected. ^{137}Cs was detected in one of two control samples taken at Site 22 (Neal Shoals 26 mi. NNW) at a concentration of 9.76E+1 pCi/kg. All required indicator/control sediment samples were collected.

Table 2 - 2010 Fission and Activated Corrosion Product Activity in Sediment

Location	Radionuclide	Activity (pCi/kg)		Corresponding Calculated Annual Dose Equivalent (mrem/yr)	
				Total Body	
		Maximum	Mean	Maximum	Mean
Parr Reservoir	^{137}Cs	7.10E+1	7.10E+1	5.96E-3	5.96E-3
			Total	**5.96E-3**	**5.96E-3**

Location	Radionuclide	Activity (pCi/kg)		Corresponding Calculated Annual Dose Equivalent (mrem/yr)	
				Total Body	
		Maximum	Mean	Maximum	Mean
Monticello Reservoir	^{137}Cs	9.06E+1	9.06E+1	7.61E-3	7.61E-3
			Total	**7.61E-3**	**7.61E-3**

CONCLUSION

As in previous years of VCSNS operation, the presence of fission product activity attributed to residual fallout from atmospheric weapons testing and the Chernobyl accident were detected in environmental media including sediment, fish and grass.

No detectable fission or activation product activity attributed to VCSNS operations was observed in environmental media with the exception of:

- Tritium in one surface water sample at Site 21 (Parr Res. 2.7 mi. SSW), which was well below the EPA drinking water standard.

The dose from this activity represents a small fraction of VCSNS effluent dose limits. The absence of an impact was expected since historically, releases from VCSNS have been a small fraction of ODCM Specification limits.

The dose calculated for the maximum exposed individual will not result in observable effect on the ecosystem or general public. The results of the Radiological Environmental Monitoring Program, therefore, substantiate the continuing adequacy of source control at VCSNS and conformance of station operation to 10 CFR 50, Appendix I design objectives.

Table 3 - Required Sampling Site Locations

Site No.	Description	Distance[1] (Miles)	Direction[2]	Sample Type(s)[3]
1	Borrow Pit	1.2	179.8 S	DQ
2	Transmission Line	1.1	225.0 SW	AP, RI, DQ
3	Firing Range	1.2	270.0 W	DQ
4	Fairfield Hydro	1.2	289.5 WNW	DQ
5	Transmission Line Entrance	0.9	144.0 SE	DQ
6	Environmental Lab Garden	1.0	111.0 ESE	AP,RI,GA,DQ,GW
7	Environmental Lab Garden	1.0	97.8 E	AP,RI,DQ, GA
8	Monticello Res. S of Rd 224	1.5	62.0 ENE	DQ
9	Ball Park	2.3	41.6 NE	DQ
10	Meteorological Tower #2	2.5	25.5 NNE	DQ
12	Old Hwy 99	4.2	349.4N	DQ
13	North Dam	2.9	333.0 NNW	DQ
14	Dairy (Shealy)[4]	6.5	277.0 W	MK,GR
16	Dairy (Parr)[4]	20.0	275.5 W	MK,GR
16a	TLD Location	28.0	278.6W	DQ
17	Columbia Water Works	25.0	144.0 SE	AP,RI,DQ,DW
18	Residence/Pine Island Club[5]	16.5	165.0 S	DQ,GA
19	Residence/Little Saluda	21.0	224.0 SSW	DQ
20	Residence/Whitmire	22.0	309.5 NW	DQ
21	Parr Reservoir	2.7	199.5 SSW	SW,FH,BS
22	Neal Shoals	26.0	343.1 NNW	SW,FH,BS
23	Discharge Canal (Mont, Res.)	0.5	104.5 ESE	SW,FH,BS
26	On Site Well (P2)	460 Ft	270.0 W	GW
27	On Site Well (P5)	510 Ft	180.0 S	GW
28	New Nuclear Deployment[6]	2.6	170.2 SSE	DW
29	Trans. Line WSW of VCSNS	1.0	260.6 WSW	DQ
30	Oak Tree North of Borrow Pit[7]	1.0 / 0.5	196.2 SSW	DQ, AP, RI
31	McCrorey-Liston School	6.6	11.5 NNE	DQ
32	Clark Bridge Road and Brooks Drive	4.6	24.0 NNE	DQ
33	Rd 48 near Hwy 213	4.2	68.0 ENE	DQ
34	Rd 419 North of Hwy 60	4.9	111.0 ESE	DQ
35	Glenn's Bridge Road	4.6	132.0 SE	DQ
36	Woods at Jenkinsville Post Office	3.1	151.0 SSE	DQ
37	Residence	4.9	304.8 NW	DQ
39	Lake Murray Water Treatment Facility	14.0	168.0 SSE	DW

Table 3 (cont) – Required Sampling Site Locations

Site No.	Description	Distance[1] (Miles)	Direction[2]	Sample Type(s)[3]
41	Below Catwalk at Trestle	3.8	182.0 S	DQ
42	Broad River Rd (Peak Residence)	3.8	198.0 SSW	DQ
43	Hwy 176 and Rd 435	5.2	236.0 SW	DQ
44	Rd 28 at Cannon's Creek	2.8	256.6 WSW	DQ
45	Rd 33 at Pomaria	5.8	253.2 WSW	DQ
46	Rd 28 at Heller's Creek	3.7	291.5 WNW	DQ
47	Fairfield Tailrace	1.0	316.0 NW	DQ
52	Monticello (Rd 11)	3.8	13.0 NNE	DQ
53	Rd 359	3.0	46.5 NE	DQ
54	Jenkinsville School	1.7	72.5 ENE	DQ
55	St. Barnabas Church	2.8	91.5 E	DQ
56	Old Jenkinsville Dinner	2.0	144.0 SE	DQ
58	Residence	2.5	157.0 SSE	DQ
59	New Nuclear Deployment[6]	2.6	170.2 SSE	DQ, GW
60	Rd 98 near Rd 28	3.5	274.6 W	DQ
100	Remediation Well (B-1)	450 Ft	NW	GW
101	Remediation Well (B-2)	300 Ft	NNW	GW
102	Remediation Well (B-6)	400 Ft	NE	GW
103	Remediation Well (DW-13)	80 Ft	NE	GW
104	Remediation Well (B-9)	175 Ft	NE	GW
105	Remediation Well (DW-11)	100 Ft	ESE	GW
106	Remediation Well (DW-7)	250 Ft	SE	GW
107	Remediation Well (B-28)	400 Ft	SW	GW
108	Remediation Well (DW-19)	250 Ft	W	GW
109	Remediation Well (B-35)	450 Ft	NW	GW
110	Remediation Well (B-36)	300 Ft	NW	GW
111	NPDES Well (GW-8)	0.27	320 SE	GW
112	NPDES Well (GW-9)	0.36	331 SSE	GW
113	NPDES Well (GW-12)	0.33	332 SSE	GW
114	NPDES Well (GW-13A)	0.39	317 SE	GW
115	NPDES Well (GW-15)	0.39	330 SSE	GW

Table 3 (cont) – Required Sampling Site Locations

Footnotes

1. Distance given is the distance between the site location and the VCSNS reactor containment building.

2. Direction given in degrees from true north-south line through center of reactor containment building.

3. Sample Types:

AP = Air Particulate	GW = Ground Water	GA = Garden
RI = Air Radioiodine	DW = Drinking Water	FH = Fish
DQ = Quarterly TLD	MK = Milk	BS = Bottom Sediment
SW = Surface Water	GR = Grass (Forage)	

4. Sites 14 and 16 are not presently in use. If conditions change, requiring a renewal of dairy sampling these sites will be reactivated.

5. Site 18 consists of two locations in close proximity to Lake Murray. Garden product samples are taken at the Wyse residence. The TLD is located on Pine Island.

6. Site 28 for drinking water and Site 59 for quarterly TLD measurements are co-located at the location of the SCE&G New Nuclear Deployment.

7. Site 30 consists of two locations in the same sector. The air sampler is located 0.5 miles from the reactor to support construction of a new facility. The TLD is located at the site boundary in the same sector.

Table 4 - Results of the 2010 Land Use Census Verification

Sector	Nearest Residence	Miles	Nearest Garden	Miles	Nearest Cattle	No. Milked	Miles	Nearest Goat	No. Milked	Miles
N	P. Oliver	3.73	Edna Fuller	4.01	John Robinson	0	3.4			
NNE	Thomas K. Crumblin	2.9		3.21	Wi/Charles Coleman	0	4.97			
NE	Gregrey Guinyard Jr.	1.55	Edna Richards	3.21						
ENE	Robert Martin	1.53	Essie Mae Glenn	1.68				Robert Martin	0	1.53
E	Lynn Mincy	1.2	Lynn Mincy	1.2						
ESE	Carrie Lee Martin	1.1	James Pearson	1.36						
SE	Mary White	1.44	Mary White	1.44	Sim Roberts (A)	0	4.7			
SSE	Ronnie Mann	2.39	Ronnie Mann	2.39						
S	Kelly Boulware	3.56	Kelly Boulware	3.56	Shirley Counts	0	5			
SSW	Nick Bates	3.11	Nora Wicker	3.77	Joe Smith (A)	0	4.73			
SW	Marvin Miller	3.3	Marvin Miller	3.3						
WSW	Ron Hope	2.9	Steve All	4.83	Ken/Virg Graham	*	4.98	Steve All	10	4.83
W	Jerry Cassado	2.55	Marion Livingston	2.8	Marion Livingston	0	2			
W					Ken/Virg Graham	90	5			
WNW	Unknown Residence	2.53	Ronnie Leitzey	4.72	Ronnie Leitzey	1	4.15	Ronnie Leitzey	15	4.15
NW	Louise Workman	3.9								
NNW	Frank March	2.9	Frank March	2.9	Frank March	0	2.9			

(A) Change In Closest Beef Cattle
(*) Keneth and Virgil Graham cows grazed in the W and WSW

Table 5 Critical Receptor Evaluation for 2010

NAME	SECTOR	MILES	PATHWAY	X/Q	D/Q	DOSE* mRem/y
John Robinson	N	3.4	B	2.70E-07	7.80E-10	7.81E-02
P. Oliver	N	3.73	Res	2.30E-07	6.30E-10	8.56E-03
Edna Fuller	N	4.01	Res,Gar	2.00E-07	5.40E-10	1.50E-01
Thomas K. Crumblin	NNE	2.9	Res	4.40E-07	1.40E-09	1.65E-02
Will/Charles Coleman	NNE	4.97	B	1.60E-07	4.10E-10	4.12E-02
Gregrey Guinyard Jr.	NE	1.55	Res	1.90E-06	6.10E-09	7.12E-02
Edna Richards	NE	3.21	Res,Gar	4.10E-07	1.10E-09	3.06E-01
Robert Martin	ENE	1.53	Res,G	2.10E-06	6.10E-09	1.52E-01
Essie Mae Glenn	ENE	1.68	Res,Gar	1.70E-06	4.80E-09	1.33E+00
**** Garden-7**	E	1	Res,Gar	5.20E-06	1.80E-08	4.85E+00
[1] Lynn Mincy	E	1.2	Res,Gar	3.30E-06	1.10E-08	2.98E+00
**** Garden-6**	ESE	1	Res,Gar	3.70E-06	1.30E-08	3.50E+00
Carrie Lee Martin	ESE	1.1	Res	2.90E-06	1.00E-08	1.09E-01
James Pearson	ESE	1.36	Res,Gar	1.80E-06	6.10E-09	1.65E+00
Mary White	SE	1.44	Res,Gar	9.00E-07	4.20E-09	1.10E+00
Sim Roberts	SE	4.7	Res,Gar,B	7.70E-08	2.60E-10	9.63E-02
Ronnie Mann	SSE	2.39	Res,Gar	1.80E-07	1.00E-09	2.58E-01
Kelly Boulware	S	3.56	Res,Gar	8.70E-08	5.30E-10	1.36E-01
Shirley Counts	S	5	Res,Gar,B	4.40E-08	2.50E-10	8.94E-02
NND Construction Site	SSW	0.49	Res	6.10E-06	5.10E-08	2.44E-01
Nick Bates	SSW	3.11	Res	1.00E-07	7.60E-10	3.97E-03
Nora Wicker	SSW	3.77	Res,Gar	7.00E-08	4.90E-10	1.25E-01
Joe Smith	SSW	4.73	Res,B	4.40E-08	3.00E-10	3.15E-02
Marvin Miller	SW	3.3	Res,Gar	8.50E-08	6.60E-10	1.67E-01
Ron Hope	WSW	2.9	Res	9.20E-08	6.40E-10	3.62E-03
Steve All	WSW	4.83	Res,G	3.20E-08	2.00E-10	5.37E-02
Ken/Virg Graham	WSW	4.98	B	3.00E-08	1.90E-10	1.89E-02
Jerry Cassado	W	2.55	Res	9.50E-08	5.60E-10	3.69E-03
Marion Livingston	W	2	B	1.60E-07	1.00E-09	9.98E-02
Marion Livingston	W	2.8	Res,Gar	7.80E-08	4.50E-10	1.16E-01
Marion Livingston	W	2 & 2.8	Res,Gar,B	BOTH	BOTH	2.16E-01
Ken/Virg Graham	W	5	Res,Gar,B,C/M	2.40E-08	1.20E-10	6.47E-02
Unknown Resident	WNW	2.53	Res	7.50E-08	3.60E-10	2.87E-03
Ronnie Leitzsey	WNW	4.15	C/M,B,G/M,G	2.70E-08	1.20E-10	1.41E-01
Ronnie Leitzsey	WNW	4.72	Res,Gar	2.10E-08	8.70E-11	2.30E-02
Ronnie Leitzsey	WNW		Res,Gar,C/M,B,G/M,G	BOTH	BOTH	1.42E-01
Louise Workman	NW	3.9	Res	7.50E-08	2.70E-10	2.82E-03
Frank March	NNW	2.9	Res,Gar,B	2.70E-07	8.20E-10	3.07E-01
ODCM ORGAN DOSE	E	1.1	Res,Gar	4.10E-06	1.40E-08	3.78E+00

Pathway

Res = Residence B = Beef G = Goat

Gar = Garden C/M = Cow/Milk(Infant) G/M = Goat/Milk(Infant)

Footnotes:

[1] Maximum exposed individual.

* Hypothetical dose based on Operating License Environmental Report Source Term.

** ODCM required environmental gardens.

Table 6 – Radiological Environmental Monitoring Program Specifications

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
AIRBORNE: I. Particulate	A) 3 Indicator samples to be taken at locations (in different sectors) beyond but as close to the exclusion boundary as practicable where the highest offsite sector ground level concentrations are anticipated.[2]	Continuous sampler operation with weekly collection.	2 7 30	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	B) 1 Indicator sample to be taken in the sector beyond but as close to the exclusion boundary as practicable corresponding to the residence having the highest anticipated offsite ground level concentration or dose.[2]	Continuous sampler operation with weekly collection.	6	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	C) 1 Indicator sample to be taken at the location of one of the dairies being sampled meeting the criteria of VII(A).[2,4]	Continuous sampler operation with weekly collection.	N/A	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	D) 1 Control sample to be taken at a location at least 10 air miles from the site and not in the most prevalent wind directions.[2]	Continuous sampler operation with weekly collection.	17	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
II. Radioiodine	A) 3 Indicator samples to be taken at two locations as given in I(A) above.	Continuous sampler operation with weekly canister collection.	2 7 30	Gamma Isotopic for Iodine 131 weekly.
	B) 1 Indicator sample to be taken at the location as given in I(B) above.	Continuous sampler operation with weekly canister collection.	6	Gamma Isotopic for Iodine 131 weekly.
	C) 1 Indicator sample to be taken at the location as given in I(C) above.	Continuous sampler operation with weekly canister collection.	N/A	Gamma Isotopic for Iodine 131 weekly.
	D) 1 Control sample to be taken at a location similar in nature to I(D) above.	Continuous sampler operation with weekly canister collection.	17	Gamma Isotopic for Iodine 131 weekly.

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
III. Direct	A) 13 Indicator stations to form and inner ring of stations in the 13 accessible sectors within 1 to 2 miles of the plant.	Monthly or quarterly exchange[5,7] two or more dosimeters at each location.	1,2,3,4,5,6, 7,8,9,10,29, 30,47	Gamma dose monthly or quarterly.
	B) 16 indicator stations to form an outer ring of stations in the 16 accessible sectors within 3 to 5 miles of the plant.	Monthly or quarterly exchange[5,7] two or more dosimeters at each location.	12,13,32,33, 34,35,36,37, 41,42,43,44, 46,53,55,60	Gamma dose monthly or quarterly.
	C) 11 Stations to be placed in special interest areas such as population centers, nearby residences, schools and in 4 or 5 areas to serve as controls.	Quarterly exchange[7]; two or more dosimeters at each location.	16,17,18,19, 20,31,45,52, 54,56,58	Gamma dose quarterly.
WATERBORNE IV. Surface Water	A) 1 Indicator sample downstream to be taken at a location which allows for mixing a dilution in the ultimate receiving river.	Time composite samples[6] with collection every month.[5]	21[3]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium.[7]
	B) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated.	Time composite samples[6] with collection every month.[5]	22[3]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium.[7]
	C) 1 Indicator sample to be taken in the upper reservoir of the pumped storage facility at the plant discharge canal.	Time composite samples[6] with collection every month.[5]	23[3]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium.[7]
V. Ground Water	A) 19 Indicator samples to be taken within the exclusion boundary and in the direction of potentially affected ground water supplies.	Quarterly grab sampling.[7]	6, 26, 27, 100-115	Gamma isotopic and tritium analyses quarterly.[7]
	B) 1 Control sample from unaffected location.	Quarterly grab sampling.[7]	59	Gamma isotopic and tritium analyses quarterly.[7]

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
VI. Drinking Water	A) 1 Indicator sample from a nearby public ground water supply source.	Monthly grab sampling.[5]	28	Monthly[5] gamma isotopic and gross beta analyses and quarterly[7] composite for tritium analyses.
	B) 1 Indicator (finished water) sample from the nearest downstream water supply.	Monthly composite sampling.	17	Monthly[5] gamma isotopic and gross beta analyses and quarterly[7] composite for tritium analyses.
	C) 1 Control (finished water) sample from an unaffected water supply.	Monthly composite sampling.	39	Monthly[5] gamma isotopic and gross beta analyses and quarterly[7] composite for tritium analyses.
INGESTION: VII. Milk[4]	A) Samples from milking animals in 3 locations within 5 km having the highest dose potential. If there are none then 1 sample from milking animals in each of 3 areas between 5 to 8 km distance where doses are calculated to be greater than 1 mrem per year.[10]	Semimonthly when animals are on pasture[8], monthly other times.[5]	To be supplied when milk animals are found in accordance with criteria VII.A.	Gamma isotopic and I-131 analysis semimonthly[8] when animals are on pasture, monthly other times.[5]
	B) 1 Control sample to be taken at the location of a dairy > 20 miles distance and not in the most prevalent wind direction.[2]	Semimonthly when animals are on pasture[8], monthly other times.[5,11]	16	Gamma isotopic and I-131 analysis semimonthly[8] when animals are on pasture, monthly other times.[5]
	C) 1 Indicator grass (forage) sample to be taken at the location of one of the dairies being sampled meeting the criteria of VII(A),above, when animals are on pasture.	Monthly when available.[5]	To be supplied when milk animals are found in accordance with criteria VII.A.	Gamma isotopic.
	D) 1 Control grass (forage) sample to be taken at the location of VII(B) above.	Monthly when available.[5,11]	16	Gamma isotopic.

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
VIII. Food Products	A) 2 Indicator samples of broadleaf vegetation grown in the 2 nearest offsite location of highest calculated annual average ground level D/Q if milk sampling is not performed within 3 km or if milk sampling is not performed at a location within 5-8 km where the doses are calculated to be greater than 1 mrem/yr.[10]	Monthly when available.[5]	6 7	Gamma isotopic on edible portion.
	B) 1 Control sample for the same foods taken at least 10 miles distance and not in the most prevalent wind direction if milk sampling is not performed within 3 km or if milk sampling is not performed at a location within 5 to 8 km where the doses are calculated to be greater than 1 mrem/yr.[10]	Monthly when available.[5]	18	Gamma isotopic on edible portion.
IX. Fish	A) 1 Indicator sample to be taken at a location in the upper reservoir.	Semiannual[9] collection.[1]	23[3]	Gamma isotopic on edible portions semiannually.[9]
	B) 1 Indicator sample to be taken at a location in the lower reservoir.	Semiannual[9] collection.[1]	21[3]	Gamma isotopic on edible portions semiannually.[9]
	C) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated.	Semiannual[9] collection.[1]	22[3]	Gamma isotopic on edible portions semiannually.[9]
AQUATIC: X. Sediment	A) 1 Indicator sample to be taken at a location in the upper reservoir.	Semiannual grab sample.[9]	23[3]	Gamma isotopic.
	B) 1 Indicator sample to be taken on or near the shoreline of the lower reservoir.	Semiannual grab sample.[9]	21[3]	Gamma isotopic.
	C) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated.	Semiannual grab sample.[9]	22[3]	Gamma isotopic.

Table 6 (cont) - Radiological Environmental Monitoring Program Specifications

FOOTNOTES

1. Fish include 3 groups (Bass, Bream/Crappie, Catfish/Carp.)

2. Sample site locations are based on 5-year average meteorological analysis.

3. Though generalized areas are noted for simplicity of sample site enumeration, airborne, water and sediment sampling is done at the same location, whereas biological sampling sites are generalized areas in order to reasonably assure availability of samples.

4. Milking animal and garden survey results will be analyzed annually. If the survey should indicate new activity the owners shall be contacted with regard to a contract for supplying sufficient samples. If contractual arrangements can be made, site(s) will be added for additional milk sampling up to a total of three Indicator locations.

5. Not to exceed 35 days.

6. Time composite samples are samples which are collected with equipment capable of collecting an aliquot at time intervals which are short relative to the compositing period.

7. At least once per 100 days.

8. At least once per 18 days.

9. At least once per 200 days.

10. The dose shall be calculated for the maximum organ and age group, using the guidance/methodology contained in Regulatory Guide 1.109, Rev. 1 and the parameters particular to the site.

11. Milk and forage sampling at the control location is only required when locations meeting the criteria of VII(A) are being sampled.

Table 7 – Supplemental Radiological Environmental Monitoring

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
AIRBORNE: S-I. Particulate	A) 1 Indicator sample monitoring the nearest community with the highest anticipated dose or ground level concentration.	Continuous sampler operation with weekly collection.	8	Gross beta following filter change; Monthly Composite (by location) for gamma isotopic.
S-II. Radioiodine	A) 1 Indicator sample to be taken from the location of S-1(A) above.	Continuous sampler operation with weekly collection.	8	Gamma isotopic for I-131 weekly.
S-III. Direct	A) 5 stations to be placed within the exclusion boundary.	Quarterly exchange[7]; two or more dosimeters at each location.	61,62,63, 68 & 99	Gamma dose quarterly.
	B) 2 stations to be placed around VCSNS sludge lagoons.	Quarterly exchange[7]; two or more dosimeters at each location.	94,97	Gamma dose quarterly.
WATERBORNE: S-IV. Surface Water	A) 1 indicator sample to be taken of the combined wastewater discharge.	Composite samples with monthly collection.[13,5]	77	Gamma isotopic and tritium.
	B) 1 Indicator sample taken at each storm drain outfall.	Daily sample with monthly composite.	72,73	Gamma isotopic and tritium.
S-VI. Drinking Water	A) 1 Indicator (finished water) sample to be taken on site.	Quarterly.	99	Quarterly gamma isotopic, gross beta and tritium analysis.†
	B) 1 Indicator (finished water) sample of public system.	Quarterly.	31	Quarterly gamma isotopic, gross beta and tritium analysis.†

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
INGESTION: S-VII. Milk[4]	A) 1 Sample from one of the nearest affected dairies at or beyond 5 miles.	Biweekly grab sample.[8,14,+]	14	Gamma isotopic and I-131 analysis biweekly.
	B) 1 Control sample to be taken at the location of a dairy greater than 20 miles distance and not in the most prevalent wind direction.	Biweekly grab sample.[8,14,+]	16	Gamma isotopic and I-131 analysis biweekly.
	C) 1 Indicator grass (forage) sample to be taken at the location of S-VII(A) above.	Monthly when available.[14]	14	Gamma isotopic.
S-VII. Milk[4]	D) 1 Control grass (forage) sample to be taken at the location of S-VII(B) above.	Monthly when available.[14]	16	Gamma isotopic.
	E) 2 Indicator grass (forage) samples to be taken at 2 of the locations beyond but as close to the exclusion boundary as practical where the highest offsite sectorial ground level concentrations are anticipated.	Monthly when available.	2,7	Gamma isotopic.
	F) 1 Control grass (forage) sample to be used for routine monitoring along with S-VII(E) above.	Monthly when available.	18	Gamma isotopic.
S-VIII. Food Products	A) 1 Indicator sample of various types of foods grown in the area surrounding the plant (root, fruit, grain).	Annually during growing season.[11]	6,7	Gamma isotopic on edible portion.
	B) 1 Control sample of various types of foods grown in the Pine Island residence (root, fruit, grain).	Annually during growing season.[11]	18	Gamma isotopic on edible portion.
Corbicula	C) 1 Indicator sample of edible portions.	Semiannual.	23	Gamma isotopic.

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
S-IX. Sediment/ Sludge	A) 1 Indicator sample from each storm drain outfall.	Semiannually.	72,73	Gamma isotopic.
	B) 3 Indicator sludge samples taken at sludge lagoons.	Semiannually. (Reference 2.6)	006A, 006B & 008	Gamma isotopic.
SOIL: S-X. Topsoil	A) 1 Indicator sample to be taken at the waste oil incinerator.	Annual grab sample.[11]	98	Gamma isotopic.

Table 7 (cont) – Supplemental Radiological Environmental Monitoring

FOOTNOTES

1. Reserved for future use.

2. Reserved for future use.

3. Reserved for future use.

4. Milking animal and garden survey results will be analyzed annually. If the survey should indicate new activity the owners shall be contacted with regard to a contract for supplying sufficient samples. If contractual arrangements can be made, site(s) will be added for additional milk sampling up to a total of 3 Indicator locations.

5. Not to exceed 35 days.

6. Reserved for future use.

7. At least once per 100 days.

8. At least once per 18 days.

9. At least once per 200 days.

10. Reserved for future use.

11. At least once per 400 days.

12. Reserved for future use.

13. Weekly, when circulating water is not operational.

14. Milk and grass (forage) sampling is not required unless VCSNS gaseous releases exceed 5% of quarterly organ dose limits or radionuclides (attributed to VCSNS operation) are detected in broadleaf vegetation, grass or air samples at concentrations greater than required LLD. Sampling should continue for two months after plant releases are reduced to less than trigger levels and milk contamination levels have returned to background levels.

+ The ODCM requires semimonthly sampling when animals are on pasture, monthly at other times.

Table 8 – Radiological Environmental Monitoring Program Summary for 2010

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Air Particulate (pCi/m^3)	Gross Beta (311)	7.34E-3 (1.0E-2)	2.19E-2 (258/259) (7.84E-3 to 4.51E-2)	Site 7, Environmental Lab Garden, (1.0 mi. E)	2.33E-2 (52/52) (8.62E-3 to 4.51E-2)	2.06E-2 (52/52) (6.87E-3 to 4.33E-2)	0
	Gamma Spec (72)						
	^{134}Cs	1.71E-3 (5.0E-2)	All < LLD			All < LLD	0
	^{137}Cs	1.93E-3 (6.0E-2)	All < LLD			All < LLD	0
Air Radioiodine (pCi/m^3)	^{131}I (311)	1.74E-2 (7.0E-2)	All < LLD			All < LLD	0
Direct (TLD)[5] ($\mu R/hr$)	Gamma(136) Quarterly	N/A	8.45E+0 (116/116) (5.65E+0 to 1.16E+1)	Site 47, Fairfield Tailrace,(1.0 mi. NW)	1.14E+1 (4/4) (1.12E+1 to 1.15E+1)	8.26E+0 (20/20) (5.56+0 to 1.05E+1)	0
	Gamma(24) Special Interest	N/A	8.99E+0 (24/24) (5.39E+0 to 1.22E+1)	Site 52, Monticello Rt. 11, (3.8 mi. NNE)	1.18E+1 (4/4) (1.16E+1 to 1.22E+1)	N/A	0
Surface Water (pCi/l)	^{3}H (36)	5.29+2 (2.0E+3)	1.00E+3 (1/24) 1.00E+3 to 1.00E+3	Site 21, Parr Res., (2.7 mi. SSW)	1.00E+3 (1/12) 1.00E+3 to 1.00E+3	All < LLD	0
	Gamma Spec(36)						
	^{54}Mn	2.22E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	2.49E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	6.41E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	2.47E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	5.40E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	4.21E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Nb	3.10E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	2.02E+0 (1.5E+1)	All < LLD			All < LLD	0

Table 8 (cont.) - Radiological Environmental Monitoring Program Summary for 2010

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Surface Water (Continued)	^{137}Cs	2.33E+0 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	1.51E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La	6.14E+0 (1.5E+1)	All < LLD			All < LLD	0
Ground Water (pCi/l)	^{3}H (77)	5.16E+2 2.00E+3	All < LLD			All < LLD	0
	Gamma Spec (74)						
	^{54}Mn	6.73E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	6.47E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	1.26E+1 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	7.02E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	1.42E+1 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	1.09E+1 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Nb	9.61E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	6.30E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{137}Cs	6.42E+0 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	2.55E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La	9.31E+0 (1.5E+1)	All < LLD			All < LLD	0

Table 8 (Cont.) - Radiological Environmental Monitoring Program Summary for 2010

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Drinking Water[6] (pCi/l)	Gross Beta (36)	1.39E+0 (4.00E+0)	1.88E+0 (17/24) (1.42E+0 to 2.55E+0)	Site 28, NTC, (2.6 mi, SSE)	2.08E+0 (8/12) (1.50E+0 to 2.55E+0)	2.11E+0 (12/12) (1.47E+0 to 2.92E+0)	0
	^{3}H (36)	5.13E+2 (2.0E+3)	All < LLD			All < LLD	0
	Gamma Spec (72)[10]						
	^{54}Mn	2.11E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{58}Co	2.03E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{59}Fe	4.41E+ 0 (3.0E+ 1)	All < LLD			All < LLD	0
	^{60}Co	2.40E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{65}Zn	4.35E+0 (3.0E+ 1)	All < LLD			All < LLD	0
	^{95}Zr	3.51E+ 0 (3.0E+ 1)	All < LLD			All < LLD	0
	^{95}Nb	2.50E+ 0 (1.5E + 1)	All < LLD			All < LLD	0
	^{131}I	8.39E-1 (1.0E+ 0)	All < LLD			All < LLD	0
	^{134}Cs	1.76E+ 0 (1.5E + 1)	All < LLD			All < LLD	0
	^{137}Cs	2.09E+ 0 (1.8E + 1)	All < LLD			All < LLD	0
	^{140}Ba	1.37E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{140}La	4.48E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0

Table 8 (Cont.) - Radiological Environmental Monitoring Program Summary for 2010

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Broadleaf Vegetation (pCi/kg wet)	Gamma Spec (36)						
	^{131}I	1.99E+1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{134}Cs	1.96E+1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{137}Cs	2.23E+1 (8.0E+ 1)	All < LLD			All < LLD	0
Fish[7] (pCi/kg wet)	Gamma Spec (18)						
	^{54}Mn	2.33E+1 (1.3E+ 2)	All < LLD			All < LLD	0
	^{58}Co	3.37E+1 (1.3E+ 2)	All < LLD			All < LLD	0
	^{59}Fe	1.07E+2 (2.6E+ 2)	All < LLD			All < LLD	0
	^{60}Co	2.49E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{65}Zn	5.01E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{134}Cs	1.73E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{137}Cs	2.12E+1 (1.5E+2)	All < LLD			1.56E+1 (1/6) (1.56E+1 to 1.56E+1)	0

Table 8 (Cont.) - Radiological Environmental Monitoring Program Summary for 2010

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Sediment (pCi/kg)[8]	Gamma Spec (6)						
	^{54}Mn	1.70E+1 N/A	All < LLD			All < LLD	0
	^{58}Co	1.76E+1 N/A	All < LLD			All < LLD	0
	^{60}Co	2.18E+1 N/A	All < LLD			All < LLD	0
	^{134}Cs	1.68E+1 (1.5E+2)	All < LLD			All < LLD	0
	^{137}Cs	9.03E+0 (1.8E+2)	8.08E+1 (2/4) (7.10E+1 to 9.06E+1)	Site 23, Monticello Reservoir, (0.5 mi. ESE)	9.06E+1 (1/2) (9.06E+1 to 9.06E+1)	9.76E+1 (1/2) (9.76E+1 to 9.76E+1)	0

Table 8 (cont) - Radiological Environmental Monitoring Program Summary for 2010

Footnotes

1. Includes indicator and control analyses. Site 8, Air Particulates and Air Radioiodines are included as indicators. Does not include other supplemental samples.

2. Values given are maximum MDA values for indicator locations calculated from the program data analyses. The maximum acceptable LLD values allowed from NRC guidelines are given in parentheses.

3. Mean and range are based on detectable measurements only. The fractions of detectable measurements (i.e., number of positive results/total number of measurements) at specific locations are indicated in parentheses.

4. Any confirmed measured level of radioactivity in any environmental medium that exceeds the reporting requirements of ODCM, Section 1.4.1.2.

5. Detection sensitivity is approximately 10 mrem/yr (1.0 μR/hr).

6. Elevated levels of ^{214}Pb and ^{214}Bi were observed in Jenkinsville drinking water samples. The values are not reported here because they are naturally occurring (do not originate from VCSNS) and furnish no quantifiable information of interest.

7. Fish include 3 groups (Bass, Bream/Crappie, Catfish/Carp.)

8. Elevated levels of ^{214}Pb and ^{214}Bi plus other ^{226}Ra daughter products and ^{228}Ac plus other ^{232}Th daughter products were observed in all sediment samples. The values are not reported here because they are naturally occurring (do not originate from VCSNS) and furnish no quantifiable information of interest.

9. Reserved for future use.

10. Drinking water resin prepared and counted for ^{131}I as separate sample.

11. Reserved for future use.

Table 9– Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measurements
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
Air Particulate (pCi/m^3) (1981-1982)	Gross Beta (1300)	4.1E-3 (1.0E-2)	1.1E-1 (562/564)[4] (1.3E-2 to 5.5E-1) 2.7E-2 (456/462)[4] (9.3E-3 to 6.6E-2)	Site 13, North Dam, (2.9 mi NNW) Site 8, Mon. Res. S of Rd 224, (1.5 ENE)	1.3E-1 (52/52) (2.1E-2 to 5.5E-1) 3.0E-2 (42/42) (1.2E-2 to 6.0E-2)	1.2E-1 (153/155) (7.9E-3 to 6.1E-1) 2.8E-2 (125/126) (1.2E-2 to 5.8E-2)	0
	Gamma Spec (307)						
	^{134}Cs	3.0E-3 (1.0E-2)	All < LLD			All < LLD	0
	^{137}Cs	3.1E-3 (1.0E-2)	3.2E-3 (22/241) (1.5E-3 to 5.2E-3)	Site 10, Met Tower, (2.4 mi NNE)	3.8E-3 (2/22) (2.5E-3 to 5.2E-3)	4.2E-3 (4/66) (3.2E-3 to 5.6E-3)	0
Air Radioiodine (pCi/m^3) (1982)	^{131}I (290)	3.6E-2 (7.0E-2)	All < LLD			All < LLD	0
Direct (TLD)[5] ($\mu R/hr$) (1978-1982)	Gamma (1220) Monthly	0.5 N/A	9.9 (915/915) (6.7 to 14.7)	Site 13, North Dam, (2.9 mi NNW)	13.1 (61/61) (12.2 to 14.2)	9.7 (305/305) (6.4 to 13.5)	0
	Gamma (161) Quarterly	0.5 N/A	10.2 (154/154) (6.8 to 14.7)	Site 55, St. Barnabas Church, (2.8 mi E)	14.0(7/7) (13.1 to 14.7)		0
Surface Water (pCi/l) (1981-1982)	^{3}H (43)	1.1E+3 (2.0E+3)	1.4E+3 (18/29) (1.1E+3 to 2.4E+3)	Site 17, Columbia Canal, (24.7 mi, SE)	1.6E+3 (2/7) (1.4E+3 to1.8E+3)	1.2E+3 (6/14) (6.7E+2 to 1.6E+3)	0
	Gamma Spec (140)						
	^{54}Mn	2.7E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	2.9E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	6.0E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	2.4E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	7.9E-1 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	5.2E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{95}Nb	3.3E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	3.0E-1 (1.5E+1)	All < LLD			All < LLD	0

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measurements
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
	^{137}Cs	2.2E-1 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	2.2E+0 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La (1982 only)	5.5E-1 (1.5E+1)	All < LLD			All < LLD	0
Ground Water (pCi/l) (1981-1982)	^{3}H (29)	9.0E+2 (2.0E+3)	1.5E+3 (16/16) (9.5E+2 to 2.3E+3)	Site 26, Onsite Well P4, (265 ft, W)	1.6E+3 (8/8) (9.5E+2 to 2.3E+3)	1.3E+3 (13/13) (1.0E+3 to 1.9E+3)	0
	Gamma Spec (32)						
	^{54}Mn	3.7E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	3.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	7.8E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	3.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	8.1E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	6.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{95}Nb	4.6E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	3.7E+0 (1.5E + 1)	All < LLD			All < LLD	0
	^{137}Cs	3.8E+0 (1.8E + 1)	All < LLD			All < LLD	0
	^{140}Ba	1.9E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La (1982 only)	5.0E0 (1.5E+1)	All < LLD			All < LLD	0
Drinking Water[6] (pCi/l) (1981-1982)	Gross Beta[7]	(2.0E+0)					
	^{3}H (14)	6.3E+2 (1.0E+3)	7.8E+2 (6/14) (6.8E+2 to 9.8E+2)	Site 28, Jenkinsville, (2.0 mi SE)[7]	8.4E+2 (3/7) (7.0E+2 to 9.8E+2)		0
	Gamma Spec (44)						
	^{54}Mn	3.0E-1 (1.5E+1)	All < LLD				0
	^{58}Co	2.7E-1 (1.5E+1)	All < LLD				0

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measurements
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
	^{59}Fe	9.6E0 (3.0E+1)	All < LLD				0
	^{60}Co	2.6E-1 (1.5E+1)	All < LLD				0
	^{65}Zn	3.4E-1 (3.0E+1)	All < LLD				0
	^{95}Zr	4.8E-1 (1.5E+1)	All < LLD				0
	^{131}I	3.4E-1 (1.5E+1)	All < LLD				0
	^{95}Nb	7.4E-1 (1.0E+0)	All < LLD				0
	^{134}Cs	2.2E-1 (1.0E+1)	All < LLD				0
	^{137}Cs	2.4E-1 (1.8E+1)	All < LLD				0
	^{140}Ba	2.5E0 (6.0E+1)	All < LLD				0
	^{140}La (1982 only)	4.4E-1 (1.5E+1)	All < LLD				0
Milk (pCi/l) (1981-1982)	Gamma Spec (94)						
	^{131}I	6.3E-1 (1.0E+0)	All < LLD			All < LLD	0
	^{134}Cs	3.3E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{137}Cs	4.6E0 (1.5E+1)	4.1E+0 (8/47) (2.8E+0 to 6.1E+0)	Site 14, Dairy, (5.1 mi., W)	4.1E+0 (8/47) (2.8E+0 to 6.1E+0)	5.7E+0 (37/47) (3.7E+0 to 9.2E+0)	0
	^{140}Ba	1.1E+1 (1.5E + 1)	All < LLD			All < LLD	0
	^{140}La	4.4E+0 (1.5E+1)	All < LLD			All < LLD	0
Grass (pCi/kg wet) (1981-1982)	Gamma Spec (82)						
	^{131}I	6.7E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{134}Cs	2.7E+1 (8.0E+1)	All < LLD			All < LLD	0
	^{137}Cs	3.3E+1 (8.0E+1)	5.0E+1 (13/51) (1.6E+1 to 1.6E+2)	Site 14, Dairy, (5.1 mi W)	5.9E+1 (5/29) (1.6E+1 to 1.6E+2)	1.3E+2 (6/31) (1.3E+1 to 3.4E+2)	0

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measurements
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
Broadleaf Vegetation (pCi/kg wet) (1980-1982)	Gamma Spec (10)						
	^{131}I	3.7E+1 (6.0E+1)	All < LLD				0
	^{134}Cs	1.9E+1 (8.0E+1)	All < LLD				0
	^{137}Cs	2.1E+1 (8.0E+1)	3.1E+1 (2/7) (1.8E+1 to 3.6E+1)	Site 2, Trans. Line, (1.2 mi SW)	3.6E+1 (1/1) (Single Value)	All < LLD	0
Other Vegetation (pCi/kg wet) (1980-1982)	Gamma Spec (32)						
	^{134}Cs	8.4E+0 (8.0E+1)	All < LLD			All < LLD	0
	^{137}Cs	1.0E+1 (8.0E+1)	All < LLD			All < LLD	0
Fish (pCi/kg wet) (1980 - 1982)	Gamma Spec (92)						
	^{134}Cs	1.4E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{137}Cs	1.8E+1 (1.3E+2)	2.8E+1 (50/71) (1.1E+1 to 1.0E+2)	Site 24, Recreation Lake, (5.5 mi, N)	3.4E+1 (17/23) 1.2E+1 to 1.0E+2)	3.1E+1 (19/21) (1.0E+1 to 7.9E+1)	0
	^{58}Co	2.6E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{54}Mn	1.8E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{59}Fe	9.0E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{65}Zn	4.1E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{60}Co	1.8E+1 (1.3E+2)	All < LLD			All < LLD	0
Sediment (pCi/kg) (1980-1982)	Gamma Spec (24)						
	^{134}Cs	2.3E+1 (1.5E+2)	All < LLD			All < LLD	0
	^{137}Cs	2.4E+1 (1.5E+2)	1.7E+2 (12/18) (2.6E+1 to 4.5E+2)	Site 21, Parr Reservoir, (2.7 mi, SSW)	2.6E+2 (6/6) (2.6E+1 to 4.5E+2)	4.2E+2 (6/6) (1.8E+1 to 1.0E+3)	0

Table 9 (Cont.)- Radiological Environmental Program Preoperational (Baseline) Summary

Footnotes

1. Values given are MDA values calculated from the program data analyses with maximum acceptable LLD values allowed from NRC guidelines given in parentheses.

2. Mean and range are based on detectable measurements only. The fractions of detectable measurements at specific locations are indicated in parentheses.

3. A non-routine measurement is any confirmed measured level of radioactivity in an environmental medium that exceeds the reporting requirements of VCSNS ODCM, Section 1.4.1.2.

4. The baseline values are high because of the fallout from the Chinese bomb test in 1980. The first set of data reflects the 1981 baseline. The second set of data reflects the 1982 baseline, essentially free of bomb test fallout. The 1982 data covers the period 1/1/82 - 10/22/82.

5. Detection sensitivity is approximately 5 mrem/yr (0.5 μR/hr) determined from the analyses of five years of preoperational data.

6. No control location was specified for drinking water during the preoperational monitoring period.

7. Inconclusive data.

Table 10 - Results of 2010 Environmental Intercomparison Program with Independent Lab, Eckert & Ziegler Analytics, Inc.

Comparison Study (Measurement Unit)	Date	Nuclides	Vendor Lab Results	Env Lab Results	Agreement
Gamma Isotopic Liquid 1 Liter (pCi/l)	3/18	^{131}I	72.2	69.3	Yes
		^{141}Ce	263	288	Yes
		^{51}Cr	364	379	Yes
		^{134}Cs	179	197	Yes
		^{137}Cs	159	189	Yes
		^{58}Co	144	159	Yes
		^{54}Mn	209	247	Yes
		^{59}Fe	138	162	Yes
		^{65}Zn	256	280	Yes
		^{60}Co	185	206	Yes
Gamma Filter (pCi)	9/30	^{141}Ce	130	140	Yes
		^{51}Cr	233	208	Yes
		^{134}Cs	92.9	72.2	Yes
		^{137}Cs	94.4	96.4	Yes
		^{58}Co	73.6	72.7	Yes
		^{54}Mn	119	131	Yes
		^{59}Fe	91.1	114	Yes
		^{65}Zn	204	247	Yes
		^{60}Co	171	171	Yes
Alpha/Beta Water (pCi/l)	5/3	Alpha	156	166	Yes
		Beta	293	309	Yes
Gamma Isotopic Pulverized Soil (pCi/g)	4/10	^{141}Ce	4.23E-1	3.86E-1	Yes
		^{51}Cr	5.84E-1	5.46E-1	Yes
		^{134}Cs	2.87E-1	2.49E-1	Yes
		^{137}Cs	3.47E-1	3.26E-1	Yes
		^{58}Co	2.31E-1	2.00E-1	Yes
		^{54}Mn	3.35E-1	3.12E-1	Yes
		^{59}Fe	2.22E-1	2.08E-1	Yes
		^{65}Zn	4.11E-1	3.78E-1	Yes
		^{60}Co	2.96E-1	2.60E-1	Yes
I-131 Solid (pCi)	3/18	^{131}I	157	155	Yes

Comparison Study (Measurement Unit)	Date	Nuclides	Vendor Lab Results	Env Lab Results	Agreement
Tritium (pCi/l)	4/15	^{3}H	12000	12100	Yes
Gross Beta Filter (pCi)	10/6	N/A	74.5	73.5	Yes
Charcoal Cartridge (pCi)	9/23	^{131}I	60	61.8	Yes
Gamma Isotopic Liquid 4 Liter (pCi/l)	9/28	^{131}I	64.4	83.0	Yes
		^{141}Ce	165	193	Yes
		^{51}Cr	297	382	Yes
		^{134}Cs	118	135	Yes
		^{137}Cs	120	138	Yes
		^{58}Co	93.5	107	Yes
		^{54}Mn	152	180	Yes
		^{59}Fe	116	140	Yes
		^{65}Zn	259	316	Yes
		^{60}Co	217	249	Yes

Table 11 – 2010 Environmental Sampling Program Exceptions

Media	Sample Location	Month (Week No.)	Cause for Exception
Air Particulate And Radioiodine	Site 2	May (20)	Gas meter failed.
Ground Water	Site 115 Site 115 Site 115 Site 107 Site 115 Site 107	Feb (07) May (20) Aug (33) Sep (38) Nov (46) Dec (51)	The station has experienced issues with ground water intrusion into plant buildings and structures. In 2008, a modification was implemented to install fourteen dewatering wells. This lowered the water table in the area below the level of the existing wells.

N

LEGEND

- ● CONTROL SAMPLE LOCATIONS
- A=AIR PARTICULATE SITE
- D=DIRECT (TLD) SITE
- I=AIRBORNE RADIOIODINE SITE
- W=WATER SITE
- O=OTHER (GARDEN PRODUCTS, FISH, SEDIMENT, GRASS, MILK)

REFERENCE:
THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF USGS STATE OF GEORGIA, 1970.

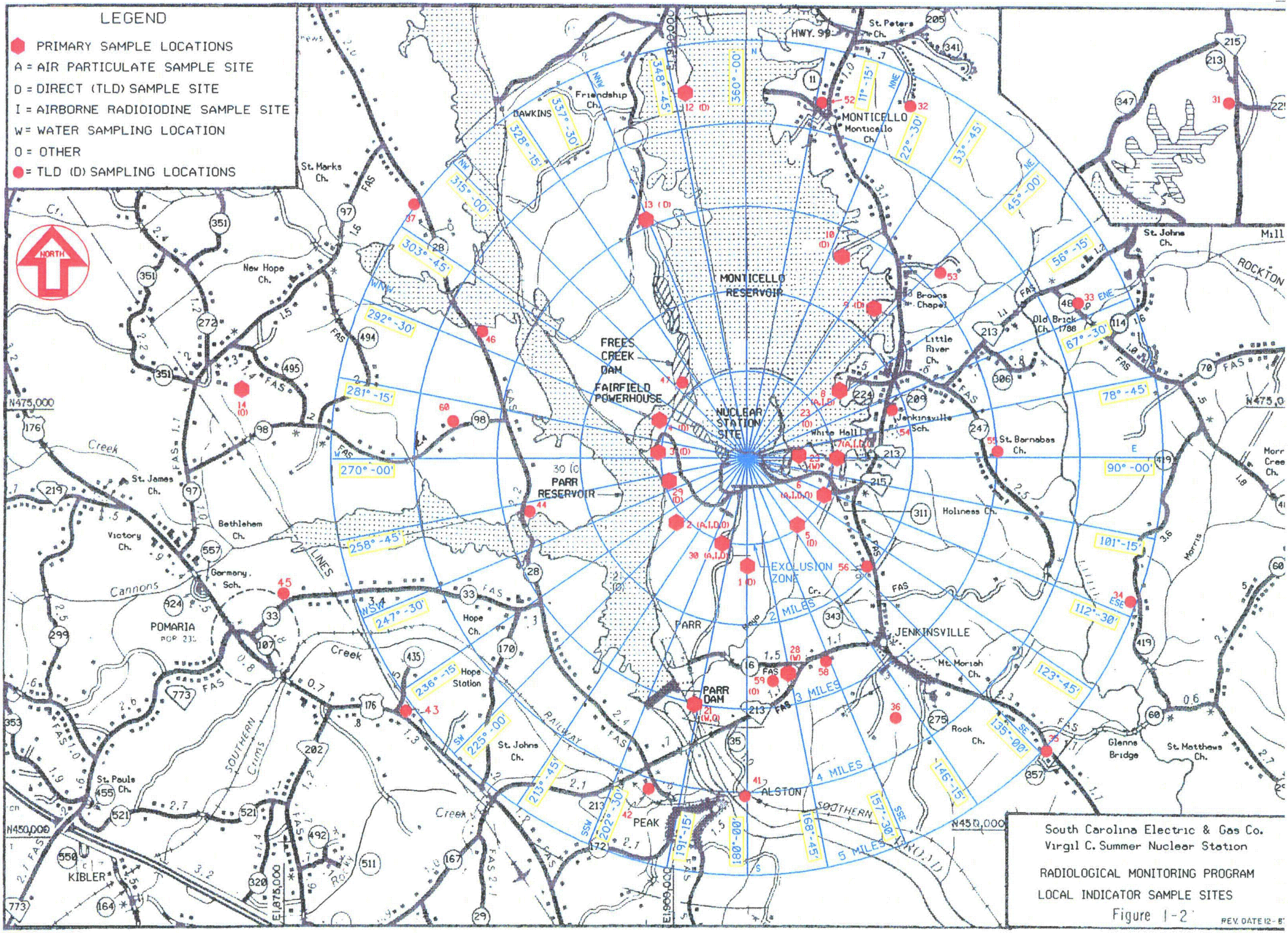
STATUTE MILES
10 0 10 20

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

Regional Location Map

Figure 1-1

REV. DATE 12-8



South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

RADIOLOGICAL MONITORING PROGRAM
LOCAL INDICATOR SAMPLE SITES
Figure 1-2

REV. DATE 12-8?

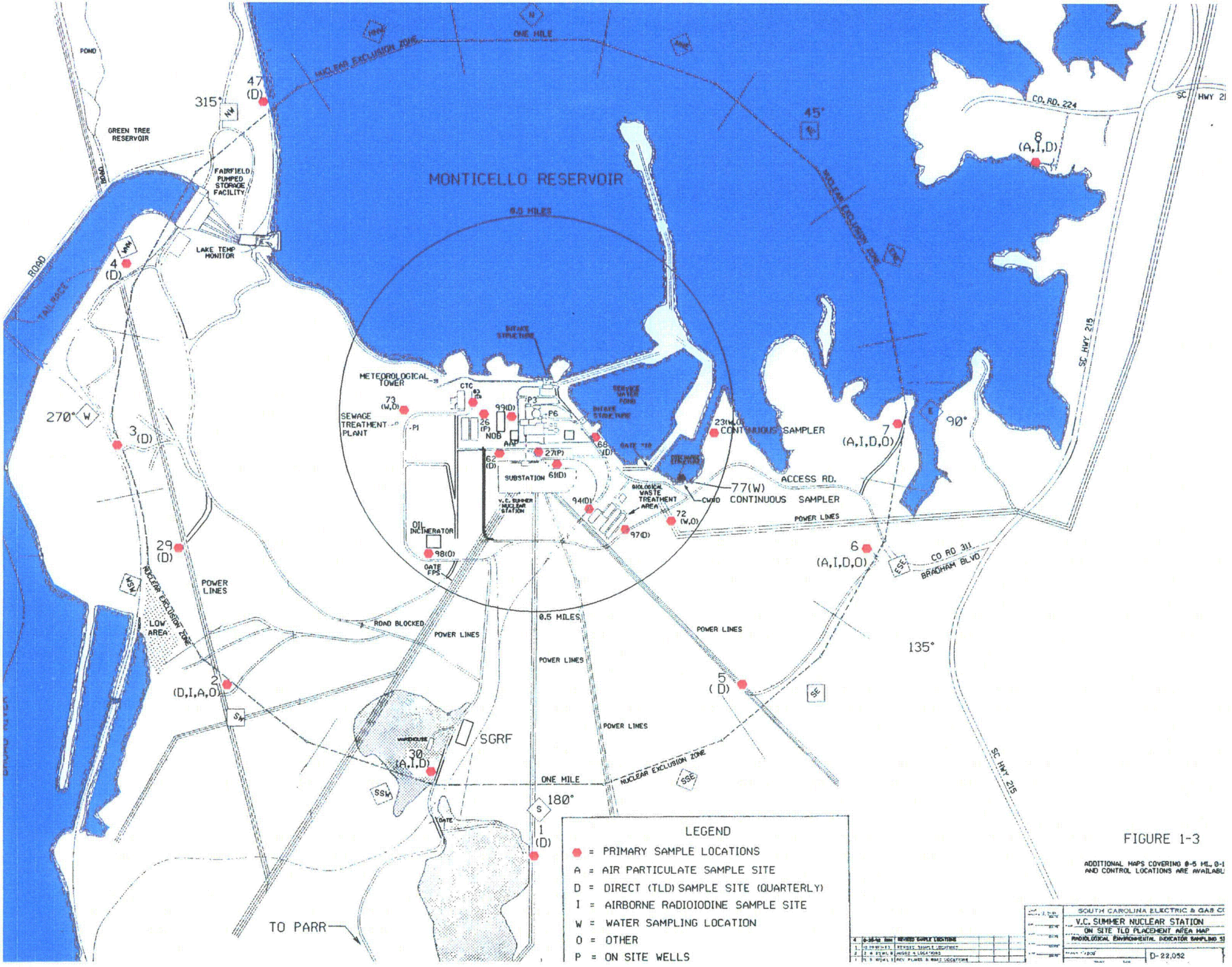


FIGURE 1-3

ADDITIONAL MAPS COVERING 0-5 MI. 0-1 AND CONTROL LOCATIONS ARE AVAILABL

4	6-30-94 Date	REVISED SAMPLE LOCATIONS
1	12-29-87 Date	REVISED SAMPLE LOCATIONS
2	2-6-85 Date	ADDED 4 LOCATIONS
1	12-9-82 Date	REV. PLUMES & ROAD LOCATIONS

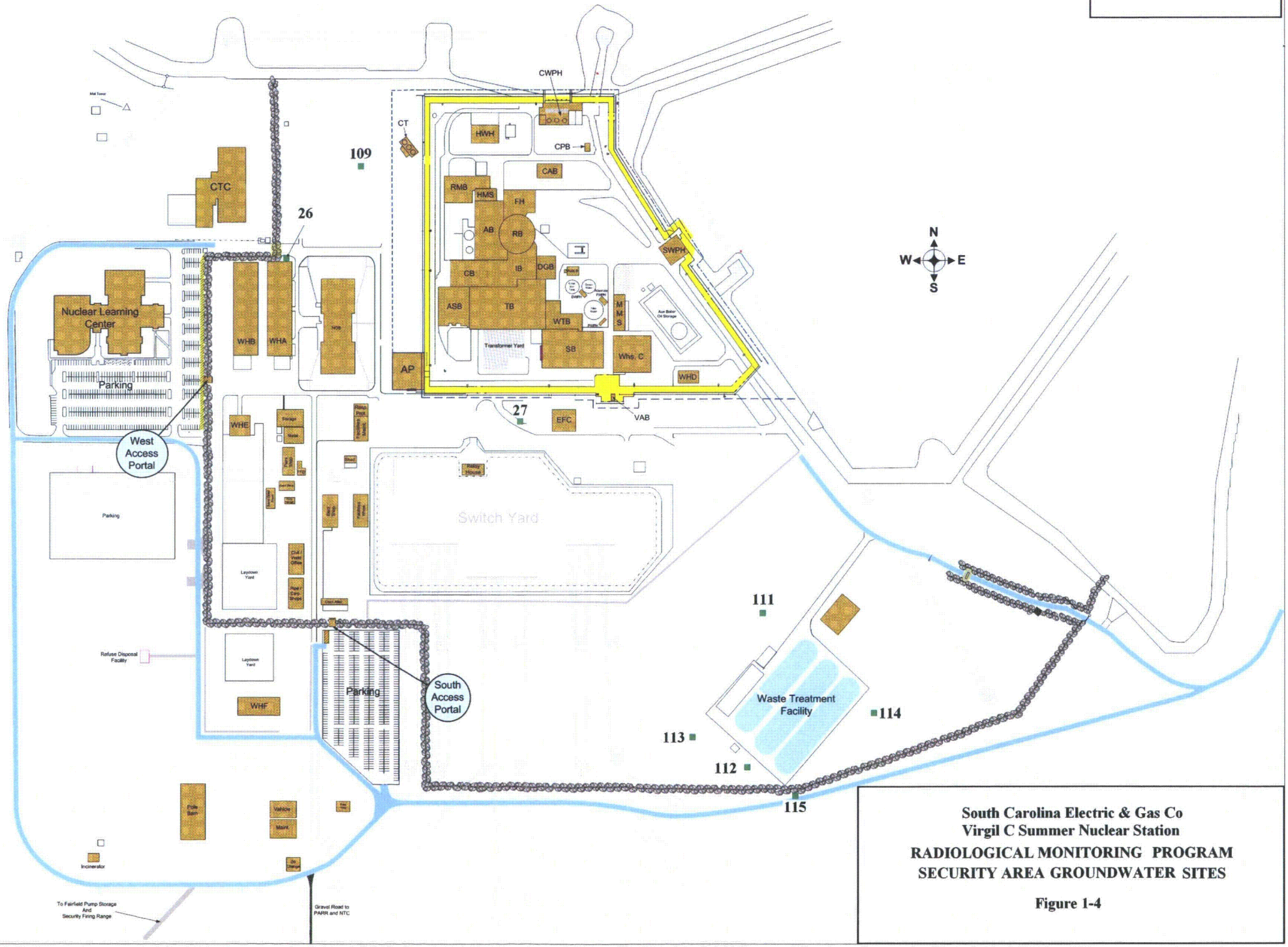
SOUTH CAROLINA ELECTRIC & GAS CO

V.C. SUMMER NUCLEAR STATION

ON SITE TLD PLACEMENT AREA MAP

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

D-22,052



South Carolina Electric & Gas Co
Virgil C Summer Nuclear Station
RADIOLOGICAL MONITORING PROGRAM
SECURITY AREA GROUNDWATER SITES

Figure 1-4

South Carolina Electric & Gas Co
Virgil C Summer Nuclear Station

RADIOLOGICAL MONITORING PROGRAM
PROTECTED AREA GROUNDWATER SITES

Figure 1-5