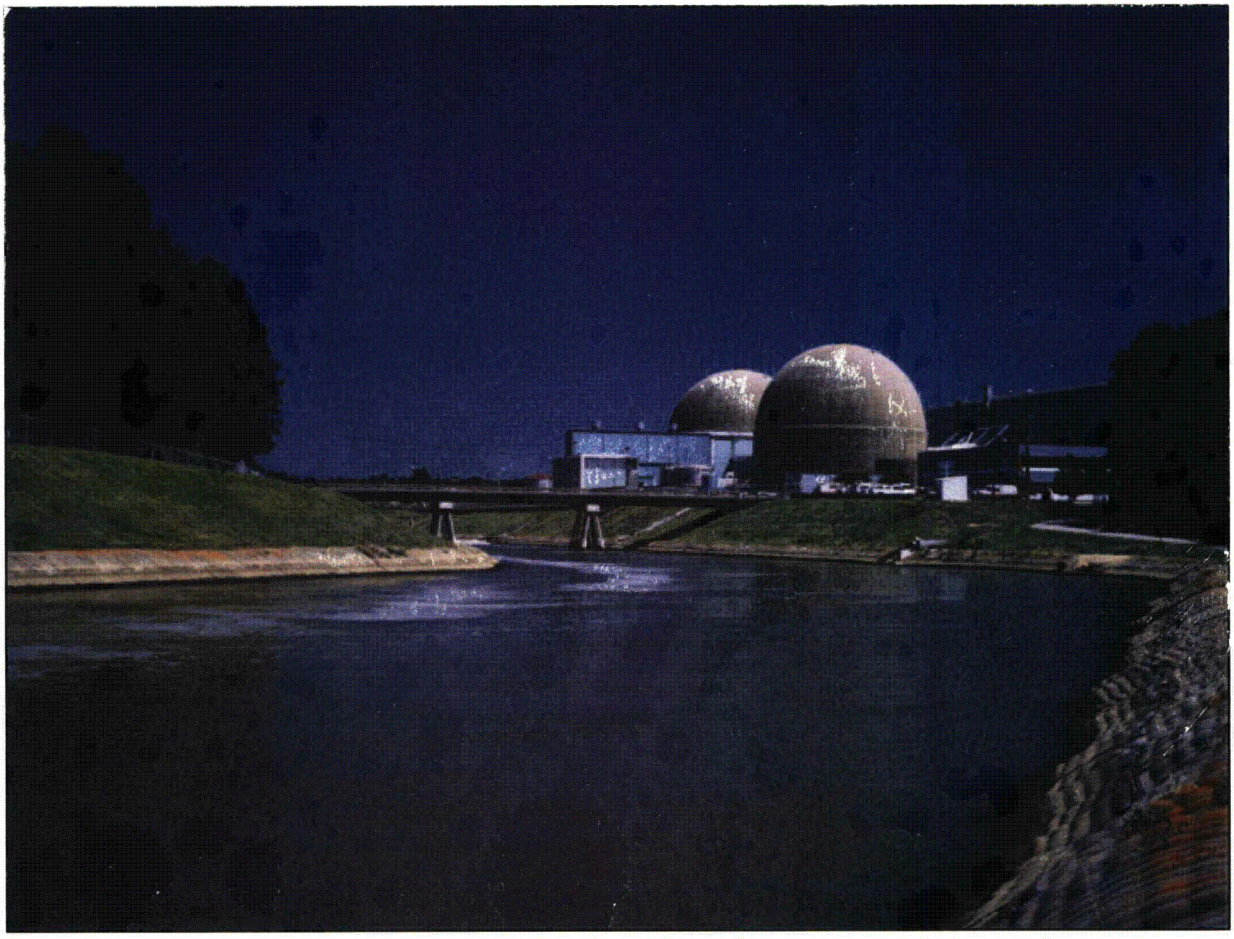
ATTACHMENT 1

2012 Annual Radioactive Effluent Release Report

SURRY POWER STATION UNITS 1 AND 2
VIRGINIA ELECTRIC AND POWER COMPANY

Surry Power Station



2012 Annual Radioactive Effluent Release Report

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

SURRY POWER STATION

January 1, 2012 through December 31, 2012

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

FOR THE

SURRY POWER STATION

January 1, 2012 through December 31, 2012

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FORWARD

This report is submitted as required by Appendix A to Operating License Nos. DPR-32 and DPR-37, Technical Specifications for Surry Power Station, Units 1 and 2, Virginia Electric and Power Company, Docket Nos. 50-280, 50-281, Section 6.6.B.3.

EXECUTIVE SUMMARY
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

The Annual Radioactive Effluent Release Report describes the radiological effluent control program conducted at Surry Power Station during the 2012 calendar year. This document summarizes the quantities of radioactive liquid and gaseous effluents and solid waste released from Surry Power Station in accordance with Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants", Revision 1, June 1974. The report also includes an assessment of radiation doses to the maximum exposed member of the public due to the radioactive liquid and gaseous effluents.

During this reporting period, there were no unplanned liquid or gaseous effluent releases as classified according to the criteria in the Offsite Dose Calculation Manual.

Based on the 2012 effluent release data, 10CFR50 Appendix I dose calculations were performed in accordance with the Offsite Dose Calculation Manual. The dose calculations are as follows:

1. The total body dose due to liquid effluents was 2.80-04 mrem, which is 4.67-03% of the 6 mrem dose limit. The critical organ doses due to liquid effluents, GI-LLI and Liver respectively, were 3.12E-04 mrem and 2.82E-04 mrem. These doses are 1.56E-03% and 1.41E-03% of the respective 20 mrem dose limit.

2. The air dose due to noble gases in gaseous effluents was 4.12E-05 mrad gamma, which is 2.06E-04% of the 20 mrad gamma dose limit, and 6.39E-05 mrad beta, which is 1.60E-04% of the 40 mrad beta dose limit.

3. The critical organ dose from gaseous effluents due to I-131, I-133, H-3, and particulates with half-lives greater than 8 days is 1.25E-01 mrem, which is 4.17E-01% of the 30 mrem dose limit.

There were no major changes to the radioactive liquid, gaseous or solid waste treatment systems during this reporting period.

There were no changes to VPAP-2103S, Offsite Dose Calculation Manual, during this reporting period.

In accordance with the Nuclear Energy Institute (NEI) Industry Ground Water Protection Initiative, analysis results of ground water monitoring locations not included in the Radiological Environmental Monitoring Program (REMP), will be included in this report. Ground water monitoring well sample results are provided in Attachment 8.

Based on the radioactivity measured and the dose calculations performed during this reporting period, the operation of Surry Power Station has resulted in negligible radiation dose consequences to the maximum exposed member of the public in unrestricted areas.

Purpose and Scope

Attachment 1 includes a summary of the quantities of radioactive liquid and gaseous effluents and solid waste as outlined in Regulatory Guide 1.21, with data summarized on a quarterly or annual basis following the format of Tables 1, 2 and 3 of Appendix B, thereof. Attachment 2 of this report includes an assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site during 2012.

As required by Technical Specification 6.8.B, changes to the Offsite Dose Calculation Manual (ODCM) for the time period covered by this report are included in Attachment 3. Major changes to the radioactive liquid, gaseous and solid waste treatment systems are reported in Attachment 4, as required by the ODCM, Section 6.7.2. If changes are made to these systems, the report shall include information to support the reason for the change and a summary of the 10CFR50.59 evaluation. In lieu of reporting major changes in this report, major changes to the radioactive waste treatment systems may be submitted as part of the annual FSAR update.

As required by the ODCM, Sections 6.2.2 and 6.3.2, a list and explanation for the inoperability of radioactive liquid and/or gaseous effluent monitoring instrumentation is provided in Attachment 5 of this report. Additionally, a list of unplanned releases during the reporting period is included in Attachment 6.

Attachment 7 provides the typical lower limit of detection (LLD) capabilities of the radioactive effluent analysis instrumentation.

As required by the ODCM, Section 6.7.5, a summary of on-site radioactive spills or leaks that were communicated in accordance with the Industry Ground Water Protection Initiative reporting protocol, and sample analyses from ground water wells that are not part of the Radiological Environmental Monitoring Program are provided in Attachment 8.

Discussion

The basis for the calculation of the percent of technical specification for the critical organ in Table 1A of Attachment 1 is the ODCM, Section 6.3.1, which requires that the dose rate for iodine-131, iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days shall be less than or equal to 1500 mrem/yr to the critical organ at or beyond the site boundary. The critical receptor is the teen via the inhalation pathway.

The basis for the calculation of the percent of technical specification for the total body and skin in Table 1A of Attachment 1 is the ODCM, Section 6.3.1, which requires that the dose rate for noble gases to areas at or beyond site boundary shall be less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

The basis for the calculation of the percent of technical specification in Table 2A of Attachment 1 is the ODCM, Section 6.2.1, which states that the concentration of radioactive material releases in liquid effluents to unrestricted areas shall not exceed ten times the concentrations specified in 10CFR20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.00E-04 microcuries/mL.

Percent of technical specification calculations are based on the total gaseous or liquid effluents released for the respective quarter.

The annual and quarterly doses, as reported in Attachment 2, were calculated according to the methodology presented in the ODCM. The beta and gamma air doses due to noble gases released from the site were calculated at the site boundary. The maximum exposed member of the public from the release of airborne iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days, was a child at 2.05 miles with the critical organ being the bone via the ingestion pathway. The maximum exposed member of the public from radioactive materials in liquid effluents in unrestricted areas was an adult, exposed by either the invertebrate or fish pathway, with the critical organ typically being the gastrointestinal-lower large intestine. The total body dose was also determined for this individual.

Presented in Attachment 6 is a list of unplanned gaseous and liquid releases as required by the ODCM, Section 6.7.2.

The typical lower limit of detection (LLD) capabilities of the radioactive effluent analysis instrumentation are presented in Attachment 7. These LLD values are based upon conservative conditions (i.e., minimum sample volumes and maximum delay time prior to analysis). Actual LLD values may be lower. If a radioisotope was not detected when effluent samples were analyzed, then the activity of the radioisotope was reported as Not Detected (N/D) on Attachment 1 of this report. When all isotopes listed on Attachment 1 for a particular quarter and release mode are less than the lower limit of detection, then the totals for this period will be designated as Not Applicable (N/A).

Supplemental Information

Section 6.6.1 of the ODCM requires the identification of the cause(s) for the unavailability of milk, or if required, leafy vegetation samples, and the identification for obtaining replacement samples. As milk was available for collection during this reporting period, leafy vegetation sampling was not required.

As required by the ODCM, Section 6.6.2, evaluation of the Land Use Census is made to determine if new sample location(s) must be added to the Radiological Environmental Monitoring Program. Evaluation of the Land Use Census conducted for this reporting period identified no change in sample locations for the Radiological Environmental Monitoring Program.

Attachment 1

EFFLUENT RELEASE DATA

January 1, 2012 through December 31, 2012

This attachment includes a summary of the quantities of radioactive liquid and gaseous effluents and solid waste as outlined in Regulatory Guide 1.21, Appendix B.

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENT-SUMMATION OF ALL RELEASES

SURRY POWER STATION UNITS 1&2	UNIT	FIRST QUARTER	SECOND QUARTER	% EST. ERROR
A. FISSION & ACTIVATION GASES				
1. TOTAL RELEASE	Ci	2.40E-03	1.13E+00	1.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	3.05E-04	1.44E-01	
B. IODINE				
1. TOTAL I-131	Ci	N/D	N/D	2.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	N/A	N/A	
C. PARTICULATE				
1. HALF-LIFE >8 DAYS	Ci	N/D	4.45E-05	2.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	N/A	5.66E-06	
3. GROSS ALPHA RADIOACTIVITY	Ci	N/D	N/D	
D. TRITIUM				
1. TOTAL RELEASE	Ci	1.01E+01	1.20E+01	3.10E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	1.29E+00	1.52E+00	
E. CARBON-14				
1. TOTAL RELEASE	Ci	2.67E-02	1.26E+01	
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	3.40E-09	1.60E-06	
PERCENTAGE OF T.S. LIMITS				
CRITICAL ORGAN DOSE RATE	%	6.52E-03	8.45E-03	
TOTAL BODY DOSE RATE	%	1.47E-06	2.45E-05	
SKIN DOSE RATE	%	3.87E-07	7.96E-06	

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENT-SUMMATION OF ALL RELEASES

SURRY POWER STATION UNITS 1&2	UNIT	THIRD QUARTER	FOURTH QUARTER	% EST. ERROR
A. FISSION & ACTIVATION GASES				
1. TOTAL RELEASE	Ci	8.31E-03	4.55E-01	1.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	1.05E-03	5.73E-02	
B. IODINE				
1. TOTAL I-131	Ci	N/D	N/D	2.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	N/A	N/A	
C. PARTICULATE				
1. HALF-LIFE >8 DAYS	Ci	1.17E-07	3.00E-05	2.80E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	1.47E-08	3.77E-06	
3. GROSS ALPHA RADIOACTIVITY	Ci	N/D	N/D	
D. TRITIUM				
1. TOTAL RELEASE	Ci	3.65E+00	9.03E+00	3.10E+01
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	4.59E-01	1.14E+00	
E. CARBON-14				
1. TOTAL RELEASE	Ci	9.27E-02	5.06E+00	
2. AVE RELEASE RATE FOR PERIOD	µCi/sec	1.17E-08	6.37E-07	
PERCENTAGE OF T.S. LIMITS				
CRITICAL ORGAN DOSE RATE	%	2.33E-03	5.89E-03	
TOTAL BODY DOSE RATE	%	2.28E-08	3.92E-06	
SKIN DOSE RATE	%	8.97E-09	1.24E-06	

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENTS-MIXED MODE RELEASES

		CONTINUOUS MODE		BATCH MODE	
SURRY POWER STATION UNITS 1&2	UNIT	FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
1. FISSION & ACTIVATION GASES					
Kr-85	Ci	N/D	N/D	N/D	N/D
Kr-85m	Ci	N/D	N/D	N/D	7.58E-03
Kr-87	Ci	N/D	N/D	N/D	N/D
Kr-88	Ci	N/D	N/D	N/D	5.98E-03
Xe-133	Ci	N/D	N/D	2.19E-03	8.06E-01
Xe-135	Ci	N/D	N/D	N/D	2.43E-01
Xe-135m	Ci	N/D	N/D	N/D	N/D
Xe-138	Ci	N/D	N/D	N/D	N/D
Xe-131m	Ci	N/D	N/D	N/D	5.50E-03
Xe-133m	Ci	N/D	N/D	N/D	1.33E-02
Ar-41	Ci	N/D	N/D	N/D	3.58E-02
TOTAL FOR PERIOD	Ci	N/A	N/A	2.19E-03	1.12E+00
2. IODINES					
I-131	Ci	N/D	N/D	N/D	N/D
I-133	Ci	N/D	N/D	N/D	N/D
I-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A
3. PARTICULATES					
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	N/D	N/D	N/D	N/D
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Co-58	Ci	N/D	N/D	N/D	N/D
Co-60	Ci	N/D	N/D	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
C-14	Ci	N/D	N/D	2.45E-02	1.25E+01
TOTAL FOR PERIOD	Ci	N/A	N/A	2.45E-02	1.25E+01

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENTS-MIXED MODE RELEASES

		CONTINUOUS MODE		BATCH MODE	
SURRY POWER STATION UNITS 1&2	UNIT	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. FISSION & ACTIVATION GASES					
Kr-85	Ci	N/D	N/D	N/D	N/D
Kr-85m	Ci	N/D	N/D	N/D	8.47E-04
Kr-87	Ci	N/D	N/D	N/D	N/D
Kr-88	Ci	N/D	N/D	N/D	N/D
Xe-133	Ci	N/D	N/D	8.31E-03	3.93E-01
Xe-135	Ci	N/D	N/D	N/D	3.17E-02
Xe-135m	Ci	N/D	N/D	N/D	N/D
Xe-138	Ci	N/D	N/D	N/D	N/D
Xe-131m	Ci	N/D	N/D	N/D	1.54E-03
Xe-133m	Ci	N/D	N/D	N/D	4.73E-03
Ar-41	Ci	N/D	N/D	N/D	2.29E-02
TOTAL FOR PERIOD	Ci	N/A	N/A	8.31E-03	4.55E-01
2. IODINES					
I-131	Ci	N/D	N/D	N/D	N/D
I-133	Ci	N/D	N/D	N/D	N/D
I-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A
3. PARTICULATES					
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	N/D	N/D	N/D	N/D
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Co-58	Ci	1.17E-07	N/D	N/D	N/D
Co-60	Ci	N/D	N/D	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
C-14	Ci	N/D	N/D	9.27E-02	5.06E+00
TOTAL FOR PERIOD	Ci	1.17E-07	N/A	9.27E-02	5.06E+00

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
SURRY POWER STATION UNITS 1&2	UNIT	FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
1. FISSION & ACTIVATION GASES					
Kr-85	Ci	N/D	N/D	N/D	N/D
Kr-85m	Ci	N/D	N/D	N/D	N/D
Kr-87	Ci	N/D	N/D	N/D	N/D
Kr-88	Ci	N/D	N/D	N/D	N/D
Xe-133	Ci	3.40E-05	N/D	N/D	1.66E-02
Xe-135	Ci	7.83E-05	8.36E-06	N/D	N/D
Xe-135m	Ci	N/D	N/D	N/D	N/D
Xe-138	Ci	N/D	N/D	N/D	N/D
Xe-131m	Ci	N/D	N/D	N/D	N/D
Xe-133m	Ci	N/D	N/D	N/D	N/D
Ar-41	Ci	9.08E-05	4.96E-04	N/D	N/D
TOTAL FOR PERIOD	Ci	2.03E-04	5.04E-04	N/A	1.66E-02
2. IODINES					
I-131	Ci	N/D	N/D	N/D	N/D
I-132	Ci	N/D	N/D	N/D	N/D
I-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A
3. PARTICULATES					
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	N/D	N/D	N/D	2.35E-07
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Co-58	Ci	N/D	4.03E-05	N/D	N/D
Co-60	Ci	N/D	4.00E-06	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
C-14	Ci	2.26E-03	5.63E-03	N/D	1.85E-01
TOTAL FOR PERIOD	Ci	2.26E-03	5.67E-03	N/A	1.85E-01

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
SURRY POWER STATION UNITS 1&2	UNIT	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. FISSION & ACTIVATION GASES					
Kr-85	Ci	N/D	N/D	N/D	N/D
Kr-85m	Ci	N/D	N/D	N/D	N/D
Kr-87	Ci	N/D	N/D	N/D	N/D
Kr-88	Ci	N/D	N/D	N/D	N/D
Xe-133	Ci	N/D	N/D	N/D	7.74E-05
Xe-135	Ci	N/D	1.31E-04	N/D	N/D
Xe-135m	Ci	N/D	N/D	N/D	N/D
Xe-138	Ci	N/D	N/D	N/D	N/D
Xe-131m	Ci	N/D	N/D	N/D	N/D
Xe-133m	Ci	N/D	N/D	N/D	N/D
Ar-41	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	1.31E-04	N/A	7.74E-05
2. IODINES					
I-131	Ci	N/D	N/D	N/D	N/D
I-133	Ci	N/D	N/D	N/D	N/D
I-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A
3. PARTICULATES					
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	N/D	N/D	N/D	N/D
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Co-58	Ci	N/D	3.00E-05	N/D	1.94E-08
Co-60	Ci	N/D	N/D	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
C-14	Ci	N/D	1.46E-03	N/D	8.63E-04
TOTAL FOR PERIOD	Ci	N/A	1.49E-03	N/A	8.63E-04

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

SURRY POWER STATION UNITS 1&2	UNIT	FIRST QUARTER	SECOND QUARTER	% EST. ERROR
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE (NOT INCLUDING TRITIUM, GASES, ALPHA)	Ci	3.84E-04	2.44E-03	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	5.77E-13	3.74E-12	
3. PERCENT OF APPLICABLE LIMIT	%	5.18E-06	1.04E-05	
B. TRITIUM				
1. TOTAL RELEASE	Ci	3.79E+02	3.99E+02	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	5.69E-07	6.11E-07	
3. PERCENT OF APPLICABLE LIMIT	%	5.69E-03	6.11E-03	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	Ci	N/D	7.73E-06	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	N/A	1.18E-14	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	5.92E-09	
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	Ci	N/D	N/D	2.00E+01
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	LITERS	2.66E+07	3.78E+07	3.00E+00
F. VOLUME OF DILUTION WATER USED DURING PERIOD	LITERS	6.66E+11	6.53E+11	3.00E+00

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

SURRY POWER STATION UNITS 1&2	UNIT	THIRD QUARTER	FOURTH QUARTER	% EST. ERROR
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE (NOT INCLUDING TRITIUM, GASES, ALPHA)	Ci	1.26E-03	1.75E-03	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	1.65E-12	2.95E-12	
3. PERCENT OF APPLICABLE LIMIT	%	7.30E-06	7.30E-06	
B. TRITIUM				
1. TOTAL RELEASE	Ci	2.03E+02	3.83E+02	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	2.66E-07	6.45E-07	
3. PERCENT OF APPLICABLE LIMIT	%	2.66E-03	6.45E-03	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	Ci	N/D	1.43E-05	2.00E+01
2. AVE DIL. CONC. DURING PERIOD	µCi/mL	N/A	2.40E-14	
3. PERCENT OF APPLICABLE LIMIT	%	N/A	1.20E-08	
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	Ci	N/D	N/D	2.00E+01
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	LITERS	4.62E+07	4.30E+07	3.00E+00
F. VOLUME OF DILUTION WATER USED DURING PERIOD	LITERS	7.64E+11	5.95E+11	3.00E+00

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
LIQUID EFFLUENTS

SURRY POWER STATION UNITS 1&2	UNIT	CONTINUOUS MODE		BATCH MODE	
		FIRST QUARTER	SECOND QUARTER	FIRST QUARTER	SECOND QUARTER
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Fe-55	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	2.59E-04	3.56E-04	6.75E-05	1.27E-04
I-131	Ci	N/D	N/D	2.05E-06	5.74E-06
Co-58	Ci	N/D	4.81E-06	6.49E-06	1.55E-03
Co-60	Ci	N/D	N/D	4.96E-05	3.22E-04
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Cr-51	Ci	N/D	N/D	N/D	N/D
Zr-95	Ci	N/D	N/D	N/D	N/D
Nb-95	Ci	N/D	N/D	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Tc-99m	Ci	N/D	N/D	N/D	N/D
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
Sb-124	Ci	N/D	N/D	N/D	N/D
Sb-125	Ci	N/D	N/D	N/D	8.08E-05
Co-57	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	2.59E-04	3.61E-04	1.26E-04	2.08E-03
Xe-133	Ci	N/D	N/D	N/D	7.73E-06
Xe-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	7.73E-06

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD: 1/1/12 TO 12/31/12
LIQUID EFFLUENTS

SURRY POWER STATION UNITS 1&2	UNIT	CONTINUOUS MODE		BATCH MODE	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
Sr-89	Ci	N/D	N/D	N/D	N/D
Sr-90	Ci	N/D	N/D	N/D	N/D
Fe-55	Ci	N/D	N/D	N/D	N/D
Cs-134	Ci	N/D	N/D	N/D	N/D
Cs-137	Ci	3.91E-04	2.81E-04	9.86E-05	4.10E-05
I-131	Ci	N/D	N/D	N/D	N/D
Co-58	Ci	7.16E-06	4.29E-05	3.00E-04	5.71E-04
Co-60	Ci	N/D	N/D	1.23E-04	1.92E-04
Fe-59	Ci	N/D	N/D	N/D	N/D
Zn-65	Ci	N/D	N/D	N/D	N/D
Mn-54	Ci	N/D	N/D	N/D	N/D
Cr-51	Ci	N/D	N/D	N/D	1.38E-04
Zr-95	Ci	N/D	N/D	N/D	N/D
Nb-95	Ci	N/D	2.36E-06	N/D	N/D
Mo-99	Ci	N/D	N/D	N/D	N/D
Tc-99m	Ci	N/D	N/D	N/D	N/D
Ba-140	Ci	N/D	N/D	N/D	N/D
La-140	Ci	N/D	N/D	N/D	N/D
Ce-141	Ci	N/D	N/D	N/D	N/D
Ce-144	Ci	N/D	N/D	N/D	N/D
Sb-124	Ci	N/D	N/D	2.54E-06	5.18E-06
Sb-125	Ci	N/D	N/D	3.42E-04	4.79E-04
Co-57	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	3.98E-04	3.26E-04	8.66E-04	1.43E-03
Xe-133	Ci	N/D	N/D	N/D	1.43E-05
Xe-135	Ci	N/D	N/D	N/D	N/D
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	1.43E-05

TABLE 3

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
PERIOD: 1/1/12 - 12/31/12

SURRY POWER STATION
A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste		12 month Period		Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	2.48E+01	Note 1	1.00E+01
	Ci	4.67E+02		3.00E+01
b. Dry compressible waste, contaminated equip., etc.	m^3	3.98E+02	Note 2	1.00E+01
	Ci	6.44E-01		3.00E+01
c. Irradiated components, control rods, etc.	m^3	0.00E+00		1.00E+01
	Ci	0.00E+00		3.00E+01
d. Other (Waste oil)	m^3	4.62E+00	Note 3	1.00E+01
	Ci	6.37E-03		3.00E+01

2. Estimate of major nuclide composition (by type of waste)

a. Co-60	%	4.58E+01	
Ni-63	%	3.74E+01	
Fe-55	%	1.16E+01	
Cs-137	%	1.95E+00	
Mn-54	%	1.44E+00	
b. Co-60	%	4.42E+01	
Ni-63	%	2.55E+01	
Cs-137	%	1.35E+01	
Fe-55	%	1.01E+01	
Cr-51	%	1.86E+00	
Co-58	%	1.61E+00	
Mn-54	%	1.22E+00	
c.	%		
d. Ce-144	%	6.46E+01	
Co-60	%	2.15E+01	
Cs-137	%	1.38E+01	

TABLE 3

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
PERIOD: 1/1/12 - 12/31/12
CONTINUED

SURRY POWER STATION

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
19	Truck	Oak Ridge, TN (Energy*Solutions*)
2	Truck	Erwin, TN (Studsvik)

B. IRRADIATED FUEL SHIPMENT (Disposition)

Number of Shipments	Mode of Transportation	Destination
0		

NOTE 1: Some of this waste was shipped to licensed waste processors for processing and/or volume reduction. Therefore, this volume is not representative of the actual volume buried. The total volume buried for this reporting period is 5.72E+00 m^3. Burial volume by Studsvik is indeterminable due to mixing of Surry waste with other generators waste.

NOTE 2: Some DAW was shipped to licensed waste processors for processing and/or volume reduction. Therefore, this volume is not representative of the actual volume buried. The total volume buried for this reporting period is 1.83E+02 m^3.

NOTE 3: Some of this waste was shipped to licensed waste processors for processing and/or volume reduction. Therefore, this volume is not representative of the actual volume buried. The total volume buried for this reporting period is 0.00E+00 m^3.

ANNUAL AND QUARTERLY DOSES

An assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site for each calendar quarter for the calendar year of this report, along with an annual total of each effluent pathway is made pursuant to the ODCM, Section 6.7.2, requirement.

2012	LIQUID			GASEOUS		
	Total Body (mrem)	GI-LLI (mrem)	Liver (mrem)	Gamma (mrad)	Beta (mrad)	Bone (mrem)
1st Quarter	6.95E-05	6.88E-05	7.03E-05	1.92E-06	1.03E-06	3.18E-04
2nd Quarter	8.44E-05	1.01E-04	8.44E-05	3.39E-05	5.52E-05	9.21E-02
3rd Quarter	3.59E-05	3.80E-05	3.67E-05	3.44E-08	1.02E-07	5.80E-04
4th Quarter	9.00E-05	1.04E-04	9.03E-05	5.40E-06	7.53E-06	3.18E-02
Annual	2.80E-04	3.12E-04	2.82E-04	4.12E-05	6.39E-05	1.25E-01

REVISIONS TO OFFSITE DOSE CALCULATION MANUAL (ODCM)

As required by Technical Specification 6.8.B, revisions to the ODCM, effective for the time period covered by this report, are included with this attachment. There were no revisions to the ODCM implemented during this reporting period.

MAJOR CHANGES TO RADIOACTIVE LIQUID, GASEOUS AND SOLID WASTE TREATMENT SYSTEMS

There were no major changes to the radioactive liquid, gaseous or solid waste treatment systems for this reporting period.

INOPERABILITY OF RADIOACTIVE LIQUID AND GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The Annual Radioactive Effluent Release Report shall explain why monitoring instrumentation required by the ODCM Attachments 1 and 5, which were determined to be inoperable, were not returned to operable status within 30 days. None of the above referenced instrumentation were inoperable greater than 30 days during this reporting period.

UNPLANNED RELEASES

There were no unplanned liquid or unplanned gaseous releases during this reporting period.

LOWER LIMIT OF DETECTION (LLD) FOR EFFLUENT SAMPLE ANALYSIS

	Isotope	Required LLD	Typical LLD
GASEOUS:	Kr-87	1.00E-04	2.06E-08 - 2.44E-05
	Kr-88	1.00E-04	2.50E-08 - 2.59E-05
	Xe-133	1.00E-04	1.48E-08 - 4.06E-05
	Xe-133m	1.00E-04	4.83E-08 - 4.06E-05
	Xe-135	1.00E-04	5.32E-09 - 7.73E-06
	Xe-135m	1.00E-04	2.46E-07 - 9.41E-05
	Xe-138	1.00E-04	6.58E-07 - 9.90E-05
	I-131	1.00E-12	7.22E-14 - 4.06E-13
	I-133	1.00E-10	1.45E-12 - 4.06E-11
	Sr-89	1.00E-11	1.45E-14 - 2.03E-12
	Sr-90	1.00E-11	1.55E-15 - 4.69E-13
	Cs-134	1.00E-11	4.96E-14 - 3.15E-13
	Cs-137	1.00E-11	1.39E-14 - 3.34E-13
	Mn-54	1.00E-11	3.60E-14 - 3.57E-13
	Fe-59	1.00E-11	9.62E-14 - 5.80E-12
	Co-58	1.00E-11	6.65E-14 - 3.14E-13
	Co-60	1.00E-11	4.82E-14 - 5.62E-13
	Zn-65	1.00E-11	1.60E-13 - 7.11E-13
	Mo-99	1.00E-11	4.80E-13 - 4.06E-12
	Ce-141	1.00E-11	5.52E-14 - 3.35E-13
	Ce-144	1.00E-11	2.23E-13 - 1.23E-12
	Alpha	1.00E-11	1.70E-14 - 1.77E-14
	Tritium	1.00E-06	6.38E-08 - 6.38E-08
LIQUID:	Sr-89	5.00E-08	1.71E-08 - 4.99E-08
	Sr-90	5.00E-08	4.67E-09 - 1.43E-08
	Cs-134	5.00E-07	1.01E-08 - 7.13E-08
	Cs-137	5.00E-07	1.84E-09 - 7.63E-08
	I-131	1.00E-06	9.22E-09 - 5.11E-08
	Co-58	5.00E-07	1.23E-08 - 6.54E-08
	Co-60	5.00E-07	7.40E-09 - 1.10E-07
	Fe-59	5.00E-07	1.57E-08 - 1.08E-07
	Zn-65	5.00E-07	2.61E-08 - 1.38E-07
	Mn-54	5.00E-07	6.64E-09 - 7.17E-08
	Mo-99	5.00E-07	8.00E-08 - 4.95E-07
	Ce-141	5.00E-07	1.26E-08 - 8.95E-08
	Ce-144	5.00E-07	5.20E-08 - 3.47E-07
	Fe-55	1.00E-06	1.67E-07 - 6.88E-07
	Alpha	1.00E-07	2.82E-08 - 2.84E-08
	Tritium	1.00E-05	1.58E-06 - 1.58E-06
	Xe-133	1.00E-05	2.30E-08 - 8.72E-07
	Xe-135	1.00E-05	7.79E-09 - 5.62E-08
	Xe-133m	1.00E-05	7.09E-08 - 3.81E-07
	Xe-135m	1.00E-05	3.43E-07 - 3.50E-06
	Xe-138	1.00E-05	9.61E-07 - 8.15E-06
	Kr-87	1.00E-05	2.93E-08 - 1.92E-07
	Kr-88	1.00E-05	3.71E-08 - 2.08E-07

INDUSTRY GROUND WATER PROTECTION INITIATIVE

The Annual Radioactive Effluent Release Report shall include a summary of on-site radioactive spills or leaks that were communicated in accordance with the Initiative reporting protocol, and also include sample analyses from ground water monitoring wells that are not part of the Radiological Environmental Monitoring Program (REMP). There were three on-site radioactive leaks communicated in accordance with the Initiative in 2012.

On 8/8/2012, an inspection of the east storm drain line determined the presence of a 6" hole in the corrugated drain line. This hole provided a direct leakage pathway to ground for portion of the fluid passing through the line. The #3 Turbine Building sump was sampled for radioactivity since the sump was known to discharge to the east storm drain line upstream of the hole discovered in the storm drain line. The discharge of the sump was redirected to prevent additional releases through the damaged storm drain line. Tritium was determined to be present in the sump water at a concentration of 1,250 picoCuries /Liter and the leak was voluntarily reported to County and State officials and the Nuclear Regulatory Commission. An exact volume of water that leaked through the storm drain could not be determined, but is estimated to be greater than 100 gallons. The causes of the damage to the storm drain line were related to the age of the line and the environmental conditions within the specific damaged area.

On 9/17/2012 and 9/23/2012, the Unit 2 Turbine Building heating steam drain receiver tank over-flowed to the damaged storm drain line described above. A sample of the water in the tank confirmed the presence of tritium at a concentration of 1,450 picoCuries/Liter and these leaks were subsequently reported to County and State officials and the Nuclear Regulatory Commission. The 9/17/2012 over-flow event occurred due the failure of the tank discharge pump. The 9/23/2012 over-flow event occurred due to the failure of the tank discharge pump to motor coupling. Each over-flow was estimated to be greater than 100 gallons.

The location of the leaks described above is within the Protected Area of Surry Power Station. Repairs to the storm drain line have been completed and no tritium has been detected in monitoring wells in the vicinity of this previously degraded storm drain line nor in any monitoring wells outside the Protected Area.

INDUSTRY GROUND WATER PROTECTION INITIATIVE

The following is a summary of 2012 sample analyses of ground water monitoring wells that are not a part of the Radiological Environmental Monitoring Program (REMP). Analyses are performed by an independent laboratory.

Well Designation	Sample Date	Tritium pCi/Liter	Gamma pCi/Liter	Fe-55 pCi/Liter	Ni-63 pCi/Liter	Sr-90 pCi/Liter	TRU pCi/Liter
1-PL-Piez-04	2/22/12	<1,020	ND	NA	NA	NA	NA
1-PL-Piez-05	2/21/12	10,000	ND	NA	NA	NA	NA
1-PL-Piez-06	2/21/12	1,930	ND	NA	NA	NA	NA
1-PL-Piez-07	2/22/12	<771	ND	NA	NA	NA	NA
1-PL-Piez-27	2/22/12	<1,010	ND	NA	NA	NA	NA
1-PL-Piez-29	2/22/12	8,620	ND	NA	NA	NA	NA
1-PL-Piez-33	2/21/12	<1,020	ND	NA	NA	NA	NA
1-PL-Piez-34	2/21/12	<1,010	ND	NA	NA	NA	NA
1-PL-Piez-41	2/21/12	<1,010	ND	NA	NA	NA	NA
1-PL-Piez-42	2/21/12	<1,010	ND	NA	NA	NA	NA
1-PL-Piez-03	6/13/12	<1,110	NA	NA	NA	NA	NA
1-PL-Piez-04	6/13/12	<1,180	ND	NA	NA	NA	NA
1-PL-Piez-05	6/13/12	8,040	ND	NA	NA	NA	ND
1-PL-Piez-06	6/13/12	1,660	ND	NA	NA	NA	ND
1-PL-Piez-07	6/14/12	<1,140	ND	NA	NA	NA	NA
1-PL-Piez-08	6/14/12	<1,150	ND	NA	NA	NA	NA
1-PL-Piez-09	6/14/12	<1,160	NA	NA	NA	NA	NA
1-PL-Piez-20	6/12/12	<1,420	ND	NA	NA	NA	NA
1-PL-Piez-22	6/12/12	<1,420	ND	NA	NA	NA	NA
1-PL-Piez-23	6/14/12	<1,180	ND	NA	NA	NA	NA
1-PL-Piez-24	6/12/12	<1,430	ND	NA	NA	NA	NA
1-PL-Piez-25	6/13/12	<1,190	ND	NA	NA	NA	NA
1-PL-Piez-27	6/14/12	<1,200	ND	NA	NA	NA	NA
1-PL-Piez-28	6/12/12	<1,420	ND	NA	NA	NA	NA
1-PL-Piez-29	6/13/12	8,950	ND	NA	NA	NA	ND
1-PL-Piez-33	6/13/12	<1,150	ND	NA	NA	NA	NA
1-PL-Piez-34	6/13/12	<1,160	ND	NA	NA	NA	NA
1-PL-Piez-35	6/12/12	<1,420	NA	NA	NA	NA	NA
1-PL-Piez-36	6/12/12	<1,400	NA	NA	NA	NA	NA
1-PL-Piez-37	6/13/12	<1,150	NA	NA	NA	NA	NA
1-PL-Piez-38	6/14/12	<1,180	NA	NA	NA	NA	NA

ND = No non-natural gamma emitting nuclides detected when analyzed to REMP LLDs.
NA = Analysis not required. TRU = Transuranics (Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240 and Pu-241)

INDUSTRY GROUND WATER PROTECTION INITIATIVE

Well Designation	Sample Date	Tritium pCi/Liter	Gamma pCi/Liter	Fe-55 pCi/Liter	Ni-63 pCi/Liter	Sr-90 pCi/Liter	TRU pCi/Liter
1-PL-Piez-39	6/13/12	<1,140	NA	NA	NA	NA	NA
1-PL-Piez-40	6/13/12	<1,170	ND	NA	NA	NA	NA
1-PL-Piez-41	6/12/12	<1,430	ND	NA	NA	NA	NA
1-PL-Piez-42	6/13/12	<1,160	ND	NA	NA	NA	NA
1-PL-Piez-05	7/31/12	9,330	NA	<114	<3.54	<0.682	NA
1-PL-Piez-06	7/31/12	1,830	NA	<83.4	<3.73	<0.703	NA
1-PL-Piez-29	7/31/12	6,120	NA	<51.2	<4.53	<0.623	NA
1-PL-Piez-05	8/30/12	8,030	NA	NA	NA	NA	NA
1-PL-Piez-06	8/30/12	1,780	NA	NA	NA	NA	NA
1-PL-Piez-24	8/30/12	<1,130	NA	NA	NA	NA	NA
1-PL-Piez-29	8/30/12	7,060	NA	NA	NA	NA	NA
1-PL-Piez-04	9/20/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-05	9/19/12	9,450	ND[1]	NA	NA	NA	NA
1-PL-Piez-06	9/19/12	1,850	ND[1]	NA	NA	NA	NA
1-PL-Piez-07	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-08	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-24	9/20/12	<797	ND[1]	NA	NA	NA	NA
1-PL-Piez-25	9/20/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-27	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-29	9/20/12	8,910	ND[1]	NA	NA	NA	NA
1-PL-Piez-33	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-34	9/20/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-40	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-41	9/19/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-42	9/20/12	<1,180	ND[1]	NA	NA	NA	NA
1-PL-Piez-05	10/24/12	10,600	NA	NA	NA	NA	NA
1-PL-Piez-06	10/24/12	2,430	NA	NA	NA	NA	NA
1-PL-Piez-24	10/24/12	<833	NA	NA	NA	NA	NA
1-PL-Piez-29	10/24/12	7,940	NA	NA	NA	NA	NA
1-PL-Piez-05	11/19/12	9,470	NA	NA	NA	NA	NA
1-PL-Piez-06	11/19/12	2,760	NA	NA	NA	NA	NA
1-PL-Piez-29	11/19/12	8,140	NA	NA	NA	NA	NA
1-PL-Piez-04	12/11/12	<844	ND	NA	NA	NA	NA
1-PL-Piez-05	12/11/12	7,190	ND	NA	NA	NA	NA

ND = No non-natural gamma emitting nuclides detected when analyzed to REMP LLDs.
NA = Analysis not required.
1 - I-131 LLD of 1 pCi/Liter not met. Analaysis based on LLD of 10 pCi/Liter.

INDUSTRY GROUND WATER PROTECTION INITIATIVE

Well Designation	Sample Date	Tritium pCi/Liter	Gamma pCi/Liter	Fe-55 pCi/Liter	Ni-63 pCi/Liter	Sr-90 pCi/Liter	TRU pCi/Liter
1-PL-Piez-06	12/11/12	1,620	ND	NA	NA	NA	NA
1-PL-Piez-07	12/11/12	<836	ND	NA	NA	NA	NA
1-PL-Piez-24	12/11/12	<933	ND	NA	NA	NA	NA
1-PL-Piez-27	12/11/12	<843	ND	NA	NA	NA	NA
1-PL-Piez-29	12/11/12	7,720	ND	NA	NA	NA	NA
1-PL-Piez-33	12/10/12	<840	ND	NA	NA	NA	NA
1-PL-Piez-34	12/10/12	<845	ND	NA	NA	NA	NA
1-PL-Piez-41	12/10/12	<838	ND	NA	NA	NA	NA
1-PL-Piez-42	12/11/12	<837	ND	NA	NA	NA	NA

ND = No non-natural gamma emitting nuclides detected when analyzed to REMP LLDs.
NA = Analysis not required.