Progress Energy

10 CFR 50.36a

APR 2 9 2008

SERIAL: BSEP 08-0059

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Radioactive Effluent Release Report for 2007

Ladies and Gentlemen:

In accordance with 10 CFR 50.36a and Technical Specification (TS) 5.6.3 for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc., is submitting the enclosed Radioactive Effluent Release Report for BSEP Unit Nos. 1 and 2. This report covers the period from January 1, 2007, through December 31, 2007.

TS 5.5.1, "Offsite Dose Calculation Manual (ODCM)," requires changes to the ODCM be submitted as part of, or concurrent with, the Radioactive Effluent Release Report. There were no revisions of the ODCM in 2007.

No regulatory commitments are contained in this submittal. Please refer any questions regarding this submittal to Mr. Gene Atkinson, Supervisor - Licensing/Regulatory Programs (Acting), at (910) 457-2056.

Sincerely,

Randy C Ivey

Randy C. Ivey
Manager - Support Services
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MAT/mat

Enclosure:

Radioactive Effluent Release Report for 2007

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IE48

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Enclosure
BSEP 08-0059

Radioactive Effluent Release Report for 2007

Brunswick Steam Electric Plant
Radioactive Effluent Release Report
January 1, through December 31, 2007

Table of Contents

Facility: Brunswick Steam Electric Plant
Licensee: Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc.

1. Regulatory Limits

   A. Fission and activation gases (Off-Site Dose Calculation Manual Specification (ODCMS) 7.3.8)

      (1) Calendar Quarter[1]

         (a) ≤ 10 mrad gamma
         (b) ≤ 20 mrad beta

      (2) Calendar Year

         (a) ≤ 20 mrad gamma
         (b) ≤ 40 mrad beta

   B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.9)

      (1) Calendar Quarter[1]

         (a) ≤ 15 mrem to any organ

      (2) Calendar Year

         (a) ≤ 30 mrem to any organ

   C. Liquid Effluents (ODCMS 7.3.4)

      (1) Calendar Quarter[2]

         (a) ≤ 3 mrem to total body
         (b) ≤ 10 mrem to any organ

      (2) Calendar Year

         (a) ≤ 6 mrem to total body
         (b) ≤ 20 mrem to any organ

2. Maximum permissible concentration and dose rates which determine maximum instantaneous release rates.

   A. Fission and activation gases (ODCMS 7.3.7.a)

      (1) ≤ 500 mrem/year to total body
      (2) ≤ 3000 mrem/year to the skin

NOTE: Dose calculations are determined in accordance with the ODCM
[1] Used for percent of ODCMS limit determination in Attachment 2, Table 1A
[2] Used for percent of ODCMS limit determination in Attachment 2, Table 2A

B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.7.b)

(1) ≤ 1500 mrem/year to any organ

C. Liquid effluents (ODCMS 7.3.3)

The concentration of radioactive material released in liquid effluents to unrestricted areas after dilution in the discharge canal shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10 CFR 20.1001 - 20.2401 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to the value given in the ODCM specifications.

(1) Tritium: limit = 1.00E-03 μCi/ml [3]
(2) Dissolved and entrained noble gases: limit = 2.00E-04 μCi/ml [3]

3. Measurements and Approximations of Total Radioactivity

A. Fission and activation gases

(1) Analyses for specific radionuclides in representative grab samples by gamma spectroscopy.

B. Iodines

(1) Analysis for specific radionuclides collected on charcoal cartridges by gamma spectroscopy.

C. Particulates

(1) Analysis for specific radionuclides collected on filter papers by gamma spectroscopy.

D. Liquid Effluents

(1) Analysis for specific radionuclides of individual releases by gamma spectroscopy.

[3] Used as applicable limits for Attachment 2, Table 2A

Nuclear counting statistics are reported utilizing 1-sigma error. Total error where reported represents a best effort to approximate the total of all individual and sampling errors.

4. Batch Releases

A. Liquid

(1) Number of batch releases:	1.39E+02
(2) Total time period for batch releases:	2.06E+04 Minutes
(3) Maximum time period for a batch release:	2.60E+02 Minutes
(4) Average time period for a batch release:	1.48E+02 Minutes
(5) Minimum time period for a batch release:	1.20E+01 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream:	7.75E+05 Gallons per Minute

B. Gaseous

(1) Number of batch releases:	0.00E+00
(2) Total time period for batch releases:	0.00E+00 Minutes
(3) Maximum time period for a batch release:	0.00E+00 Minutes
(4) Average time period for a batch release:	0.00E+00 Minutes
(5) Minimum time period for a batch release:	0.00E+00 Minutes

5. Abnormal Releases[4]

A. Liquid

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

B. Gaseous

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

[4] There were no abnormal releases that exceeded 10 CFR 20 or 10 CFR 50 limits. See page 5 for a discussion of release events that occurred.

Summary

Water is routinely discharged from the plant storm drainage system to the Storm Drain Stabilization Pond (SDSP). This system is intended to provide for mitigation and control of release of storm water and plant drainage water to the environment. In addition to storm water, this water also includes potentially radioactive contaminated liquids, including tritium that originated primarily from the Turbine Building. The Turbine Building Heating Ventilation and Air Conditioning (TB HVAC) System employs an air recirculation system to ventilate the building. Prior to the exhaust air being drawn into the supply fans, the air passes through the TB HVAC cooling system that consists of two spray coolers (airwashes) to control building temperatures. The chilled water receives heat and contaminants (including tritium) through mechanical scrubbing from the incoming air and is recycled through the cooling system. The total air environment consists of approximately 90% of the air volume being re-circulated with approximately 10% of the air volume being exhausted from the building. This constant recycling results in buildup of radioactive contaminants in the cooling water. Water that overflows from the spray coolers containing tritium was discharged to the Storm Drain Collection Basin (SDCB). The water that is collected into the SDCB gets pumped to the SDSP for retention prior to release from the site to meet National Pollution Discharge Elmination System (NPDES) requirements. Water from the SDSP is ultimately released to the intake canal through a controlled discharge process.

On May 7, 2007 water samples obtained from two electrical manholes located in the vicinity of the meteorological tower, approximately 50 yards from the west side of the SDSP, were analyzed and found to contain detectable concentrations of tritium. Investigation of the source led to the detection of tritium in surface water at several locations around the perimeter of the SDSP. These locations are all on company property. As a result of ongoing investigations to determine the source and potential migration path of the tritium, an increased environmental sampling program was initiated. On June 13, 2007, tritium levels in excess of Nuclear Energy Institute (NEI) voluntary reporting criteria were confirmed to be present in new onsite shallow groundwater wells. The NRC was notified on 6/13/07 (Event Number 43420). Immediate corrective actions were taken to perform additional sampling of areas surrounding the stabilization pond and to reconfigure the Turbine Building HVAC airwash system. The reconfiguration of the turbine building airwash system was done to eliminate the designed pathway of tritiated water to the storm drain collection basin and the storm drain stabilization pond. Additional corrective actions included installation of additional monitoring wells at various locations to determine groundwater flow and checking for the presence of tritium in the surrounding groundwater. There has been no indication that tritium has migrated offsite to drinking water supplies.

Further investigations indicated that the pond was contributing to offsite dose via the airborne pathway due to evaporation. Increased sampling of the SDSP has been instituted and monthly calculations of the airborne release are being performed.

Additional investigations indicate the presence of tritium in the onsite tidally influenced marsh area near the pond. Release impacts from the tidally influenced marsh are calculated based on

falling tides from the marsh areas to Nancy's Creek. Fish and invertebrate sampling and analysis for tritium was performed twice in Nancy's Creek in 2007. Routine fish and invertebrate sampling has also been initiated. The results indicated that tritium concentrations for fish and invertebrates in Nancy's Creek was ≤ LLD.

Discussion of releases from the Storm Drain Collection Basin

Due to heavy rain events, the Storm Drain Collection Basin (SDCB) was released directly to the discharge canal on two occasions in 2007. The SDCB is a permitted release point during periods of inclement weather to protect plant personnel and equipment. Approximately 4.63E+05 gallons containing 4.50E-02 curies of tritium were released. There was no detectable gamma radioactivity. This resulted in an estimated maximum dose to the individual of 6.47E-08 mrem. The volume released was not included in the average diluted concentration determination or in the volume of waste released on Attachment 2, Table 2A. The tritium released was included in the quarterly summaries on Attachment 2, Table 2A.

Discussion of releases from the Storm Drain Stabilization Pond

Approximately 7.97E+06 gallons containing 1.80E+01 curies of tritium were released from the Storm Drain Stabilization Pond (SDSP) to the intake canal during this reporting period. There was no detectable gamma radioactivity. This resulted in an estimated maximum dose to the individual of 2.70E-05 mrem. The volume released was not included in the average diluted concentration determination or in the volume of waste released on Attachment 2, Table 2A. The tritium released was included in the quarterly summaries on Attachment 2, Table 2A. The SDSP is a permitted release point.

Discussion of releases from water evaporation from the Storm Drain Stabilization Pond

There was 5.43E+06 ft^3 of tritiated water released via evaporation from the Storm Drain Stabilization Pond for 2007. This yields 73.9 curies of tritium released to the atmosphere as a ground release. The nearest resident to the pond is in the northwest sector at approximately 0.3 miles. The maximum exposed individuals at that location received a calculated dose of 2.11E-02 millirem via the inhalation pathway. Only inhalation dose was determined because these exposed individuals do not have a garden and also do not have any milk or meat animals at this location. The dose from this release is not included in Attachment 7, Annual Dose Assessment. The total curies released are not included in Attachment 2, Table 1A. The curies, volume released, and dose were not included because those releases are not part of the pathway for designed releases from the plant.

Discussion of releases from the Marsh to Nancy's Creek

On June 28, 2007 tritium activity at a concentration of 3.56E-06 µCi/ml was detected at Waypoint 74. This location is on company owned property in the marsh approximately 100 yards from Nancy's Creek (which is offsite). This location (marsh land) is under the influence of high and low tides which releases to Nancy's Creek offsite. This constituted a release point for evaluation (curies released, volume, offsite dose impact, etc). From the point of discovery the sampling program was expanded to weekly sampling and analysis at seven locations.

From the point of discovery all gamma analysis were ≤LLD. There were 181 tritium analyses with 45 positive results. The minimum concentration detected was 2.67E-07 μCi/ml. The maximum concentration was 1.66E-05 μCi/ml. Using the average concentration of 1.44E-06 μCi/ml, two high tides per day, the area of the marsh at high tide, and 186 days (from June 28 thru December 31,2007), it is calculated that 2.69E07 gallons were released to Nancy's Creek containing 5.45E+01 curies of tritium. This yielded a Total Body dose of 7.15 E-04 mrem to an adult from eating fish and 1.76E-04 mrem from eating invertebrate (shrimp, crabs, etc.) for a total dose of 8.91E-04 mrem.

However, for purposes of estimating the total release for the calendar year 2007 a linear extrapolation was performed to account for releases during the entire year. This is done because it is generally realized that the releases were most likely occurring prior to the point of discovery. An accounting of data in this manner utilizes assumptions that the data was the same from January 1, 2007 to point of discovery. Since the point of discovery was June 28, 2007 (day 179 of the year) the resulting computations were applied to the known data. Utilizing these assumptions it is estimated that 1.07E+02 curies of tritium and approximately 5.27E07 gallons were released to Nancy's Creek. This yielded a Total Body dose of 1.40E-03 mrem to an adult from eating fish and 3.45E-04 mrem from eating invertebrate (shrimp, crabs, etc.) for a total dose of 1.75E-03 mrem.

The curies and volume released are not included in Attachment 2, Table 2A. The calculated dose is not included in the Annual Dose Summary, Attachment 7. The curies, volume released, and dose were not included because those releases are not part of the pathway for designed releases from the plant.

Discussion of Ground Water Monitoring

Based on the aforementioned event, in June of 2007 the site ground water sampling and analysis surveillance program expanded. By the end of 2007 the ground water program included approximately 42 wells. During this time period there were 214 tritium analyses with 105 positive results. Several gamma analysis and hard to identify analysis (Sr-90, Sr-89, & Fe-55) were performed and all these results were less than the Lower Limit of Detection (≤LLD). Due to the positive results of tritium analysis two Open House Meetings (June 19, 2007 and August 21, 2007) were held to inform the general public that on site wells had detectable tritium radioactivity.

The sampling program consists of shallow, intermediate, and deep wells in different locations around the Storm Drain Stabilization Pond and various plant site locations to evaluate ground water movement. Shallow wells are being sampled around Nancy's Creek to evaluate potential ground water movement towards offsite.

The major source of tritium to the Storm Drain Stabilization Pond, the turbine building airwash system, has been rerouted to Radwaste to be released to the designed discharged point of release (discharge canal which discharges into the ocean).

The following are the tritium results and maps showing each well location.

Shallow Wells for Plant Site						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-2C	3	3	1.82E+06	1.74E+06	1.89E+06	23.0
ESS-3C	4	4	4.34E+02	3.11E+02	6.21E+02	14.3
ESS-13C	3	0	≤ LLD	≤ LLD	≤ LLD	24.8
ESS-16	3	3	4.38E+04	2.83E+04	5.40E+04	25.4
MW-2	3	1	4.70E+02	4.70E+02	4.70E+02	24.7
MW-3	2	0	≤ LLD	≤ LLD	≤ LLD	24.7

Intermediate Wells for Plant Site						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-1B	3	0	≤ LLD	≤ LLD	≤ LLD	59.2
ESS-2B	3	1	4.70E+02	4.70E+02	4.70E+02	54.8
ESS-3B	4	4	1.10E+03	4.53E+02	1.56E+03	52.4
ESS-13B	3	0	≤ LLD	≤ LLD	≤ LLD	56.5

*LLD for groundwater monitoring is 259 pCi/L.

Shallow Wells for Storm Drain Stabilization Pond						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-17C	6	6	4.28E+03	3.29E+03	5.10E+03	26.0
ESS-18C	6	6	6.55E+05	5.07E+05	7.50E+05	20.0
ESS-19C	8	8	4.33E+05	3.55E+05	5.35E+05	20.0
ESS-20C	7	7	1.56E+04	1.25E+04	1.76E+04	20.0
ESS-21C	6	5	5.51E+02	3.78E+02	7.40E+02	20.0
ESS-22C	6	6	5.89E+05	2.94E+05	7.88E+05	20.0
ESS-23C	6	6	2.11E+05	1.91E+05	2.39E+05	23.0
ESS-24C	6	6	3.51E+03	3.06E+03	4.23E+03	18.0
ESS-25C	6	0	≤ LLD	≤ LLD	≤ LLD	22.0
ESS-26C	6	6	6.31E+05	5.62E+05	6.89E+05	15.0
ESS-27C	6	6	2.62E+05	2.35E+05	3.02E+05	15.5
ESS-28C	6	2	3.17E+02	3.06E+02	3.28E+02	23.0
ESS-30C	3	3	1.78E+04	2.41E+03	4.82E+04	15.0
ESS-31C	3	3	3.19E+03	1.56E+03	4.87E+03	15.0
ESS-STAB	6	6	6.33E+05	5.31E+05	6.86E+05	31.0

Intermediate Wells for Storm Drain Stabilization Pond						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-17B	7	2	4.71E+02	3.10E+02	6.33E+02	53.0
ESS-18B	6	0	≤ LLD	≤ LLD	≤ LLD	63.0
ESS-19B	8	8	4.18E+03	2.85E+03	7.20E+03	42.0
ESS-20B	6	0	≤ LLD	≤ LLD	≤ LLD	43.0
ESS-21B	6	0	≤ LLD	≤ LLD	≤ LLD	67.0
ESS-22B	6	1	4.22E+02	4.22E+02	4.22E+02	76.0
ESS-24B	6	1	8.50E+02	8.50E+02	8.50E+02	53.0
ESS-25B	4	0	≤ LLD	≤ LLD	≤ LLD	43.0

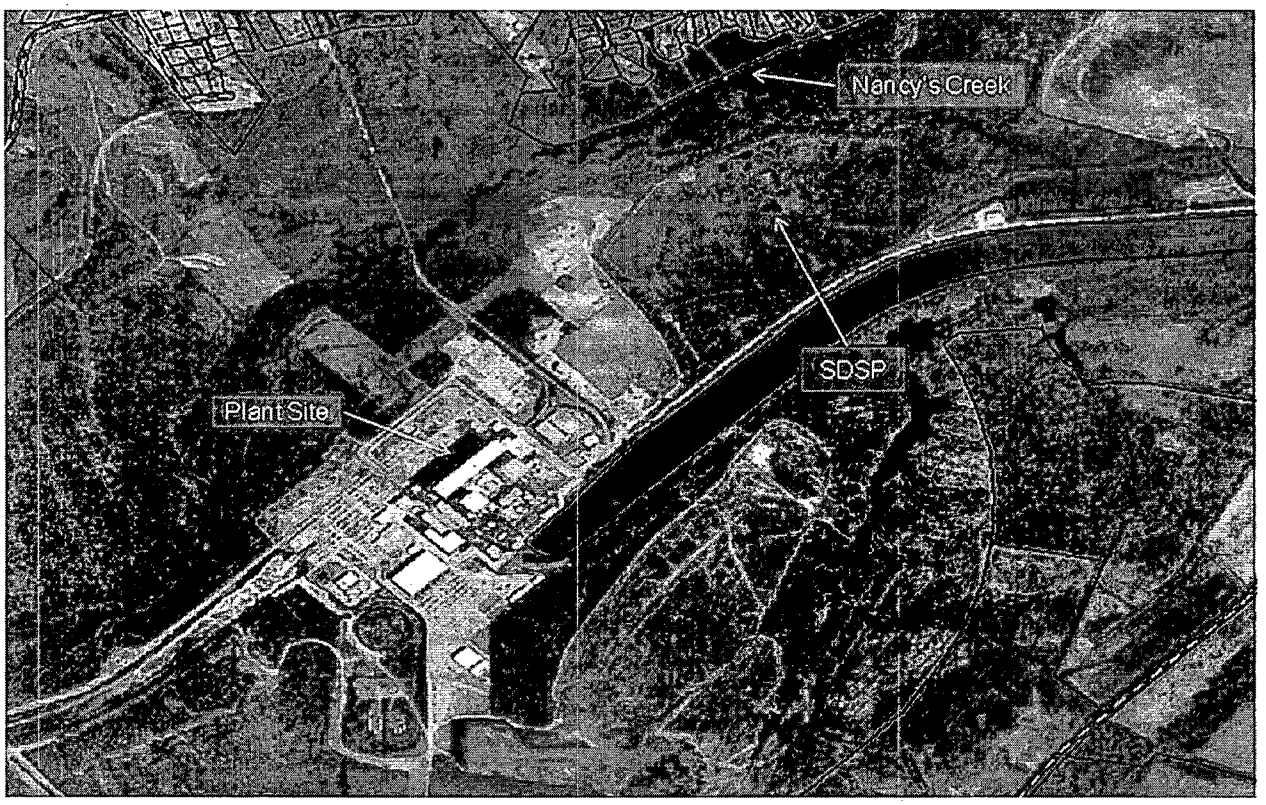
*LLD for groundwater monitoring is 259 pCi/L.

Deep Wells for Storm Drain Stabilization Pond						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-17A	4	0	≤ LLD	≤ LLD	≤ LLD	150.0
ESS-24A	5	0	≤ LLD	≤ LLD	≤ LLD	140.0
ESS-27A	6	0	≤ LLD	≤ LLD	≤ LLD	150.0

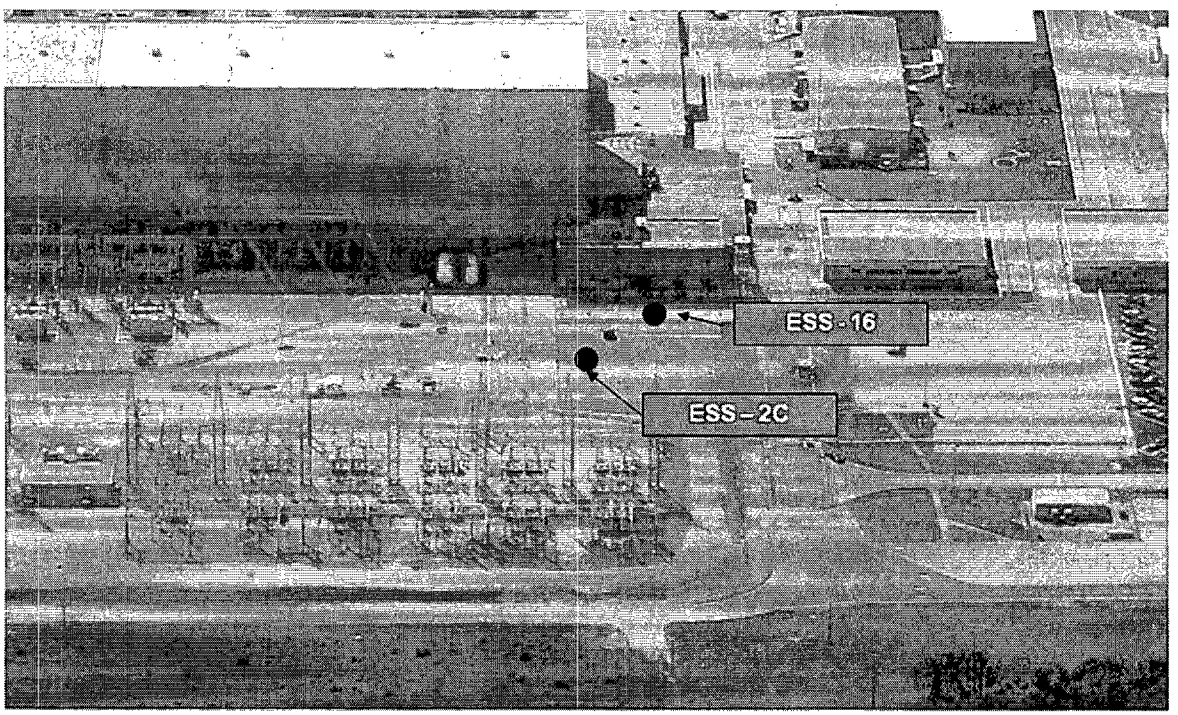
Shallow Wells for Nancy's Creek						
Well Name	**Number of Samples in 2007**	**Number of Positive Samples in 2007**	**Average Pos Act (pCi/L)**	**Minimum Pos Act (pCi/L)**	**Maximum Pos Act (pCi/L)**	**Depth of Well (ft)**
ESS-GLB-1	5	0	≤ LLD	≤ LLD	≤ LLD	8.0
ESS-NC-1	6	0	≤ LLD	≤ LLD	≤ LLD	7.5
ESS-NC-2	6	0	≤ LLD	≤ LLD	≤ LLD	8.0
ESS-NC-3	5	0	≤ LLD	≤ LLD	≤ LLD	8.0
ESS-NC-4	5	1	3.14E+02	3.14E+02	3.14E+02	8.0
ESS-NC-5	5	0	≤ LLD	≤ LLD	≤ LLD	8.0

*LLD for groundwater monitoring is 259 pCi/L.

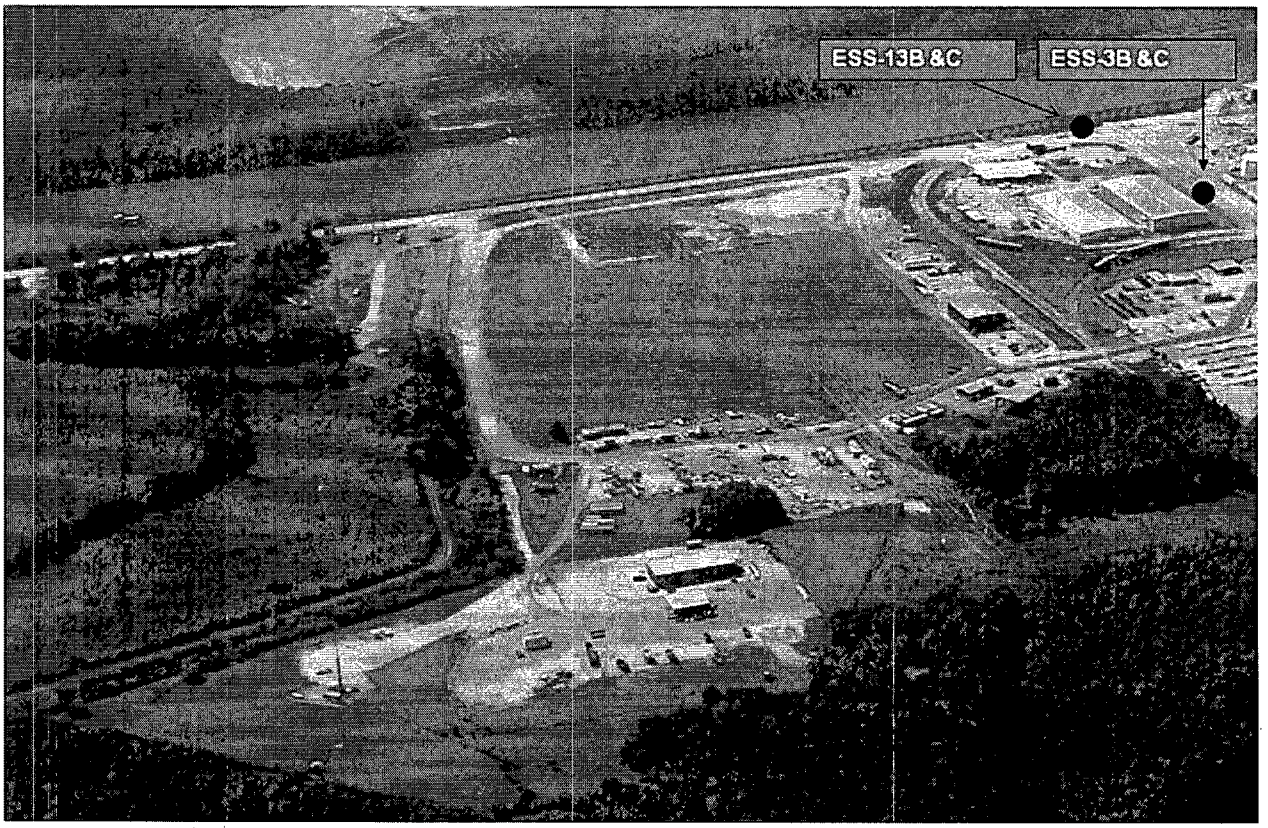
Overview of Plant Site, SDSP, and Nancy's Creek

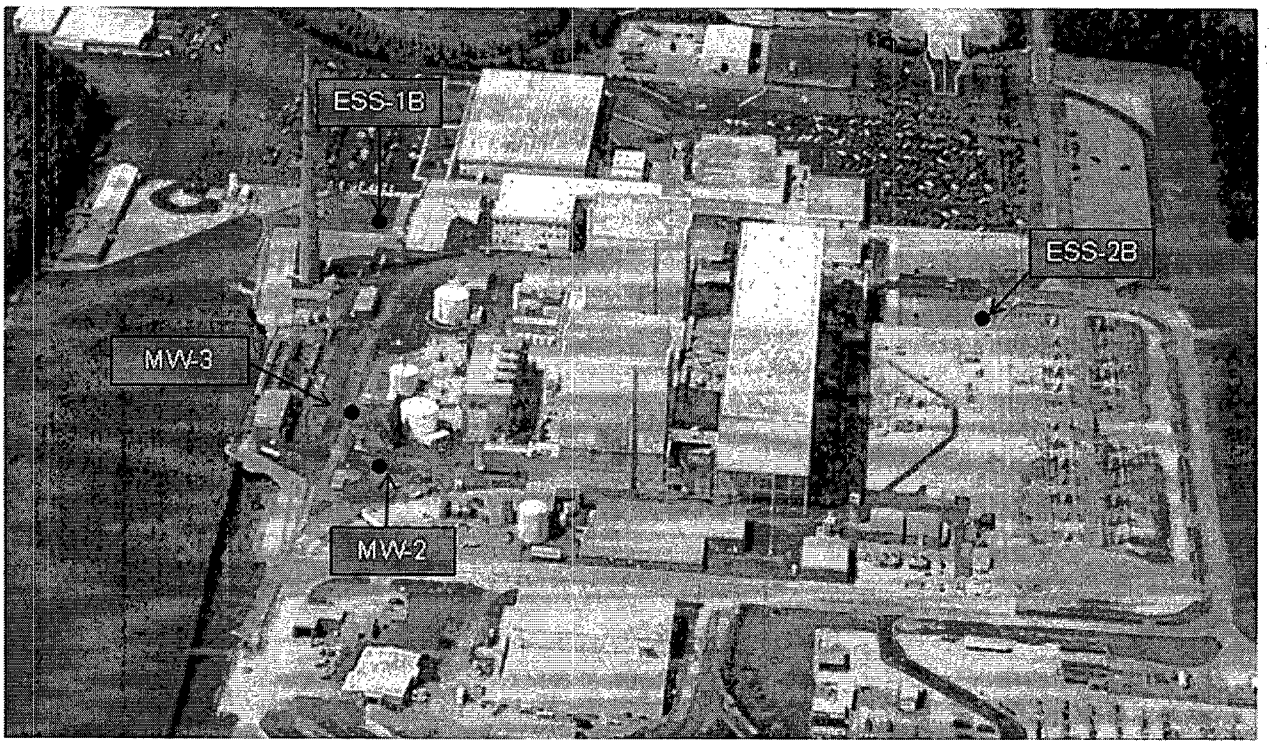


Shallow Wells for Plant Site

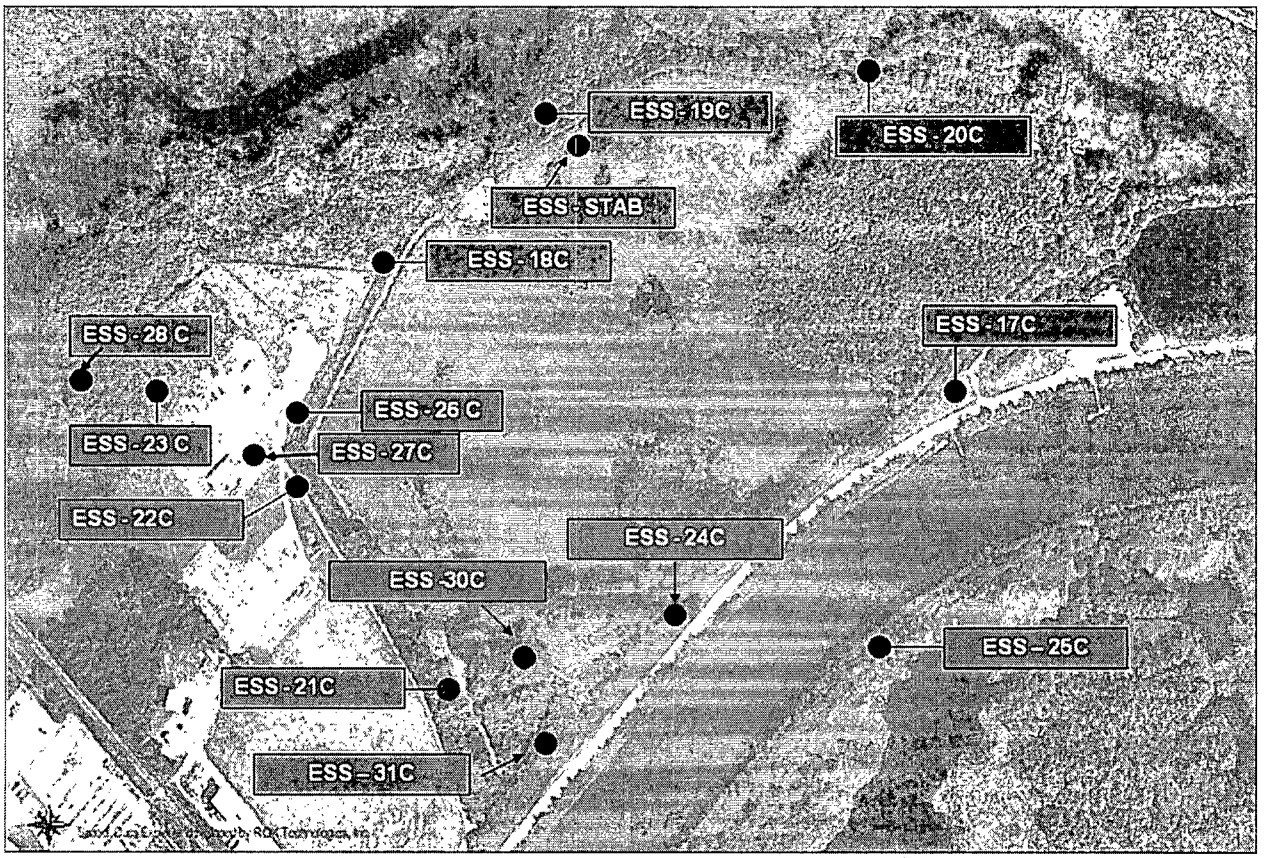


Intermediate/Shallow Wells for Plant Site

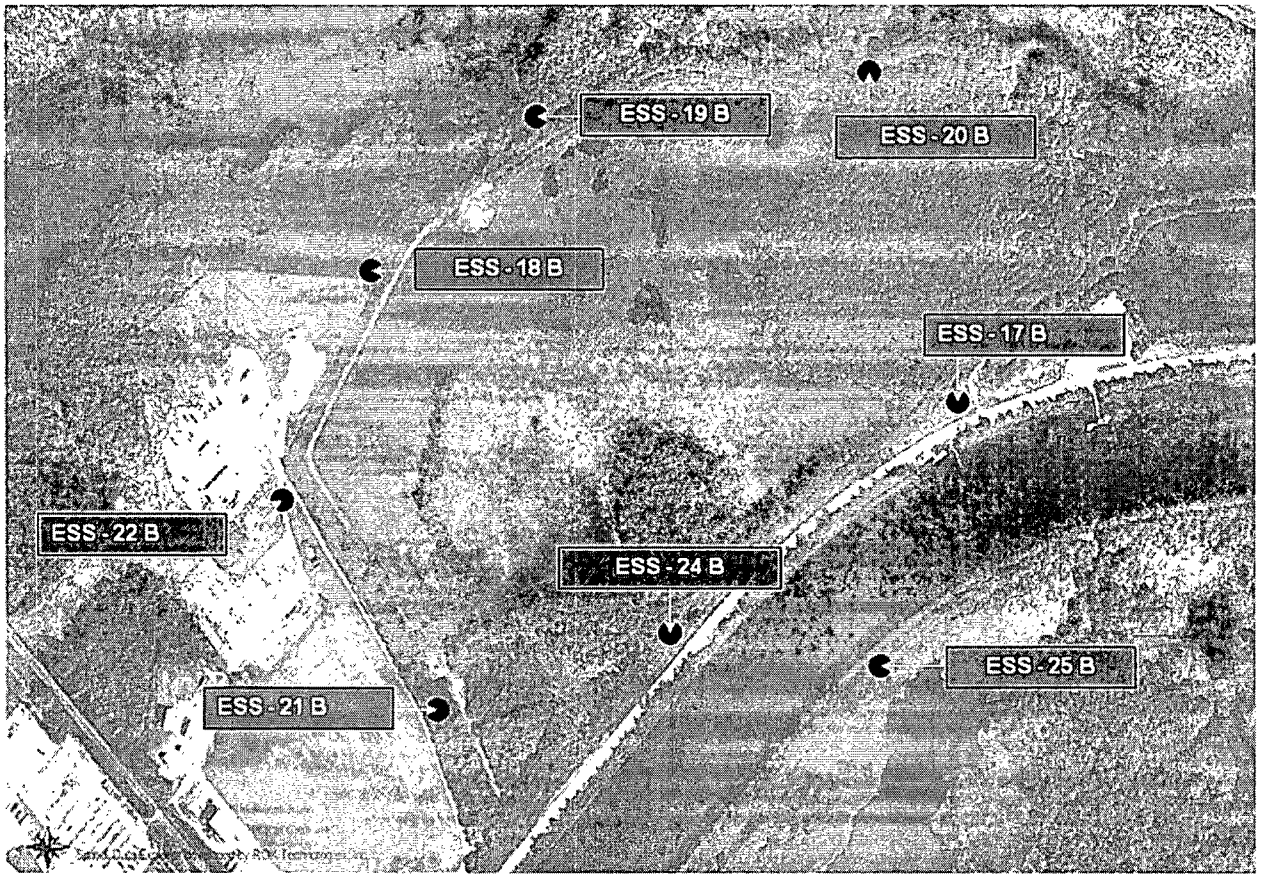




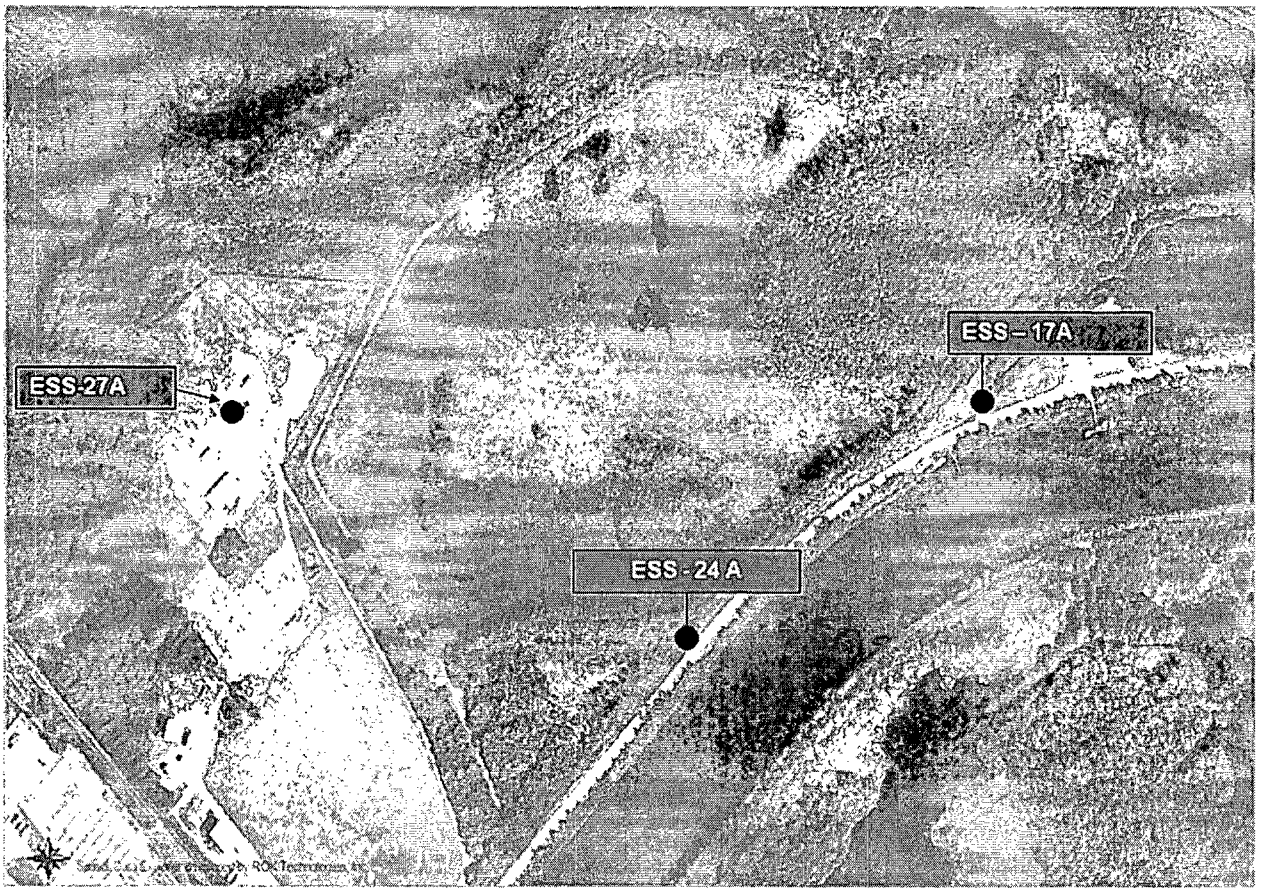
Shallow Wells for Storm Drain Stabilization Pond



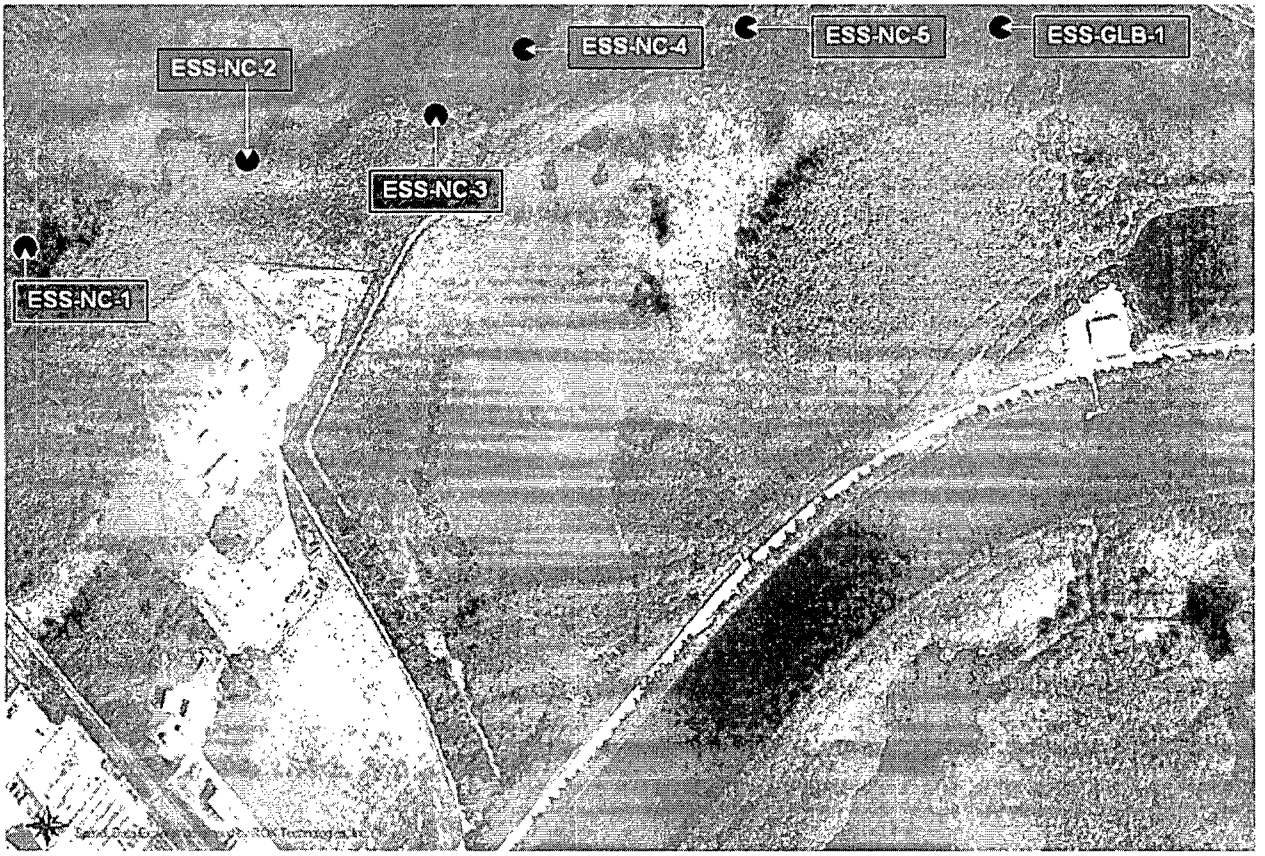
Intermediate Wells for Storm Drain Stabilization Pond



Deep Wells for Storm Drain Stabilization Pond



Shallow Wells for Nancy's Creek



Attachment 2
Effluent and Waste Disposal Data

Table 1A	Gaseous Effluents - Summation of all Releases
Table 1B	Gaseous Effluents - Elevated Releases
Table 1C	Gaseous Effluents - Ground Level Releases
Table 2A	Liquid Effluents - Summation of all Releases
Table 2B	Liquid Effluents - Batch Mode
	Lower Limits of Detection
Table 3A	Solid Waste and Irradiated Fuel Shipments - Waste Class A
Table 3B	Solid Waste and Irradiated Fuel Shipments - Waste Class B
Table 3C	Solid Waste and Irradiated Fuel Shipments - Waste Class C

Attachment 2
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents - Summation of all Releases

A. FISSION AND ACTIVATION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	5.34E+02	3.01E+02	3.18E+02	3.34E+02	4.50E+01
2. Average release rate for period	µCi/sec	6.87E+01	3.83E+01	4.00E+01	4.20E+01	NA
3. Percent of ODCMS limit	%	1.14E-01	5.89E-02	7.52E-02	7.70E-02	NA

B. IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total Iodine - 131 release	Ci	3.95E-02	1.63E-02	9.96E-03	1.06E-02	3.50E+01
2. Average release rate for period	µCi/sec	5.07E-03	2.08E-03	1.25E-03	1.33E-03	NA

C. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	1.19E-02	3.48E-03	4.61E-03	3.69E-03	3.50E+01
2. Average release rate for period	µCi/sec	1.53E-03	4.43E-04	5.80E-04	4.64E-4	NA
3. Gross Alpha	Ci	0.00E+00	5.91E-08	0.00E+00	0.00E+00	3.50E+01

D. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	5.78E+01	6.51E+01	6.72E+01	6.59E+01	3.00E+01
2. Average release rate for period	µCi/sec	7.43E+00	8.28E+00	8.46E+00	8.29E+00	NA

Attachment 2
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents - Summation of all Releases

E. IODINE-131, IODINE-133, TRITIUM AND PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Total release	Ci	5.81E+01	6.53E+01	6.73E+01	6.60E+01
2. Average release rate for period	µCi/sec	7.47E+00	8.30E+00	8.47E+00	8.30E+00
3. Percent of ODCMS limit	%	1.77E+00	5.85E-01	3.54E-01	3.77E-01

Attachment 2
Effluent and Waste Disposal Data

Table 1B: Gaseous Effluents - Elevated Releases
Continuous Release

Nuclides Released

1. FISSION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
krypton-85m	Ci	4.74E+00	3.14E-01	5.69E-02	≤ LLD
krypton-87	Ci	1.21E+01	6.23E+00	7.01E+00	6.59E+00
krypton-88	Ci	7.21E+00	7.13E-01	4.82E-01	≤ LLD
xenon-133	Ci	1.23E+01	4.07E+00	3.29E+00	7.10E+00
xenon-135	Ci	2.55E+01	1.43E+01	1.96E+01	3.02E+01
xenon-135m	Ci	6.26E+01	4.42E+01	5.92E+01	5.83E+01
xenon-137	Ci	2.11E+02	1.30E+02	8.91E+01	9.23E+01
xenon-138	Ci	1.56E+02	8.64E+01	1.24E+02	1.26E+02
total for period	Ci	4.91E+02	2.87E+02	3.03E+02	3.21E+02

2. GASEOUS IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	3.00E-02	1.60E-02	9.43E-03	1.01E-02
iodine-132	Ci	1.40E-01	1.06E-01	5.03E-02	4.87E-02
iodine-133	Ci	2.21E-01	1.56E-01	7.66E-02	8.05E-02
iodine-134	Ci	4.36E-01	3.35E-01	1.32E-01	1.03E-01
iodine-135	Ci	3.52E-01	2.66E-01	1.22E-01	1.24E-01
total for period	Ci	1.18E+00	8.79E-01	3.90E-01	3.66E-01

3. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
manganese-54	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-58	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-60	Ci	1.40E-05	9.37E-06	≤ LLD	≤ LLD
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	1.35E-03	4.80E-04	3.90E-04	5.06E-04
strontium-90	Ci	1.88E-05	6.26E-06	2.48E-06	2.82E-06
ruthenium-106	Ci	≤ LLD	1.61E-04	≤ LLD	≤ LLD
cesium-134	Ci	≤ LLD	≤ LLD	1.55E-06	≤ LLD
cesium-137	Ci	2.08E-06	≤ LLD	2.70E-06	2.22E-06
barium-140	Ci	3.53E-03	9.95E-04	1.54E-03	1.12E-03
lanthanum-140	Ci	6.37E-03	1.67E-03	2.59E-03	2.02E-03
total for period	Ci	1.13E-02	3.32E-03	4.53E-03	3.65E-03

4. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
hydrogen-3	Ci	1.86E+01	3.40E+01	3.70E+01	3.11E+01

Attachment 2
Effluent and Waste Disposal Data

Table 1C: Gaseous Effluents – Ground Level Releases
Continuous Release

Nuclides Released

1. FISSION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
krypton-85m	Ci	1.81E-02	≤ LLD	≤ LLD	≤ LLD
krypton-87	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
krypton-88	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
xenon-133	Ci	1.57E+01	3.03E-01	2.69E-01	≤ LLD
xenon-135	Ci	8.87E+00	5.65E+00	7.10E+00	6.62E+00
xenon-135m	Ci	1.82E+01	8.72E+00	7.63E+00	6.37E+00
xenon-137	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
xenon-138	Ci	1.67E-01	1.54E-01	≤ LLD	≤ LLD
total for period	Ci	4.30E+01	1.48E+01	1.50E+01	1.30E+01

2. GASEOUS IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	9.47E-03	3.55E-04	5.28E-04	5.30E-04
iodine-132	Ci	1.07E-02	3.88E-03	4.84E-03	6.42E-03
iodine-133	Ci	1.31E-02	3.26E-03	4.92E-03	5.23E-03
iodine-134	Ci	3.94E-02	7.08E-03	1.33E-02	1.11E-02
iodine-135	Ci	2.24E-02	7.26E-03	8.45E-03	1.05E-02
total for period	Ci	9.50E-02	2.18E-02	3.20E-02	3.37E-02

3. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
chromium-51	Ci	3.49E-05	2.89E-05	≤ LLD	≤ LLD
manganese-54	Ci	2.71E-06	1.32E-06	≤ LLD	≤ LLD
cobalt-58	Ci	6.17E-06	4.84E-06	≤ LLD	≤ LLD
cobalt-60	Ci	1.24E-04	9.29E-05	2.43E-05	3.41E-05
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	3.11E-05	5.38E-06	5.47E-05	5.91E-06
strontium-90	Ci	7.98E-07	≤ LLD	5.12E-07	2.43E-07
cesium-134	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-137	Ci	4.67E-06	≤ LLD	≤ LLD	≤ LLD
barium-140	Ci	1.32E-04	1.22E-05	≤ LLD	≤ LLD
lanthanum-140	Ci	2.78E-04	1.81E-05	≤ LLD	≤ LLD
cerium-141	Ci	6.20E-06	1.68E-07	≤ LLD	≤ LLD
total for period	Ci	6.21E-04	1.64E-04	7.95E-05	4.03E-05

4. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
hydrogen-3	Ci	3.92E+01	3.11E+01	3.02E+01	3.49E+01

Attachment 2
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents – Summation of all Releases

A. FISSION AND ACTIVATION PRODUCTS (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release (excluding tritium, gases, and alpha)	Ci	1.32E-03	1.49E-03	1.89E-03	1.18E-03	4.00E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	1.17E-10	1.02E-10	1.08E-10	6.95E-11	NA
3. Percent of applicable limit	%	7.23E-03	6.37E-03	5.30E-03	4.26E-03	NA

B. TRITIUM (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	9.06E+01	7.80E+01	3.98E+01	5.45E+01	4.50E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	8.02E-06	5.36E-06	2.27E-06	3.20E-06	NA
3. Percent of applicable limit	%	8.02E-01	5.36E-01	2.27E-01	3.20E-01	NA

C. DISSOLVED AND ENTRAINED GASES (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	3.31E-02	2.91E-02	1.84E-02	2.66E-02	4.00E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	2.93E-09	2.00E-09	1.05E-09	1.56E-09	NA
3. Percent of applicable limit	%	1.46E-03	1.00E-03	5.25E-04	7.80E-04	NA

D. GROSS ALPHA RADIOACTIVITY

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD	4.00E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases
NOTE 2: Does not include rainwater (i.e. Storm Drain Collection Basin and/or Storm Drain Stabilization Pond)

Attachment 2
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents – Summation of all Releases

E. VOLUME OF WASTE RELEASED (NOTE 2)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total volume	liters	2.32E+06	2.50E+06	2.33E+06	2.29E+06	1.50E+01

F. VOLUME OF DILUTION WATER

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total volume (used during release for average diluted concentration)	liters	1.13E+10	1.46E+10	1.75E+10	1.70E+10	1.50E+01

G. VOLUME OF COOLING WATER DISCHARGED FROM PLANT

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total volume	liters	3.43E+11	4.47E+11	5.02E+11	4.62E+11	1.50E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases
NOTE 2: Does not include rainwater (i.e. Storm Drain Collection Basin and/or Storm Drain Stabilization Pond)

Attachment 2
Effluent and Waste Disposal Data

Table 2B: Liquid Effluents - Batch Mode

Nuclides Released

1. FISSION AND ACTIVATION PRODUCTS

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
manganese-54	Ci	≤ LLD	7.21E-05	2.64E-06	≤ LLD
iron-55	Ci	5.26E-04	3.85E-04	≤ LLD	≤ LLD
cobalt-58	Ci	≤ LLD	6.83E-05	1.95E-06	≤ LLD
cobalt-60	Ci	7.37E-04	7.44E-04	3.19E-04	1.80E-04
strontium-89	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-90	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
iodine-131	Ci	≤ LLD	≤ LLD	7.81E-04	5.94E-04
iodine-133	Ci	3.35E-05	1.39E-05	7.04E-04	3.98E-04
iodine-135	Ci	≤ LLD	≤ LLD	1.36E-05	≤ LLD
cesium-134	Ci	8.18E-07	3.00E-05	5.14E-06	1.97E-06
cesium-137	Ci	2.34E-05	1.79E-04	5.86E-05	1.04E-05
barium-140	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
lanthanum-140	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cerium-144	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
total for period	Ci	1.32E-03	1.49E-03	1.89E-03	1.18E-03

2. DISSOLVED AND ENTRAINED GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
krypton-85	Ci	5.57E-04	≤ LLD	≤ LLD	≤ LLD
xenon-133	Ci	5.19E-03	4.63E-03	3.17E-03	4.19E-03
xenon-133m	Ci	≤ LLD	3.50E-05	≤ LLD	≤ LLD
xenon-135	Ci	2.73E-02	2.44E-02	1.52E-02	2.24E-02
xenon-135m	Ci	4.41E-05	2.28E-05	≤ LLD	4.66E-06
total for period	Ci	3.31E-02	2.91E-02	1.84E-02	2.66E-02

Attachment 2
Effluent and Waste Disposal Data

Lower Limits of Detection

Units: μCi/ml

1. LIQUID RELEASES

Alpha	3.69E-08
H-3	2.58E-06
Cr-51	1.48E-07
Mn-54	2.33E-08
Fe-55	1.31E-07
Co-58	2.77E-08
Fe-59	3.96E-08
Co-60	2.65E-08
Zn-65	3.87E-08
Sr-89	2.99E-08
Sr-90	1.33E-08
Mo-99	1.39E-07
I-131	1.82E-08
I-133	1.44E-08
I-135	6.57E-08
Cs-134	3.13E-08
Cs-137	2.50E-08
Ba-140	5.07E-08
La-140	4.28E-08
Ce-141	2.38E-08
Ce-144	1.06E-07
Kr-85	5.40E-06
Kr-87	4.35E-08
Kr-88	7.32E-08
Xe-133	4.27E-08
Xe-133m	1.47E-07
Xe-135	1.40E-08
Xe-135m	6.78E-08
Xe-138	1.90E-07

2. GASEOUS RELEASES

Kr-85m	6.68E-09
Kr-87	1.55E-08
Kr-88	1.50E-08
Xe-133	1.40E-08
Xe-133m	5.84E-08
Xe-135	2.52E-09
Xe-135m	2.12E-08
Xe-137	6.70E-07
Xe-138	4.14E-08

3. IODINES AND PARTICULATES

Alpha	1.94E-15
H-3	4.62E-11
Mn-54	7.64E-13
Co-58	9.63E-13
Fe-59	2.08E-12
Co-60	1.18E-12
Zn-65	1.86E-12
Sr-89	2.33E-15
Sr-90	1.01E-15
Mo-99	3.37E-12
Ru-106	6.42E-12
I-131	5.36E-13
Cs-134	9.55E-13
Cs-137	8.47E-13
Ba-140	2.44E-12
La-140	9.83E-13
Ce-141	8.32E-13
Ce-144	4.49E-12

NOTES:

1. The above values represent typical "a priori" LLDs for isotopes where values of "≤ LLD" are indicated in Tables 1A, 1B, 1C, 2A, and 2B. Also included are isotopes specified in ODCMS 7.3.3 and 7.3.7.

2. Where activity for any nuclide is reported as "≤ LLD," that nuclide is considered not present and the LLD activity listed is not considered in the summary data.

Attachment 2
Effluent and Waste Disposal Data

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

Waste Class A

1. Total volume shipped (cubic meters) 9.08E+02

   Total curie quantity (estimated) 5.35E+01

2. Type of Waste

		Unit	Period	Estimated Total %Error
a.	Spent resins, filter, sludges	meter^3	3.86E+01	
		Curies	5.24E+01	1.00E+01
b.	Dry active waste, compacted/non-compacted	meter^3	8.70E+02	
		Curies	1.16E+00	1.00E+01
c.	Irradiated components	meters^3	0.00E+00	
		Curies	0.00E+00	N/A
d.	Others (describe)	meters^3	0.00E+00	
		Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

a.

H-3	6.53E+00 %
Mn-54	1.65E+00 %
Fe-55	2.16E+01 %
Co-60	5.27E+01 %
Ni-63	1.09E+01 %
Zn-65	1.23E+00 %
Cs-134	1.15E+00 %
Cs-137	3.38E+00 %
Ce-144	1.44E+00 %

b.

Mn-54	6.03E+00 %
Fe-55	2.04E+01 %
Co-60	6.87E+01 %
Ni-63	4.47E+00 %

c. N/A

d. N/A

NOTE:

Solid Radioactive Waste listed above was shipped for processing to various waste processing services or directly shipped to a licensed disposal facility.

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

4. Cross reference table, waste stream, form, and container type

Stream	Form	Container Type Type A/Type B	No. of shipments
a. Resin	Dewatered	Type A or GP	9.0E+00
b. Dry active waste	Compacted/ Non-compacted	Type A or GP	1.9E+01
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

Number of Shipments	Mode of Transportation	Destination
5.0E+00	Highway	Oak Ridge, TN
5.0E+00	Highway	Erwin, TN
3.0E+00	Highway	Richland, WA
9.0E+00	Rail	Clive, UT
1.0E+00	Highway	Clive, UT
5.0E+00	Highway	Ashford, AL

b. Irradiated Fuel

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

Attachment 2
Effluent and Waste Disposal Data

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

Waste Class B

1. Total volume shipped (cubic meters) 1.77E+00

   Total curie quantity (estimated) 1.89E+02

2. Type of Waste

		Unit	Period	Estimated Total %Error
a.	Spent resins, filter, sludges	meter^3	1.77E+00	
		Curies	1.89E+02	1.00E+01
b.	Dry active waste, compacted/non-compacted	meter^3	0.00E+00	
		Curies	0.00E+00	N/A
c.	Irradiated components	meters^3	0.00E+00	
		Curies	0.00E+00	N/A
d.	Others (describe)	meters^3	0.00E+00	
		Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

a.

Cr-51	1.13E+00 %
Mn-54	2.83E+00 %
Fe-55	2.63E+01 %
Co-58	3.85E+00 %
Co-60	5.43E+01 %
Ni-63	0.77E+00 %
Zn-65	5.95E+00 %
Cs-134	1.55E+00 %
Cs-137	1.75E+00 %

b. N/A

c. N/A

d. N/A

NOTE:

Solid Radioactive Waste was shipped either directly for disposal or to a waste processor for processing and then transported for disposal by the processor.

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

4. Cross reference table, waste stream, form, and container type

Stream	Form	Container Type Type A/Type B	No. of shipments
a. Resin & Filters	Dewatered	Type B	2.00E+00
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

Number of Shipments	Mode of Transportation	Destination
2.00E+00	Highway	Erwin, TN

b. Irradiated Fuel

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

Attachment 2
Effluent and Waste Disposal Data

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

Waste Class C

1. Total volume shipped (cubic meters) 6.65E+00

   Total curie quantity (estimated) 4.72E+04

2. Type of Waste

		Unit	Period	Estimated Total %Error
a.	Spent resins, filter, sludges	meter^3	0.00E+00	
		Curies	0.00E+00	N/A
b.	Dry active waste, compacted/non-compacted	meter^3	0.00E+00	
		Curies	0.00E+00	N/A
c.	Irradiated components	meters^3	6.65E+00	
		Curies	4.72E+04	1.00E+01
d.	Others (describe)	meters^3	0.00E+00	
		Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

   a. N/A

   b. N/A

   c.

Mn-54	3.43E+00 %
Fe-55	5.71E+01 %
Co-60	2.86E+01 %
Ni-63	3.77E+00 %
Hf-181	1.46E+00 %
Ta-182	4.62E+00 %

   d. N/A

NOTE:

Solid Radioactive Waste was shipped either directly for disposal or to a waste processor for processing and then transported for disposal by the processor.

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

4. Cross reference table, waste stream, form, and container type

Stream	Form	Container Type Type A/Type B	No. of shipments
a. Resin & Filters	Dewatered	N/A	N/A
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		Type B	3.00E+00
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

Number of Shipments	Mode of Transportation	Destination
3.00E+00	Highway	Barnwell, SC

b. Irradiated Fuel

Number of Shipments	Mode of Transportation	Destination
7.00E+00	Rail	New Hill, NC

Enclosure 1: Milk and Vegetable Sample Location

Enclosure 2: Land Use Census

Enclosure 1: Milk and Vegetable Sample Location

No milk animals are located in the area evaluated by the last Land Use Census, therefore, no milk sampling locations were available during this time period.

Enclosure 2: Land Use Census

The 2007 Land Use Census did not identify any locations that are reportable in the Radioactive Effluent Release Report for 2007.

The following is a summary of the nearest resident and garden locations identified within five miles of the plant for each of the 16 meteorological sectors. No milk animals were found within five miles of the plant.

Direction	Residence	Garden
NNE	0.8 miles	None
NE	None	None
ENE	None	None
E	None	None
ESE	1.4 miles	None
SE	None	None
SSE	2.1 miles	None
S	1.1 miles	1.7 miles
SSW	1.2 miles	1.9 miles
SW	1.1 miles	2.5 miles
WSW	1.2 miles	1.2 miles
W	0.9 miles	1.0 miles
WNW	0.9 miles	None
NW	0.9 miles	4.9 miles
NNW	0.8 miles	0.9 miles
N	0.8 miles	1.0 miles

Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation

Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation

Enclosure 3: Liquid Hold-Up Tank

Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation

No Radioactive Liquid Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.

Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation

No Radioactive Gaseous Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.

Enclosure 3: Liquid Hold-Up Tank

No Liquid Hold-Up Tank exceeded the 10-Curie limit of ODCMS 7.3.6 during this reporting period.

Attachment 5

Major Modification To The Radioactive Waste Treatment Systems

In accordance with ODCMS 7.5.1, major changes to the liquid, gaseous, and solid Radioactive Waste Treatment Systems shall be reported to the NRC as part of the Radioactive Effluent Release Report or as part of the Updated Final Safety Analysis Report (UFSAR) update. Any major modifications to the radioactive waste treatment systems will be submitted with the UFSAR in accordance with 10 CFR 50.71(e). No changes have been made during this reporting period.

Attachment 6

Meteorological Data

Per Technical Specification 5.6.3 and ODCMS 7.4.2, the annual summary of meteorological data collected over the calendar year has been retained in a file and is available for NRC review upon request.

Attachment 7

Annual Dose Assessment

Summary

Liquid Effluents [1]

Critical Age: Adult
Controlling location for liquid releases: SW sector at 0.1 miles

	(mrem)	Limit: (mrem)
GI-LLI	9.66E-04	2.00E+01
Bone	3.25E-04	2.00E+01
Liver	7.07E-04	2.00E+01
Lung	5.68E-04	2.00E+01
Total Body	5.58E-04	6.00E+00
Thyroid	1.27E-03	2.00E+01
Kidney	4.60E-04	2.00E+01

Gaseous Effluents [1]

Noble Gas: Critical Age: Infant
Controlling location: NE sector at 0.7 mile

	(mrad)	Limit: (mrad)
Gamma	3.25E-02	2.00E+01
Beta	1.32E-02	4.00E+01

Iodine, Particulates, and Tritium: Critical Age: Infant
Controlling location: NE sector at 4.75 mile
Assuming a cow milk pathway

	(mrem)	Limit: (mrem)
Thyroid	4.62E-01	3.00E+01
Kidney	3.45E-03	3.00E+01
Liver	3.21E-03	3.00E+01
Total Body	2.37E-03	3.00E+01
Skin	1.75E-03	3.00E+01
GI_LLI	1.81E-03	3.00E+01
Lung	1.75E-03	3.00E+01
Bone	1.50E-03	3.00E+01

[1] Reference – dose determined using site specific ODCM software

Attachment 8

Off-Site Dose Calculation Manual (ODCM) And Process Control Program (PCP) Revisions

There were no revisions to the ODCM and no revisions to the PCP during the report period.