COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HEALTH

DIVISION OF RADIOLOGICAL HEALTH
109 Governor Street, Room 730 Richmond, Virginia 23218-2448
Office (804) 864-8150 Fax (804) 864-8165

2012

ENVIRONMENTAL RADIATION PROGRAM

REPORT

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

ACKNOWLEDGEMENTS

We would like to acknowledge the following organizations and agencies that contributed to the environmental surveillance program:

- Babcock & Wilcox

- Department of Agriculture and Consumer Services
  Dairy and Food Division

- Department of Conservation and Recreation
  Division of State Parks

- Department of Emergency Management
  Preparedness and Mitigation Division

- Department of General Services
  Division of Consolidated Laboratory Services

- Department of Health
  Division of Shellfish Sanitation

- Dominion Virginia Power

- Newport News Shipbuilding

- Norfolk Naval Shipyard

PREFACE

The Division of Radiological Health conducts an extensive environmental monitoring program of radiological conditions around certain fixed nuclear facilities in the Commonwealth of Virginia to provide an independent assessment of each facility's compliance with applicable federal and state regulations. Each of these fixed nuclear facilities has its own routine surveillance program. The objectives of a routine surveillance program include:

a) Providing information useful in assessing the adequacy of protection of the public
b) Meeting requirements of regulatory agencies
c) Verifying radionuclide containment and plant waste management practices
d) Meeting legal liability obligations
e) Providing public assurance and acceptance (NCRP, 1976).

In addition to these stated objectives, the DRH has identified other objectives such as;

a) Maintenance of a database of background radionuclide levels and trends to assist with the assessment of other environmental data
b) Identification of radiological releases not associated with the licensed facility
c) Maintenance of equipment and proficiency of capabilities used in emergency preparedness and response activities.

Part of this work is funded by the Virginia Department of Emergency Management.

This report is distributed to the licensee, as well as state and local agencies, which have a direct interest in the results. Single copies of this report are available by contacting:

Virginia Department of Health
Division of Radiological Health
109 Governor Street, Room 730
Richmond, Virginia 23219
(804) 864-8150

You are invited to submit any comments or questions regarding this report to the Division of Radiological Health.

NCRP (2006) National Council on Radiation Protection and Measurements, *Environmental Radiation Measurements* (1976) - Report No. 050, National Council on Radiation Protection and Measurements, Washington.

VIRGINIA DEPARTMENT OF HEALTH

ENVIRONMENTAL RADIATION SURVEILLANCE DATA ANNUAL REPORT 2012

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FOREWORD

The Division of Radiological Health conducts an extensive environmental radiological monitoring program around nuclear facilities in the Commonwealth of Virginia to determine compliance with applicable federal and state regulations and guidelines.

Sampling locations are primarily located around the two nuclear power stations in the Commonwealth of Virginia.

(1) North Anna Power Station, Louisa County, Virginia
(2) Surry Power Station, Surry County, Virginia

Sampling locations are also present at:

(3) Babcock & Wilcox, Lynchburg, Virginia
(4) Newport News Shipbuilding (Formerly Newport News Shipbuilding & Drydock Company)
(5) Norfolk Naval Shipyard, Portsmouth, Virginia

Samples are also collected at various control locations. This data can be compared to data for samples collected at plant environs. This provides a comparison between naturally occurring radiation and any radiological deposition resulting from nuclear power plant operation or radioactive fallout.

All State samples are analyzed by Consolidated Laboratories of the Commonwealth of Virginia and Virginia Department of Health.

All the data are within normal expected levels.

This report represents a compilation of all samples collected between January 1, 2012 and December 31, 2012.

SAMPLING PROGRAM

The Division of Radiological Health maintains an environmental surveillance program with primary focus on the environs of the nuclear power facilities in Virginia. The objectives of this radiological monitoring program are:

a) To detect and measure radioactive releases during routine nuclear power plant operation.

b) To detect and measure radioactive releases during abnormal events occurring at nuclear facilities.

c) To measure concentration of radioactive effluents in the environment particularly in human exposure pathways.

d) To provide an independent means of verification of utility release reports.

These objectives are achieved through continuous sampling of air and ambient radiation, as well as, periodic sampling of water, milk, vegetation, fish, shellfish, etc. Details on sample locations and frequencies are outlined in Appendix III of this report.

A brief description of each sampling medium follows:

AIR PARTICULATE AND RADIOGAS

Stationary air samplers are utilized at the Surry Power Station, the North Anna Power Station, and one control location at Pocahontas State Park. Pumps run approximately 168 hours per week at an average flow rate of 115 cubic feet per hour. All samplers are continuously equipped with a charcoal filter. Air particulate filters are used at every sampling location to measure any radioactive particulates. All stations, except the control station, duplicate utility stations. At BWX Technologies, there is one air sampler located on site. This air pump is equipped with air particulate filters and run approximately 168 hours per week with an average flow rate of 70 cubic feet per hour.

Charcoal filters & air particulate filters are analyzed weekly for gamma activity with special emphasis on I-131 retention.

Samples obtained quarterly from Babcock & Wilcox undergo gross alpha analysis.

FISH

Fish samples are collected semi-annually in Lake Anna, near the North Anna Power Station. Each sample consists of approximately one kilogram of flesh from catfish, sunfish, bass or bluegill.

All fish samples are counted for gamma activity with data based on wet weight.

MILK

Raw milk samples are collected quarterly from a dairy near each reactor site. Each sample consists of one gallon of raw milk with no preservatives added. Raw milk is a primary indicator of radioiodine incorporation in the food chain.

All milk samples are counted for gamma activity and analyzed quarterly for Strontium-89 & 90 and are also radiochemically separated for I-131.

SHELLFISH

Shellfish is no longer collected as part of the environmental surveillance program around Surry Power Station due to the inability to aquire said samples.

SILT

Silt is collected semi-annually next to the Waste Treatment building at North Anna Power Station. The sample consists of one kilogram of bottom sediment and is an indicator of radioactive deposition in sediment.

Silt is collected quarterly at Norfolk Naval Shipyard (NNSY) on the Elizabeth River to ensure that shipyard operations result in minimal radioactive effluents. Silt is also collected quarterly at Newport News Shipbuilding (NNSB) on the James River to ensure that operations result in minimal radioactive deposition.

Silt samples are counted for gamma activity and gross beta activity with data based on activity per unit of dry weight.

SOIL

Two soil samples are collected at the Babcock & Wilcox facility. One sample site is located at a ball field on the facility's eastern boundary, and the other is a control location at the Department of Agriculture's Lynchburg Regional Animal Health Laboratory (LRAHL), located 5 miles southwest of the plant site, off Route 460. These samples are collected annually. Samples obtained undergo uranium separation followed by alpha analysis.

VEGETATION

Green leafy vegetation is collected from home gardens located near each nuclear power facility. Samples of one kilogram of kale, cabbage, or turnip greens are collected annually at harvest. When leafy vegetation is unavailable, tall grass is collected. These samples would indicate incorporation of radioactivity in edible vegetation. Vegetation is counted for gamma activity with data based on activity per unit wet weight.

Two vegetation samples are collected at Babcock & Wilcox. These consist of one kilogram of grass from the ball field at the eastern site boundary and one control location at the Department of Agriculture's Lynchburg Regional Animal Health Laboratory (LRAHL), located 5 miles southwest of the plant site, off Route 460. These samples are collected annually and undergo

uranium separation followed by alpha analysis.

SURFACE WATER

Surface water is collected weekly at each nuclear power facility. Three and one half liters (L) samples of station discharge water and upstream controls are collected. These samples provide data on radioactive effluents.

Two surface water samples are collected from the James River at Babcock & Wilcox on an annual basis. One is located approximately 3 miles downstream of the Babcock & Wilcox plant, near the ball field at the eastern site boundary, and the other is at a control location near Six Mile Bridge, which is approximately 1.5 miles upstream. Samples undergo uranium separation followed by alpha counting.

Surface water is also collected quarterly on the James River at Newport News Shipbuilding (NNSB) and on the Elizabeth River at the Norfolk Naval Shipyard (NNSY) to ensure that shipyard operations result in minimal radioactive effluents.

AMBIENT GAMMA EXPOSURE (OSL)

Ambient gamma exposure readings are collected using either calcium fluoride or optically stimulated luminescence dosimeters (OSL). There are twelve OSL sample stations surrounding North Anna Power Station and fourteen stations surrounding Surry Power Station. One control OSL station is located at Pocahontas State Park. Several stations at each site duplicate utility sampling stations.

The OSL's are processed quarterly using a Micro Star system, by Landauer, by VDH for net exposure during their time in the field, resulting in a millirem/quarter reading.

Sources of Radioactivity in the Environment

Radioactivity from natural sources is found everywhere. Naturally occurring radioactivity comes from the decay of primordial terrestrial sources, such as uranium and thorium. Other sources are continually produced in our upper atmosphere through interactions of atoms with cosmic rays. These naturally occurring sources produce the background levels of radioactivity.

In the past century, environmental radiation levels have been influenced by human practices of using or manufacturing radioactive materials. Such practices include the use of radioactive materials in the healing arts, uranium mining and milling operations, nuclear power generation, nuclear weapons manufacturing and testing, and storage and disposal of nuclear weapons.

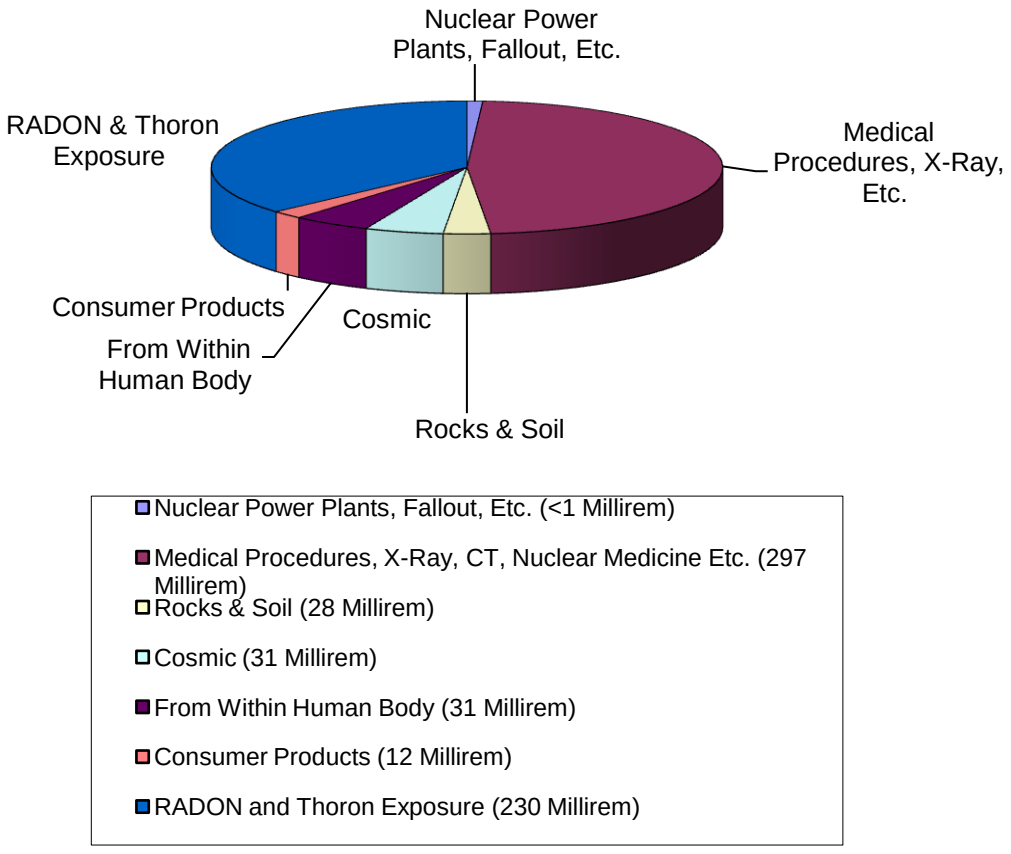
Background radiation levels were most altered by residual fallout from nuclear weapons testing. The United States ceased atmospheric testing following adoption of the 1963 Nuclear Test Ban Treaty. Only long-lived fallout radionuclides remain.

Doses to the Public

The primary source of natural radiation dose received by the general public is due to radon exposure (See Figure 1 next page). The average individual receives approximately 230 mrem/year from radon and less than 1 mrem/year from nuclear facilities. Another 81 mrem/year are received from other natural sources and approximately 297 mrem/year from medical procedures. The total average whole body dose nationwide is approximately 620 mrem/year.

Inherent in all standards for radiation control is the philosophy of limiting exposure to levels, “AS LOW AS REASONABLY ACHIEVABLE,” (ALARA). In practice, this philosophy continues to result in very low average doses to the public from nuclear facilities cited earlier. The monitoring program maintained by the Division of Radiological Health continues to verify compliance to these standards.

FIGURE 1: Sources of Radiation Exposure



Source: National Council on Radiation Protection & Measurement; Estimated Annual Dose of 620 Millirem for an average person in the U.S.A.

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North Anna and Surry Nuclear Power Stations & Other Selected Locations

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Surry Power Station – on site

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
1	A-20	12/28/11	-	1/5/12	0.03	+/-	0.01
2	A-20	1/5/12	-	1/10/12	0.05	+/-	0.01
3	A-20	1/10/12	-	1/18/12	0.03	+/-	0.004
4	A-20	1/18/12	-	1/24/12	0.09	+/-	0.01
5	A-20	1/24/12	-	1/31/12	0.08	+/-	0.01
6	A-20	1/31/12	-	2/7/12	0.11	+/-	0.02
7	A-20	2/7/12	-	2/14/12	0.07	+/-	0.01
8	A-20	2/14/12	-	2/22/12	0.03	+/-	0.005
9	A-20	2/22/12	-	2/28/12	0.12	+/-	0.02
10	A-20	2/28/12	-	3/6/12	0.03	+/-	.005
11	A-20	3/6/12	-	3/13/12	0.07	+/-	0.01
12	A-20	3/13/12	-	3/20/12	0.05	+/-	0.01
13	A-20	3/20/12	-	3/27/12	0.06	+/-	0.01
14	A-20	3/27/12	-	4/3/12	0.03	+/-	0.001
15	A-20	4/3/12	-	4/10/12	0.13	+/-	0.02
16	A-20	4/9/12	-	4/16/12	0.09	+/-	0.01
17	A-20	4/17/12	-	4/24/12	0.07	+/-	0.01
18	A-20	4/24/12	-	5/1/12	0.04	+/-	0.01

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

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Location: Surry Power Station – on site - *continued*

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
19	A-20	5/1/12	-	5/8/12	0.03	+/-	0.004
20	A-20	5/8/12	-	5/15/12	0.12	+/-	0.02
21	A-20	5/15/12	-	5/22/12	0.10	+/-	0.01
22	A-20	5/22/12	-	5/29/12	0.04	+/-	0.01
23	A-20	5/29/12	-	6/4/12	0.04	+/-	0.01
24	A-20	6/4/12	-	6/12/12	0.09	+/-	0.01
25	A-20	6/12/12	-	6/19/12	0.02	+/-	0.003
26	A-20	6/19/12	-	6/26/12	0.11	+/-	0.01
27	A-20	6/26/12	-	7/3/12	*NDR	+/-	*NDR
28	A-20	7/3/12	-	7/10/12	0.04	+/-	0.01
29	A-20	7/10/12	-	7/17/12	0.07	+/-	0.01
30	A-20	7/17/12	-	7/24/12	0.13	+/-	0.02
31	A-20	7/24/12	-	7/31/12	0.07	+/-	0.01
32	A-20	7/31/12	-	8/7/12	0.03	+/-	0.004
33	A-20	8/7/12	-	8/14/12	0.05	+/-	0.01
34	A-20	8/14/12	-	8/21/12	0.19	+/-	0.02
35	A-20	8/21/12	-	8/28/12	0.04	+/-	0.01
36	A-20	8/28/12	-	9/4/12	0.05	+/-	0.01
37	A-20	9/4/12	-	9/11/12	0.05	+/-	0.01

*NDR-No data reported due to air sampler malfunction during the week.

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AIR PARTICULATE

January 1, 2012 through December 31, 2012

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Location: Surry Power Station – on site - *continued*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
38	A-20	9/11/12	-	9/18/12	0.14	+/-	0.02
39	A-20	9/18/12	-	9/26/12	0.18	+/-	0.02
40	A-20	9/26/12	-	10/2/12	0.07	+/-	0.01
41	A-20	10/2/12	-	10/9/12	0.07	+/-	0.01
42	A-20	10/9/12	-	10/16/12	0.05	+/-	0.01
43	A-20	10/16/12	-	10/23/12	0.27	+/-	0.03
44	A-20	10/23/12	-	11/1/12	0.04	+/-	0.01
45**	A-20	11/1/12	-	10/5/12	0.05	+/-	0.01
46	A-20	11/5/12	-	11/13/12	0.16	+/-	0.02
47	A-20	11/13/12	-	11/19/12	0.06	+/-	0.01
48	A-20	11/19/12	-	11/27/12	0.16	+/-	0.02
49	A-20	11/27/12	-	12/4/12	0.32	+/-	0.04
50	A-20	12/4/12	-	12/11/12	0.10	+/-	0.01
51	A-20	12/11/12	-	12/18/12	0.08	+/-	0.01
52***	A-20		-			+/-	

**Shortened sample length due to state offices closures on 10/29-10/30 as a result of Hurricane Sandy.

***No samples collected due to shortened holiday week.

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Pocahontas State Park – *control / naturally occurring background*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
1	A-40	12/26/11	-	1/2/12	0.04	+/-	0.01
2	A-40	1/2/12	-	1/9/12	0.13	+/-	0.02
3	A-40	1/9/12	-	1/16/12	0.09	+/-	0.01
4	A-40	1/16/12	-	1/23/12	0.04	+/-	0.01
5	A-40	1/23/12	-	1/30/12	0.09	+/-	0.01
6	A-40	1/30/12	-	2/6/12	0.05	+/-	0.01
7	A-40	2/6/12	-	2/13/12	0.05	+/-	0.01
8	A-40	2/13/12	-	2/21/12	0.03	+/-	0.004
9	A-40	2/21/12	-	2/27/12	0.11	+/-	0.02
10	A-40	2/27/12	-	3/5/12	0.05	+/-	0.01
11	A-40	3/5/12	-	3/12/12	0.04	+/-	0.01
12	A-40	3/12/12	-	3/19/12	0.04	+/-	0.01
13	A-40	3/19/12	-	3/26/12	0.09	+/-	0.01
14	A-40	3/26/12	-	4/2/12	0.06	+/-	0.01
15	A-40	4/2/12	-	4/9/12	0.06	+/-	0.01
16	A-40	4/9/12	-	4/16/12	0.06	+/-	0.01
17	A-40	4/16/12	-	4/23/12	0.07	+/-	0.01
18	A-40	4/23/12	-	4/30/12	0.04	+/-	0.01

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: - Pocahontas State Park – *control / naturally occurring background continued*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
19	A-40	4/30/12	-	5/7/12	0.03	+/-	0.004
20	A-40	5/7/12	-	5/14/12	0.06	+/-	0.01
21	A-40	5/14/12	-	5/21/12	0.13	+/-	0.02
22	A-40	5/21/12	-	5/29/12	0.05	+/-	0.01
23	A-40	5/29/12	-	6/4/12	0.07	+/-	0.01
24	A-40	6/4/12	-	6/11/12	0.05	+/-	0.01
25	A-40	6/11/12	-	6/18/12	0.02	+/-	0.03
26	A-40	6/18/12	-	6/25/12	0.05	+/-	0.01
27	A-40	6/25/12	-	7/2/12	0.08	+/-	0.02
28	A-40	7/2/12	-	7/9/12	0.04	+/-	0.01
29	A-40	7/9/12	-	7/16/12	0.04	+/-	0.01
30	A-40	7/16/12	-	7/23/12	0.07	+/-	0.01
31	A-40	7/23/12	-	7/30/12	0.08	+/-	0.01
32	A-40	7/30/12	-	8/6/12	0.03	+/-	0.005
33	A-40	8/6/12	-	8/13/12	0.03	+/-	0.005
34	A-40	8/13/12	-	8/20/12	0.10	+/-	0.01
35	A-40	8/20/12	-	8/27/12	0.05	+/-	0.01
36	A-40	8/27/12	-	9/3/12	0.05	+/-	0.01

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Pocahontas State Park – *control / naturally occurring background* **-** *continued*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
37	A-40	9/3/12	-	9/10/12	0.04	+/-	0.01
38	A-40	9/10/12	-	9/17/12	0.11	+/-	0.01
39	A-40	9/17/12	-	9/24/12	0.11	+/-	0.02
40	A-40	9/24/12	-	10/1/12	0.06	+/-	0.01
41	A-40	10/1/12	-	10/8/12	0.07	+/-	0.01
42	A-40	10/8/12	-	10/15/12	0.04	+/-	0.01
43	A-40	10/15/12	-	10/22/12	0.12	+/-	0.02
44	A-40	10/22/12	-	10/31/12	0.05	+/-	0.01
45*	A-40	10/31/12	-	11/4/12	0.04	+/-	0.01
46	A-40	11/4/12	-	11/11/12	0.13	+/-	0.02
47	A-40	11/11/12	-	11/19/12	0.09	+/-	0.01
48	A-40	11/19/12	-	11/26/12	0.25	+/-	0.03
49	A-40	11/26/12	-	12/3/12	0.30	+/-	0.04
50	A-40	12/3/12	-	12/11/12	0.28	+/-	0.03
51	A-40	12/11/12	-	12/17/12	0.07	+/-	0.01
52**	A-40		-			+/-	

*Shortened sample length due to state offices closures on 10/29-10/30 as a result of Hurricane Sandy.

**No samples collected due to shortened holiday week.

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

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Location: Jamestown State Park & Historical Site

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
1*	A-44		-			+/-	
2*	A-44		-			+/-	
3*	A-44		-			+/-	
4*	A-44		-			+/-	
5	A-44	1/24/12	-	1/31/12	0.07	+/-	0.01
6	A-44	1/31/12	-	2/7/12	0.06	+/-	0.01
7	A-44	2/7/12	-	2/14/12	0.07	+/-	0.01
8	A-44	2/14/12	-	2/22/12	0.03	+/-	0.004
9	A-44	2/22/12	-	2/28/12	0.07	+/-	0.01
10	A-44	2/28/12	-	3/6/12	0.02	+/-	0.004
11	A-44	3/6/12	-	3/13/12	0.06	+/-	0.01
12	A-44	3/13/12	-	3/20/12	0.04	+/-	0.01
13	A-44	3/20/12	-	3/27/12	0.05	+/-	0.01
14	A-44	3/27/12	-	4/3/12	0.02	+/-	0.001
15	A-44	4/3/12	-	4/10/12	0.11	+/-	0.01
16	A-44	4/10/12	-	4/17/12	0.10	+/-	0.01
17	A-44	4/17/12	-	4/24/17	0.05	+/-	0.01
18	A-44	4/24/12	-	5/1/12	0.04	+/-	0.01

*No sampling was performed due to samplers not in place.

Virginia Department of Health

AIR PARTICULATE

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Location: - Jamestown State Park & Historical Site - *continued*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
19	A-44	5/1/12	-	5/8/12	0.02	+/-	0.003
20	A-44	5/8/12	-	5/15/12	0.04	+/-	0.01
21	A-44	5/15/12	-	5/22/12	0.08	+/-	0.01
22	A-44	5/22/12	-	5/30/12	0.03	+/-	0.01
23	A-44	5/29/12	-	6/4/12	0.04	+/-	0.01
24	A-44	6/4/12	-	6/12/12	0.09	+/-	0.01
25	A-44	6/12/12	-	6/19/12	0.02	+/-	0.003
26	A-44	6/19/12	-	6/26/12	0.09	+/-	0.01
27	A-44	6/26/12	-	7/3/12	0.19	+/-	0.02
28	A-44	7/3/12	-	7/10/12	0.03	+/-	0.004
29	A-44	7/10/12	-	7/17/12	0.05	+/-	0.01
30	A-44	7/17/12	-	7/24/12	0.08	+/-	0.01
31	A-44	7/24/12	-	7/31/12	0.06	+/-	0.01
32	A-44	7/31/12	-	8/7/12	0.02	+/-	0.003
33	A-44	8/7/12	-	8/14/12	0.03	+/-	0.005
34	A-44	8/14/12	-	8/21/12	0.12	+/-	0.02
35	A-44	8/21/12	-	8/28/12	0.03	+/-	0.005
36	A-44	8/28/12	-	9/4/12	0.05	+/-	0.01

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AIR PARTICULATE

January 1, 2012 through December 31, 2012

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Location: Jamestown State Park & Historical Site - *continued*

Week #	Station	Date Start		Date Stop	Gross Beta Activity pCi/meter3		
37	A-44	9/4/12	-	9/11/12	0.04	+/-	0.01
38	A-44	9/11/12	-	9/18/12	0.10	+/-	0.01
39	A-44	9/18/12	-	9/25/12	0.04	+/-	0.01
40	A-44	9/25/12	-	10/2/12	0.06	+/-	0.01
41	A-44	10/2/12	-	10/9/12	0.06	+/-	0.01
42	A-44	10/9/12	-	10/16/12	0.04	+/-	0.01
43	A-44	10/16/12	-	10/23/12	0.25	+/-	0.03
44	A-44	10/23/12	-	11/1/12	0.04	+/-	0.01
45**	A-44	11/1/12	-	11/5/12	0.04	+/-	0.01
46	A-44	11/5/12	-	11/13/12	0.12	+/-	0.02
47	A-44	11/13/12	-	11/19/12	0.05	+/-	0.01
48	A-44	11/19/12	-	11/27/12	0.14	+/-	0.02
49	A-44	11/27/12	-	12/4/12	0.23	+/-	0.04
50	A-44	12/4/12	-	12/11/12	0.26	+/-	0.03
51	A-44	12/11/12	-	12/18/12	0.07	+/-	0.01
52***	A-44		-			+/-	

**Shortened sample length due to state offices closures on 10/29-10/30 as a result of Hurricane Sandy.

***No samples collected due to shortened holiday week.

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Louisa County / Bumpass Volunteer Fire Station

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
1*	A-86		-			+/-	
2*	A-86		-			+/-	
3*	A-86		-			+/-	
4*	A-86		-			+/-	
5*	A-86		-			+/-	
6*	A-86		-			+/-	
7	A-86	2/6/12	-	2/13/12	0.04	+/-	0.01
8	A-86	2/13/12	-	2/21/12	0.03	+/-	0.004
9	A-86	2/21/12	-	2/27/12	0.12	+/-	0.02
10	A-86	2/27/12	-	3/5/12	0.03	+/-	0.005
11	A-86	3/5/12	-	3/12/12	0.04	+/-	0.01
12	A-86	3/12/12	-	3/19/12	0.03	+/-	0.01
13	A-86	3/19/12	-	3/26/12	0.04	+/-	0.01
14	A-86	3/26/12	-	4/2/12	0.03	+/-	0.001
15	A-86	4/2/12	-	4/9/12	0.04	+/-	0.01
16	A-86	4/9/12	-	4/16/12	0.03	+/-	0.001
17	A-86	4/16/12	-	4/23/12	0.05	+/-	0.01
18	A-86	4/23/12	-	4/30/12	0.03	+/-	0.005

*No sampling was performed due to samplers not in place.

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Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Louisa County / Bumpass Volunteer Fire Station

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
19	A-86	4/30/12	-	5/7/12	0.02	+/-	0.003
20	A-86	5/7/12	-	5/14/12	0.03	+/-	0.01
21	A-86	5/14/12	-	5/21/12	0.08	+/-	0.01
22	A-86	5/21/12	-	5/29/12	0.03	+/-	0.004
23	A-86	5/29/12	-	6/5/12	0.08	+/-	0.01
24	A-86	6/5/12	-	6/11/12	0.08	+/-	0.01
25	A-86	6/11/12	-	6/18/12	0.02	+/-	0.03
26	A-86	6/18/12	-	6/25/12	0.08	+/-	0.01
27	A-86	6/25/12	-	7/2/12	0.06	+/-	0.01
28	A-86	7/2/12	-	7/9/12	0.04	+/-	0.005
29	A-86	7/9/12	-	7/16/12	0.03	+/-	0.004
30	A-86	7/16/12	-	7/23/12	0.04	+/-	0.006
31	A-86	7/23/12	-	7/30/12	0.07	+/-	0.01
32	A-86	7/30/12	-	8/6/12	0.03	+/-	0.004
33	A-86	8/6/12	-	8/13/12	0.04	+/-	0.01
34	A-86	8/13/12	-	8/20/12	0.06	+/-	0.01
35	A-86	8/20/12	-	8/27/12	0.03	+/-	0.004
36	A-86	8/27/12	-	9/3/12	0.03	+/-	0.005

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Louisa County / Bumpass Volunteer Fire Station *continued*

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
37**	A-86	9/3/12	-	9/6/12	0.02	+/-	0.004
38	A-86	9/10/12	-	9/17/12	0.12	+/-	0.02
39	A-86	9/17/12	-	9/24/12	0.11	+/-	0.01
40	A-86	9/24/12	-	10/1/12	0.04	+/-	0.01
41	A-86	10/1/12	-	10/8/12	0.05	+/-	0.01
42	A-86	10/8/12	-	10/15/12	0.03	+/-	0.004
43	A-86	10/15/12	-	10/22/12	0.10	+/-	0.01
44	A-86	10/22/12	-	10/31/12	0.04	+/-	0.01
45***	A-86	10/31/12	-	11/6/12	0.08	+/-	0.01
46	A-86	11/6/12	-	11/12/12	0.26	+/-	0.03
47	A-86	11/12/12	-	11/19/12	0.06	+/-	0.01
48	A-86	11/19/12	-	11/26/12	0.19	+/-	0.02
49	A-86	11/26/12	-	12/3/12	0.24	+/-	0.03
50	A-86	12/3/12	-	12/11/12	0.22	+/-	0.03
51	A-86	12/11/12	-	12/17/12	0.05	+/-	0.01
52****	A-86		-			+/-	

**Note: Power interruption occurred at Station 86 as a result of Ground Circuit Fault Interrupter (GCFI) failure due to severe weather in the area. This resulted in a lower than normal sample volume (approx. 42%) and accounts for the lower than normal activity for Gross Beta. Resumed monitoring once power restored.

***Shortened sample length due to state offices closures on 10/29-10/30 as a result of Hurricane Sandy.

****No samples collected due to shortened holiday week.

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Louisa County / Route 700

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
1	A-88	12/27/11	-	1/3/12	0.02	+/-	0.01
2	A-88	1/3/12	-	1/9/12	0.09	+/-	0.02
3	A-88	1/9/12	-	1/17/12	0.03	+/-	0.01
4	A-88	1/17/12	-	1/23/12	0.04	+/-	0.01
5	A-88	1/23/12	-	1/30/12	0.08	+/-	0.01
6	A-88	1/30/12	-	2/6/12	0.04	+/-	0.01
7	A-88	2/6/12	-	2/13/12	0.03	+/-	0.005
8	A-88	2/13/12	-	2/21/12	0.03	+/-	0.004
9	A-88	2/21/12	-	2/27/12	0.10	+/-	0.01
10	A-88	2/27/12	-	3/5/12	0.03	+/-	0.005
11	A-88	3/5/12	-	3/12/12	0.04	+/-	0.01
12	A-88	3/12/12	-	3/19/12	0.04	+/-	0.01
13	A-88	3/19/12	-	3/26/12	0.09	+/-	0.01
14	A-88	3/26/12	-	4/2/12	0.04	+/-	0.01
15	A-88	4/2/12	-	4/9/12	0.04	+/-	0.01
16	A-88	4/9/12	-	4/16/12	0.03	+/-	0.001
17	A-88	4/16/12	-	4/23/12	0.05	+/-	0.01
18	A-88	4/23/12	-	4/30/12	0.03	+/-	0.004

Virginia Department of Health

AIR PARTICULATE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location: Louisa County / Route 700 *continued*

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
19	A-88	4/30/12	-	5/7/12	0.02	+/-	0.003
20	A-88	5/7/12	-	5/14/12	0.04	+/-	0.01
21	A-88	5/14/12	-	5/21/12	0.08	+/-	0.01
22	A-88	5/21/12	-	5/29/12	0.03	+/-	0.004
23	A-88	5/29/12	-	6/5/12	0.08	+/-	0.01
24	A-88	6/5/12	-	6/11/12	0.05	+/-	0.01
25	A-88	6/11/12	-	6/18/12	0.02	+/-	0.003
26	A-88	6/18/12	-	6/25/12	0.06	+/-	0.01
27	A-88	6/25/12	-	7/2/12	0.06	+/-	0.01
28	A-88	7/2/12	-	7/9/12	0.04	+/-	0.01
29	A-88	7/9/12	-	7/16/12	0.03	+/-	0.04
30	A-88	7/16/12	-	7/23/12	0.04	+/-	0.006
31	A-88	7/23/12	-	7/30/12	0.07	+/-	0.01
32	A-88	7/30/12	-	8/6/12	0.03	+/-	0.004
33	A-88	8/6/12	-	8/13/12	0.06	+/-	0.01
34	A-88	8/13/12	-	8/20/12	0.06	+/-	0.01
35	A-88	8/20/12	-	8/27/12	0.04	+/-	0.005
36*	A-88	8/29/12	-	9/3/12	0.04	+/-	0.007

*Note: Station 88 was only in service 5 days due change over in electrical power.

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AIR PARTICULATE

January 1, 2012 through December 31, 2012

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Location: Louisa County / Route 700 *continued*

Week #	Station	Date Start		Stop	Gross Beta Activity pCi/meter3		
37	A-88	9/3/12	-	9/10/12	0.03	+/-	0.004
38	A-88	9/10/12	-	9/17/12	0.08	+/-	0.01
39	A-88	9/17/12	-	9/24/12	0.07	+/-	0.01
40	A-88	9/24/12	-	10/1/12	0.04	+/-	0.01
41	A-88	10/1/12	-	10/8/12	0.06	+/-	0.01
42	A-88	10/8/12	-	10/15/12	0.03	+/-	0.004
43	A-88	10/15/12	-	10/22/12	0.06	+/-	0.01
44	A-88	10/22/12	-	10/31/12	0.04	+/-	0.01
45	A-88	10/31/12	-	11/6/12	0.10	+/-	0.01
46	A-88	11/6/12	-	11/12/12	0.22	+/-	0.03
47	A-88	11/12/12	-	11/19/12	0.05	+/-	0.01
48	A-88	11/19/12	-	11/26/12	0.14	+/-	0.02
49	A-88	11/26/12	-	12/3/12	0.15	+/-	0.02
50	A-88	12/3/12	-	12/11/12	0.15	+/-	0.02
51	A-88	12/11/12	-	12/17/12	0.06	+/-	0.01
52**	A-88		-			+/-	

**No samples collected due to shortened holiday week.

Virginia Department of Health

AMBIENT GAMMA EXPOSURE

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location	Station	Quarter	Net Exposure Rate mR/Std Qtr +/- S.D.		
Surry Power Station	D-20	1st	**27.00**	**+/-**	**10.39**
Surry Power Station	D-20	2nd	**27.72**	**+/-**	**10.53**
Surry Power Station	D-20	3rd	**35.35**	**+/-**	**11.89**
Surry Power Station	D-20	4th	**28.75**	**+/-**	**10.72**
North Anna Power Station	D-35	1st	**30.92**	**+/-**	**11.12**
North Anna Power Station	D-35	2nd	**36.28**	**+/-**	**12.05**
North Anna Power Station	D-35	3rd	**40.35**	**+/-**	**12.70**
North Anna Power Station	D-35	4th	**38.68**	**+/-**	**12.43**
Pocahontas State Park	D-40	1st	**34.92**	**+/-**	**11.82**
Pocahontas State Park	D-40	2nd	**39.04**	**+/-**	**12.50**
Pocahontas State Park	D-40	3rd	**42.73**	**+/-**	**13.07**
Pocahontas State Park	D-40	4th	**45.43**	**+/-**	**13.48**
Surry – Lebanon Baptist Church	D-41	1st	**26.76**	**+/-**	**10.35**
Surry – Lebanon Baptist Church	D-41	2nd	**28.57**	**+/-**	**10.69**
Surry – Lebanon Baptist Church	D-41	3rd	**36.40**	**+/-**	**12.07**
Surry – Lebanon Baptist Church	D-41	4th	**28.57**	**+/-**	**10.69**
Surry – Lawnes Creek	D-42	1st	**29.77**	**+/-**	**10.91**
Surry – Lawnes Creek	D-42	2nd	**31.03**	**+/-**	**11.14**
Surry – Lawnes Creek	D-42	3rd	**46.02**	**+/-**	**13.57**
Surry – Lawnes Creek	D-42	4th	**31.34**	**+/-**	**11.20**
Surry – Route 628	D-43	1st	**26.19**	**+/-**	**10.23**
Surry – Route 628	D-43	2nd	**24.72**	**+/-**	**9.94**
Surry – Route 628	D-43	3rd	**34.11**	**+/-**	**11.68**
Surry – Route 628	D-43	4th	**24.74**	**+/-**	**9.95**
Jamestown – Historical site	D-44	1st	**31.12**	**+/-**	**11.16**
Jamestown – Historical site	D-44	2nd	**37.16**	**+/-**	**12.19**
Jamestown – Historical site	D-44	3rd	**38.79**	**+/-**	**12.46**
Jamestown – Historical site	D-44	4th	**33.62**	**+/-**	**11.60**
Newport News - Lee Hall	D-45	1st	**37.76**	**+/-**	**12.29**
Newport News - Lee Hall	D-45	2nd	**38.81**	**+/-**	**12.46**
Newport News - Lee Hall	D-45	3rd	**44.69**	**+/-**	**13.37**
Newport News - Lee Hall	D-45	4th	**39.26**	**+/-**	**12.53**
Louisa County - Mineral	D-50	1st	**27.09**	**+/-**	**10.41**
Louisa County - Mineral	D-50	2nd	**35.81**	**+/-**	**11.97**
Louisa County - Mineral	D-50	3rd	**32.55**	**+/-**	**11.41**
Louisa County - Mineral	D-50	4th	**35.35**	**+/-**	**11.89**
Louisa County – Wares Crossroads	D-51	1st	**27.52**	**+/-**	**10.49**
Louisa County – Wares Crossroads	D-51	2nd	**25.28**	**+/-**	**10.06**
Louisa County – Wares Crossroads	D-51	3rd	**30.34**	**+/-**	**11.02**
Louisa County – Wares Crossroads	D-51	4th	**27.00**	**+/-**	**10.39**

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AMBIENT GAMMA EXPOSURE

January 1, 2012 through December 31, 2012

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Location	Station	Quarter	Net Exposure Rate mR/Std Qtr +/- S.D.		
Louisa County – Good Hope Church	D-52	1st	**32.46**	**+/-**	**11.39**
Louisa County – Good Hope Church	D-52	2nd	**33.06**	**+/-**	**11.50**
Louisa County – Good Hope Church	D-52	3rd	**39.78**	**+/-**	**12.62**
Louisa County – Good Hope Church	D-52	4th	**31.97**	**+/-**	**11.31**
Spotsylvania Route 614	D-53	1st	**26.51**	**+/-**	**10.30**
Spotsylvania Route 614	D-53	2nd	**27.92**	**+/-**	**10.57**
Spotsylvania Route 614	D-53	3rd	**30.53**	**+/-**	**11.05**
Spotsylvania Route 614	D-53	4th	**28.97**	**+/-**	**10.76**
Louisa County – Fred Hall	D-54	1st	**24.61**	**+/-**	**9.92**
Louisa County – Fred Hall	D-54	2nd	**27.20**	**+/-**	**10.43**
Louisa County – Fred Hall	D-54	3rd	**31.36**	**+/-**	**11.20**
Louisa County – Fred Hall	D-54	4th	**26.87**	**+/-**	**10.37**
Naval Weapons Station – 1	D-73	1st	**23.51**	**+/-**	**9.70**
Naval Weapons Station – 1	D-73	2nd	**29.50**	**+/-**	**10.86**
Naval Weapons Station – 1	D-73	3rd	**35.93**	**+/-**	**11.99**
Naval Weapons Station – 1	D-73	4th	**29.87**	**+/-**	**10.93**
Newport News – Fort Eustis	D-76	1st	**25.32**	**+/-**	**10.06**
Newport News – Fort Eustis	D-76	2nd	**26.67**	**+/-**	**10.33**
Newport News – Fort Eustis	D-76	3rd	**36.01**	**+/-**	**12.00**
Newport News – Fort Eustis	D-76	4th	**28.48**	**+/-**	**10.67**
Williamsburg – Busch Gardens	D-77	1st	**31.68**	**+/-**	**11.26**
Williamsburg – Busch Gardens	D-77	2nd	**31.39**	**+/-**	**11.21**
Williamsburg – Busch Gardens	D-77	3rd	**52.32**	**+/-**	**14.47**
Williamsburg – Busch Gardens	D-77	4th	**34.65**	**+/-**	**11.77**
Williamsburg – Airport	D-78	1st	**22.95**	**+/-**	**9.58**
Williamsburg – Airport	D-78	2nd	**30.49**	**+/-**	**11.04**
Williamsburg – Airport	D-78	3rd	**32.89**	**+/-**	**11.47**
Williamsburg – Airport	D-78	4th	**31.32**	**+/-**	**11.19**
Surry – Scotland Wharf	D-79	1st	**22.37**	**+/-**	**9.46**
Surry – Scotland Wharf	D-79	2nd	**24.78**	**+/-**	**9.95**
Surry – Scotland Wharf	D-79	3rd	**30.92**	**+/-**	**11.12**
Surry – Scotland Wharf	D-79	4th	**26.98**	**+/-**	**10.39**
Surry – Bacon's Castle	D-80	1st	**26.76**	**+/-**	**10.35**
Surry – Bacon's Castle	D-80	2nd	**26.85**	**+/-**	**10.36**
Surry – Bacon's Castle	D-80	3rd	**30.15**	**+/-**	**10.98**
Surry – Bacon's Castle	D-80	4th	**26.62**	**+/-**	**10.32**
Surry – Alliance	D-81	1st	**26.37**	**+/-**	**10.27**
Surry – Alliance	D-81	2nd	**27.87**	**+/-**	**10.56**
Surry – Alliance	D-81	3rd	**35.86**	**+/-**	**11.98**
Surry – Alliance	D-81	4th	**27.78**	**+/-**	**10.54**

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AMBIENT GAMMA EXPOSURE

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Location	Station	Quarter	Net Exposure Rate mR/Std Qtr +/- S.D.		
Surry – Hog Point	D-82	1st	**24.49**	**+/-**	**9.90**
Surry – Hog Point	D-82	2nd	**28.63**	**+/-**	**10.70**
Surry – Hog Point	D-82	3rd	**35.97**	**+/-**	**11.99**
Surry – Hog Point	D-82	4th	**27.49**	**+/-**	**10.49**
Louisa County – Route 685	D-84	1st	**26.26**	**+/-**	**10.25**
Louisa County – Route 685	D-84	2nd	**32.95**	**+/-**	**11.48**
Louisa County – Route 685	D-84	3rd	**32.71**	**+/-**	**11.44**
Louisa County – Route 685	D-84	4th	**32.39**	**+/-**	**11.38**
Spotsylvania – Route 713	D-85	1st	**26.08**	**+/-**	**10.21**
Spotsylvania – Route 713	D-85	2nd	**28.52**	**+/-**	**10.68**
Spotsylvania – Route 713	D-85	3rd	**32.24**	**+/-**	**11.36**
Spotsylvania – Route 713	D-85	4th	**28.07**	**+/-**	**10.60**
Louisa County – Bumpass Fire Dept.	D-86	1st	**29.53**	**+/-**	**10.87**
Louisa County – Bumpass Fire Dept.	D-86	2nd	**35.30**	**+/-**	**11.88**
Louisa County – Bumpass Fire Dept.	D-86	3rd	**38.21**	**+/-**	**12.36**
Louisa County – Bumpass Fire Dept.	D-86	4th	**33.84**	**+/-**	**11.63**
Spotsylvania – Levy	D-87	1st	**31.86**	**+/-**	**11.29**
Spotsylvania – Levy	D-87	2nd	**34.69**	**+/-**	**11.78**
Spotsylvania – Levy	D-87	3rd	**39.57**	**+/-**	**12.58**
Spotsylvania – Levy	D-87	4th	**35.95**	**+/-**	**11.99**
Louisa County – Route 700	D-88	1st	**32.48**	**+/-**	**11.40**
Louisa County – Route 700	D-88	2nd	**34.92**	**+/-**	**11.82**
Louisa County – Route 700	D-88	3rd	**39.62**	**+/-**	**12.59**
Louisa County – Route 700	D-88	4th	**34.90**	**+/-**	**11.82**
Louisa County – Aspen Hill	D-89	1st	**32.33**	**+/-**	**11.37**
Louisa County – Aspen Hill	D-89	2nd	**40.42**	**+/-**	**12.71**
Louisa County – Aspen Hill	D-89	3rd	**42.73**	**+/-**	**13.07**
Louisa County – Aspen Hill	D-89	4th	**38.83**	**+/-**	**12.46**
Radiological Health	Control 1	1st	**14.58**	**+/-**	**7.64**
Radiological Health	Control 1	2nd	**15.48**	**+/-**	**7.87**
Radiological Health	Control 1	3rd	**14.68**	**+/-**	**7.66**
Radiological Health	Control 1	4th	**13.02**	**+/-**	**7.22**
Radiological Health	Control 2	1st	**16.58**	**+/-**	**8.14**
Radiological Health	Control 2	2nd	**15.88**	**+/-**	**7.97**
Radiological Health	Control 2	3rd	**16.73**	**+/-**	**8.18**
Radiological Health	Control 2	4th	**16.20**	**+/-**	**8.05**

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FISH

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location Type of fish	Date of Report	Isotope	pCi/gram
North Anna 2nd Cooling Lagoon F-24 (Catfish)	4/11/2012	Ba	<0.09
		Cs-134	<0.01
		Cs-137	0.01+/-0.01
		Co-58	<0.01
		Co-60	<0.01
		I-131	<0.06
		Fe-59	<0.02
		Mn-54	<0.01
		Ru-106	<0.06
		Ag-110M	<0.01
		Zn-65	<0.01
		Nb-95	<0.01
North Anna Lake 2nd Cooling Lagoon F-24 (Catfish)	10/25/2012	Ba	<0.07
		Cs-134	<0.01
		Cs-137	0.01+/-0.02
		Co-58	<0.01
		Co-60	<0.01
		I-131	<0.04
		Fe-59	<0.02
		Mn-54	<0.01
		Ru-106	<0.06
		Ag-110M	<0.01
		Zn-65	<0.01
		Nb-95	<0.01

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Milk

January 1, 2012 through December 31, 2012

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Louisa County - Lakeside Dairy M-29			
1st Quarter Date: 03/07/2012		2nd Quarter Date: 06/14/2012	
Isotope	**Results - pCi/liter**	**Isotope**	**Results - pCi/liter**
Ba	<5	Ba	<8
Cs-134	<6	Cs-134	<6
Cs-137	<4	Cs-137	<6
K-40*	1.6+/-0.1	K-40*	1.7+/-0.1
I-131	0.1+/-0.2	I-131	0.2+/-0.4
Sr-89	<4.0	Sr-89	<4.0
Sr-90	0.7+/-0.4	Sr-90	0.7+/-0.4
3rd Quarter Date: 09/19/2012		4th Quarter Date: **	
Isotope	**Results - pCi/liter**	**Isotope**	**Results - pCi/liter**
Ba	<6	Ba	
Cs-134	<7	Cs-134	
Cs-137	<6	Cs-137	
K-40*	1.6+/-0.1	K-40*	
I-131	0.1+/-0.3	I-131	
Sr-89	<4.0	Sr-89	
Sr-90	0.1+/-0.4	Sr-90	
Surry County - Epps Dairy M-66			
1st Quarter Date: 03/05/2012		2nd Quarter Date: 06/13/2012	
Isotope	**Results - pCi/liter**	**Isotope**	**Results - pCi/liter**
Ba	<6	Ba	<8
Cs-134	<5	Cs-134	<6
Cs-137	<4	Cs-137	<7
K-40*	1.5+/-0.1	K-40*	1.6+/-0.1
I-131	0.1+/-0.2	I-131	0.0+/-0.4
Sr-89	<4.0	Sr-89	<4.0
Sr-90	0.8+/-0.4	Sr-90	0.9+/-0.5
3rd Quarter Date: 09/20/2012		4th Quarter Date: 12/05/2012	
Isotope	**Results - pCi/liter**	**Isotope**	**Results - pCi/liter**
Ba	<6	Ba	<8
Cs-134	<6	Cs-134	<6
Cs-137	<6	Cs-137	<6
K-40*	1.5+/-0.1	K-40*	1.6+/-0.1
I-131	0.1+/-0.4	I-131	0.0+/-0.4
Sr-89	<4.0	Sr-89	<4.0
Sr-90	0.3+/-0.4	Sr-90	0.9+/-0.5

*K-40 data is reported in units of grams/liter.
** Sample was not available for the 4th quarter.

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Location: Surry Power Station

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
1	C-20	12/28/11	-	1/5/12	0.25	0.05	< 0	< 0.11
2	C-20	1/5/12	-	1/10/12	0.37	0.14	< 0	< 0.17
3	C-20	1/10/12	-	1/18/12	0.08	< 0	0.04	< 0.11
4	C-20	1/18/12	-	1/24/12	0.005	0.03	< 0	< 0.15
5	C-20	1/24/12	-	1/31/12	0.25	0.10	0.05	< 0.12
6	C-20	1/31/12	-	2/7/12	0.23	0.03	< 0	< 0.12
7	C-20	2/7/12	-	2/14/12	0.02	0.04	< 0	< 0.12
8	C-20	2/14/12	-	2/22/12	0.08	< 0	0.05	< 0.10
9	C-20	2/22/12	-	2/28/12	0.02	0.05	< 0	< 0.15
10	C-20	2/28/12	-	3/6/12	0.05	< 0	0.004	< 0.23
11	C-20	3/6/12	-	3/13/12	0.06	0.11	0.07	< 0.13
12	C-20	3/13/12	-	3/20/12	0.05	0.04	0.07	< 0.12
13	C-20	3/20/12	-	3/27/12	0.09	< 0	0.10	< 0.14
14	C-20	3/27/12	-	4/3/12	0.30	< 0	< 0	< 0.13
15	C-20	3/6/12	-	3/13/12	0.06	0.11	0.07	< 0.13
16	C-20	4/10/12	-	4/17/12	0.07	0.05	< 0	< 0.12
17	C-20	4/17/12	-	4/24/12	0.009	0.01	< 0	< 0.12
18	C-20	4/24/12	-	5/1/12	0.19	0.04	< 0	< 0.12
19	C-20	5/1/12	-	5/8/12	0.04	< 0	0.002	< 0.15
20	C-20	5/8/12	-	5/15/12	0.03	0.04	0.02	< 0.13
21	C-20	5/15/12	-	5/22/12	0.18	0.05	0.04	< 0.13
22	C-20	5/22/12	-	5/29/12	< 0	< 0	0.01	< 0.15
23	C-20	5/29/12	-	6/4/12	0.71	< 0	0.05	< 0.15
24	C-20	6/4/12	-	6/12/12	0.09	0.09	0.02	< 0.11
25	C-20	6/12/12	-	6/19/12	0.004	0.02	0.001	<0.14
26	C-20	6/19/12	-	6/26/12	0.09	0.10	0.12	< 0.13
27	C-20	6/26/12	-	7/3/12	*NDR	*NDR	*NDR	*NDR
28	C-20	7/2/12	-	7/9/12	0.01	0.01	0.03	< 0.007
29	C-20	7/9/12	-	7/16/12	0.03	0.04	< 0	< 0.16
30	C-20	7/16/12	-	7/23/12	0.69	0.13	0.16	< 0.13
31	C-20	7/24/12	-	7/31/12	0.05	0.006	0.005	< 0.14
32	C-20	7/31/12	-	8/7/12	0.39	0.05	0.06	< 0.13
33	C-20	8/7/12	-	8/14/12	< 0	< 0	0.0004	< 0.01
34	C-20	8/14/12	-	8/21/12	< 0	< 0	0.01	< 0.13

*NDR-No data reported due to air sampler malfunction during the week

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Location: Surry Power Station *continued*

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
35	C-20	8/21/12	-	8/28/12	< 0	0.001	< 0	< 0.13
36	C-20	8/28/12	-	9/4/12	0.03	< 0	< 0	< 0.12
37	C-20	9/4/12	-	9/11/12	0.05	0.05	< 0	< 0.14
38	C-20	9/11/12	-	9/18/12	0.05	0.06	< 0	< 0.12
39	C-20	9/18/12	-	9/26/12	0.14	0.01	< 0	< 0.11
40	C-20	09/26/12	-	10/2/12	< 0	0.11	< 0	< 0.14
41	C-20	10/2/12	-	10/9/12	0.05	0.02	< 0	< 0.12
42	C-20	10/9/12	-	10/16/12	< 0	0.07	0.02	< 0.14
43	C-20	10/16/12	-	10/23/12	0.07	0.06	0.06	< 0.14
44	C-20	10/23/12	-	11/1/12	0.05	0.01	< 0	< 0.09
45*	C-20	11/1/12	-	11/5/12	0.66	0.02	0.04	< 0.22
46	C-20	11/5/12	-	11/13/12	0.008	0.04	0.06	< 0.14
47	C-20	11/13/12	-	11/19/12	0.06	0.08	0.06	< 0.14
48	C-20	11/19/12	-	11/27/12	0.05	0.05	< 0	< 0.14
49	C-20	11/27/12	-	12/4/12	< 0	< 0	0.19	< 0.14
50	C-20	12/4/12	-	12/11/12	0.35	0.05	< 0	< 0.14
51	C-20	12/11/12	-	12/18/12	0.36	0.03	< 0	< 0.12
52**	C-20		-					

* Note: Elevated MDA levels due to reduced sample volume as a result of personnel not being able to obtain sample on scheduled day. This was caused by state office closings on 10/29 and 10/30 due to the effects of Hurricane Sandy.

** No samples collected due to shortened holiday week.

Virginia Department of Health

Gamma & Radiogas in Air

January 1, 2012 through December 31, 2012

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Location: Pocahontas State Park

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
1	C-40	12/26/11	-	1/2/12	< 0	0.01	0.008	< 0.12
2	C-40	1/2/12	-	1/9/12	0.14	0.03	0.02	< 0.13
3	C-40	1/9/12	-	1/16/12	0.2	0.04	< 0	< 0.14
4	C-40	1/16/12	-	1/23/12	0.17	0.04	< 0	< 0.19
5	C-40	1/23/12	-	1/30/12	0.15	0.07	< 0	< 0.13
6	C-40	1/30/12	-	2/6/12	0.05	0.02	0.008	< 0.13
7	C-40	2/6/12	-	2/13/12	0.03	0.05	0.01	< 0.14
8	C-40	2/13/12	-	2/21/12	< 0	< 0	0.02	< 0.10
9	C-40	2/21/12	-	2/27/12	0.11	0.06	< 0	< 0.13
10	C-40	2/27/12	-	3/5/12	0.02	0.05	< 0	< 0.11
11	C-40	3/5/12	-	3/12/12	0.27	0.03	< 0	<0.14
12	C-40	3/12/12	-	3/19/12	0.06	0.03	0.04	< 0.10
13	C-40	3/19/12	-	3/26/12	0.12	< 0	0.02	< 0.11
14	C-40	3/26/12	-	4/2/12	0.02	0.10	0.12	< 0.11
15	C-40	4/2/12	-	4/9/12	0.09	0.10	0.36	< 0.25
16	C-40	4/9/12	-	4/16/12	0.01	0.06	< 0	< 0.13
17	C-40	4/16/12	-	4/23/12	0.04	0.06	0.04	< 0.13
18	C-40	4/23/12	-	4/30/12	0.09	< 0	0.02	< 0.13
19	C-40	4/30/12	-	5/7/12	< 0	0.005	< 0	< 0.15
20	C-40	5/7/12	-	5/14/12	0.007	< 0	0.03	< 0.13
21	C-40	5/14/12	-	5/21/12	< 0	< 0	< 0	< 0.13
22	C-40	5/21/12	-	5/29/12	0.31	0.05	< 0	< 0.11
23	C-40	5/29/12	-	6/4/12	0.11	0.001	0.04	< 0.16
24	C-40	6/4/12	-	6/11/12	0.61	0.11	0.15	< 0.15
25	C-40	6/11/12	-	6/18/12	0.16	< 0	0.14	< 0.14
26	C-40	6/18/12	-	6/25/12	0.14	0.15	0.22	< 0.23
27	C-40	6/25/12	-	7/2/12	0.39	0.04	0.0004	< 0.12
28	C-40	7/2/12	-	7/9/12	0.01	0.02	0.03	< 0.03
29	C-40	7/9/12	-	7/16/12	< 0	< 0	0.04	< 0.13
30	C-40	7/16/12	-	7/23/12	0.58	0.09	0.13	< 0.13
31	C-40	7/23/12	-	7/30/12	0.03	0.03	< 0	< 0.12
32	C-40	7/30/12	-	8/6/12	0.32	< 0	< 0	< 0.14
33	C-40	8/6/12	-	8/13/12	0.12	0.05	0.11	< 0.13
34	C-40	8/13/12	-	8/20/12	0.40	< 0	0.01	< 0.13

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Location: Pocahontas State Park *continued*

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
35	C-40	8/20/12	-	8/27/12	0.19	0.06	0.06	< 0.14
36	C-40	8/27/12	-	9/3/12	< 0	0.0001	< 0	< 0.14
37	C-40	9/3/12	-	9/10/12	0.04	0.06	0.008	< 0.14
38	C-40	9/10/12	-	9/17/12	0.50	0.10	0.06	< 0.20
39	C-40	9/17/12	-	9/24/12	0.02	< 0	0.05	< 0.19
40	C-40	9/24/12	-	10/1/12	0.40	< 0	< 0	< 0.13
41	C-40	10/1/12	-	10/8/12	0.27	0.08	0.07	< 0.14
42	C-40	10/8/12	-	10/15/12	0.08	0.07	< 0	< 0.13
43	C-40	10/15/12	-	10/22/12	0.34	0.04	0.03	< 0.15
44	C-40	10/22/12	-	10/31/12	0.01	< 0	0.05	< 0.10
45*	C-40	10/31/12	-	11/4/12	0.60	< 0	< 0	< 0.27
46	C-40	11/4/12	-	11/11/12	0.43	< 0	< 0	< 0.14
47	C-40	11/11/12	-	11/19/12	0.12	< 0	< 0	< 0.10
48	C-40	11/19/12	-	11/26/12	0.04	0.07	< 0	< 0.13
49	C-40	11/26/12	-	12/3/12	< 0	< 0	< 0	< 0.12
50	C-40	12/3/12	-	12/11/12	0.16	0.03	< 0	< 0.11
51	C-40	12/11/12	-	12/17/12	0.08	0.18	< 0	< 0.18
52**	C-40		-					

* Note: Elevated MDA levels due to reduced sample volume as a result of personnel not being able to obtain sample on scheduled day. This was caused by state office closings on 10/29 and 10/30 due to the effects of Hurricane Sandy.

** No samples collected due to shortened holiday week.

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Location: Jamestown State Park – Historical Site

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
1*	C-44		-					
2*	C-44		-					
3*	C-44		-					
4*	C-44		-					
5	C-44	1/24/12	-	1/31/12	< 0	< 0	0.03	< 0.11
6	C-44	1/31/12	-	2/7/12	0.42	0.001	0.05	< 0.13
7	C-44	2/7/12	-	2/14/12	< 0	< 0	0.002	< 0.01
8	C-44	2/14/12	-	2/22/12	0.38	0.02	0.004	< 0.09
9	C-44	2/22/12	-	2/28/12	< 0	0.05	< 0	< 0.14
10	C-44	2/28/12	-	3/6/12	< 0	< 0	< 0	< 0.11
11	C-44	3/6/12	-	3/12/12	0.06	0.77	0.17	< 0.11
12	C-44	3/13/12	-	3/20/12	0.05	0.09	< 0	< 0.11
13	C-44	3/20/12	-	3/27/12	0.36	< 0	0.08	< 0.12
14	C-44	3/27/12	-	4/3/12	0.30	0.30	< 0	< 0.12
15	C-44	4/3/12	-	4/10/12	< 0	< 0	0.14	< 0.12
16	C-44	4/10/12	-	4/17/12	0.05	< 0	0.05	< 0.11
17	C-44	4/17/12	-	4/24/12	0.08	< 0	< 0	< 0.11
18	C-44	4/24/12	-	5/1/12	0.06	0.006	< 0	< 0.11
19	C-44	5/1/12	-	5/8/12	0.007	< 0	0.006	< 0.13
20	C-44	5/8/12	-	5/15/12	0.15	0.07	0.03	< 0.12
21	C-44	5/15/12	-	5/22/12	0.04	0.09	0.06	< 0.12
22	C-44	5/22/12	-	5/29/12	0.55	0.02	0.03	< 0.13
23	C-44	5/29/12	-	6/4/12	< 0	0.02	< 0	< 0.15
24	C-44	6/4/12	-	6/12/12	0.39	0.08	0.15	< 0.10
25	C-44	6/12/12	-	6/19/12	0.006	0.008	< 0	< 0.01
26	C-44	6/19/12	-	6/26/12	0.08	0.09	0.11	< 0.12
27	C-44	6/26/12	-	7/3/12	0.008	0.01	< 0	< 0.12
28	C-44	7/2/12	-	7/9/12	0.01	0.01	0.02	< 0.02
29	C-44	7/9/12	-	7/16/12	0.01	< 0	< 0	< 0.14
30	C-44	7/16/12	-	7/23/12	0.62	0.11	0.14	< 0.12
31	C-44	7/24/12	-	7/31/12	0.03	0.01	0.005	< 0.01
32	C-44	7/31/12	-	8/7/12	0.01	0.04	0.1	< 0.13
33	C-44	8/7/12	-	8/14/12	0.003	0.001	< 0	< 0.01
34	C-44	8/14/12	-	8/21/12	< 0	< 0	0.02	< 0.13

*No sampling was performed due to samplers not in place.

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Gamma & Radiogas in Air

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Location: Jamestown State Park – Historical Site *continued*

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
35	C-44	8/21/12	-	8/28/12	0.06	0.08	0.04	< 0.11
36	C-44	8/28/12	-	9/4/12	< 0	0.009	< 0	< 0.12
37	C-44	9/4/12	-	9/11/12	< 0	0.03	0.03	< 0.11
38	C-44	9/11/12	-	9/18/12	0.08	< 0	< 0	< 0.12
39	C-44	9/18/12	-	9/25/12	0.04	0.03	< 0	< 0.11
40	C-44	9/25/12	-	10/2/12	0.15	0.03	< 0	< 0.12
41	C-44	10/2/12	-	10/9/12	0.33	< 0	< 0	< 0.12
42	C-44	10/9/12	-	10/16/12	< 0	< 0	0.03	< 0.21
43	C-44	10/16/12	-	10/23/12	0.04	< 0	< 0	< 0.13
44	C-44	10/23/12	-	11/1/12	0.02	0.01	0.0004	< 0.09
45**	C-44	11/1/12	-	11/5/12	0.12	0.14	0.003	< 0.23
46	C-44	11/5/12	-	11/13/12	< 0	< 0	< 0	< 0.10
47	C-44	11/13/12	-	11/19/12	0.02	0.07	0.005	< 0.14
48	C-44	11/19/12	-	11/27/12	< 0	0.03	0.03	< 0.10
49	C-44	11/27/12	-	12/4/12	0.06	< 0	< 0	< 0.11
50	C-44	12/4/12	-	12/11/12	0.06	0.02	0.06	< 0.14
51	C-44	12/11/12	-	12/18/12	< 0	0.07	0.07	< 0.12
52**	C-44		-					

** Note: Elevated MDA levels due to reduced sample volume as a result of personnel not being able to obtain sample on scheduled day. This was caused by state office closings on 10/29 and 10/30 due to the effects of Hurricane Sandy.

** No samples collected due to shortened holiday week.

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Gamma & Radiogas in Air

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Location: Bumpass Volunteer Fire Department

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
1*	C-86		-					
2*	C-86		-					
3*	C-86		-					
4*	C-86		-					
5*	C-86		-					
6*	C-86		-					
7	C-86	2/6/12	-	2/13/12	0.03	0.02	< 0	< 0.01
8	C-86	2/13/12	-	2/21/12	0.17	0.04	0.03	< 0.11
9	C-86	2/21/12	-	2/27/12	0.05	0.02	< 0	< 0.12
10	C-86	2/27/12	-	3/5/12	0.08	< 0	0.03	< 0.13
11	C-86	3/5/12	-	3/12/12	< 0	0.50	< 0	< 0.12
12	C-86	3/12/12	-	3/19/12	0.03	0.05	0.04	< 0.12
13	C-86	3/19/12	-	3/26/12	0.06	< 0	0.04	< 0.13
14	C-86	3/26/12	-	4/2/12	0.27	0.08	0.10	< 0.11
15	C-86	4/2/12	-	4/9/12	0.10	0.10	0.42	< 0.25
16	C-86	4/9/12	-	4/16/12	0.08	0.01	0.003	< 0.12
17	C-86	4/16/12	-	4/23/12	0.16	< 0	< 0	< 0.12
18	C-86	4/23/12	-	4/30/12	0.13	< 0	< 0	< 0.11
19	C-86	4/30/12	-	5/7/12	0.008	< 0	< 0	< 0.16
20	C-86	5/7/12	-	5/14/12	0.03	0.06	0.008	< 0.11
21	C-86	5/14/12	-	5/21/12	0.002	< 0	< 0	< 0.12
22	C-86	5/21/12	-	5/29/12	0.11	0.009	0.05	< 0.10
23	C-86	5/29/12	-	6/5/12	< 0	0.05	0.07	< 0.13
24	C-86	6/5/12	-	6/11/12	0.65	0.10	0.15	< 0.15
25	C-86	6/11/12	-	6/18/12	0.06	0.02	< 0	< 0.11
26	C-86	6/18/12	-	6/25/12	0.08	0.10	0.12	< 0.12
27	C-86	6/25/12	-	7/2/12	0.05	< 0	< 0	< 0.11
28	C-86	7/2/12	-	7/9/12	0.01	0.02	0.03	< 0.03
29	C-86	7/9/12	-	7/16/12	0.05	0.03	< 0	< 0.12
30	C-86	7/16/12	-	7/23/12	0.51	0.10	0.12	< 0.09
31	C-86	7/23/12	-	7/30/12	< 0	< 0	0.002	< 0.01
32	C-86	7/30/12	-	8/6/12	< 0	0.06	< 0	< 0.14
33	C-86	8/6/12	-	8/13/12	0.47	0.03	< 0	< 0.12
34	C-86	8/13/12	-	8/20/12	0.01	0.006	0.01	< 0.02

*No sampling was performed due to samplers not in place.

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Virginia Department of Health

Gamma & Radiogas in Air

January 1, 2012 through December 31, 2012

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Location: Bumpass Volunteer Fire Department - *continued*

Week #	Station	Date Start		Ended	Cs-134 pCi/meter^3	Cs-137 pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
35	C-86	8/20/12	-	8/27/12	0.04	0.05	< 0	< 0.11
36	C-86	8/27/12	-	9/3/12	0.23	0.07	< 0	< 0.11
37**	C-86	9/3/12	-	9/6/12	0.30	0.17	< 0	< 0.27
38	C-86	9/10/12	-	9/17/12	0.01	0.04	0.09	< 0.12
39	C-86	9/17/12	-	9/24/12	< 0	0.04	< 0	< 0.12
40	C-86	9/24/12	-	10/1/12	< 0	< 0	< 0	< 0.12
41	C-86	10/1/12	-	10/8/12	0.35	< 0	0.1	< 0.12
42	C-86	10/8/12	-	10/15/12	< 0	< 0	0.07	< 0.12
43	C-86	10/15/12	-	10/22/12	0.05	0.007	0.04	< 0.13
44	C-86	10/22/12	-	10/31/12	0.05	0.02	0.03	< 0.10
45	C-86	10/31/12	-	11/6/12	0.90	< 0	0.0003	< 0.15
46	C-86	11/6/12	-	11/12/12	0.41	< 0	< 0	< 0.15
47	C-86	11/12/12	-	11/19/12	0.08	< 0	0.03	< 0.12
48	C-86	11/19/12	-	11/26/12	< 0	0.05	< 0	< 0.14
49	C-86	11/26/12	-	12/3/12	0.11	0.04	0.02	< 0.12
50	C-86	12/03/12	-	12/11/12	< 0	0.02	0.0008	< 0.12
51	C-86	12/11/12	-	12/17/12	0.11	0.05	0.06	< 0.15
52**	C-86		-					

**Note: Power interruption occurred at Station 86 as a result of Ground Circuit Fault Interrupter (GCFI) failure due to severe weather in the area. This resulted in a lower than normal sample volume (approx. 42%) and accounts for the higher than expected Gamma MDA's (Minimal Detectable Activities). Resumed monitoring once power restored.

** No samples collected due to shortened holiday week.

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Gamma & Radiogas in Air

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Location: Louisa County / Route 700

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
1	C-88	12/27/11	-	1/3/12	0.02	0.08	0.02	< 0.13
2	C-88	1/3/12	-	1/9/12	0.17	0.06	< 0	< 0.15
3	C-88	1/9/12	-	1/17/12	0.08	0.04	< 0	< 0.13
4	C-88	1/17/12	-	1/23/12	0.002	< 0	< 0	< 0.16
5	C-88	1/23/12	-	1/30/12	0.02	0.02	0.07	< 0.13
6	C-88	1/30/12	-	2/6/12	0.03	0.09	< 0	< 0.14
7	C-88	2/6/12	-	2/13/12	< 0	0.01	0.004	< 0.02
8	C-88	2/13/12	-	2/21/12	0.09	0.06	< 0	< 0.11
9	C-88	2/21/12	-	2/27/12	0.13	0.07	0.13	< 0.15
10	C-88	2/27/12	-	3/5/12	0.01	0.01	< 0	< 0.25
11	C-88	3/5/12	-	3/12/12	0.56	< 0	0.12	< 0.14
12	C-88	3/12/12	-	3/19/12	0.08	0.09	0.01	< 0.13
13	C-88	3/19/12	-	3/26/12	0.06	< 0	0.04	< 0.12
14	C-88	3/26/12	-	4/2/12	< 0	0.02	0.11	< 0.14
15	C-88	4/2/12	-	4/9/12	0.10	0.11	0.25	< 0.26
16	C-88	4/9/12	-	4/16/12	0.07	< 0	0.10	< 0.13
17	C-88	4/16/12	-	4/23/12	0.23	< 0	0.02	< 0.13
18	C-88	4/23/12	-	4/30/12	< 0	0.04	0.01	< 0.13
19	C-88	4/30/12	-	5/7/12	0.007	< 0	< 0	< 0.14
20	C-88	5/7/12	-	5/14/12	0.12	0.05	0.03	< 0.13
21	C-88	5/14/12	-	5/21/12	0.04	0.07	< 0	< 0.13
22	C-88	5/21/12	-	5/29/12	0.04	0.007	0.02	< 0.11
23	C-88	5/29/12	-	6/5/12	0.60	0.007	0.03	< 0.13
24	C-88	6/5/12	-	6/11/12	0.75	0.15	0.17	< 0.17
25	C-88	6/11/12	-	6/18/12	0.12	< 0	0.05	< 0.13
26	C-88	6/18/12	-	6/25/12	0.10	0.11	0.14	< 0.15
27	C-88	6/25/12	-	7/2/12	0.05	0.03	< 0	< 0.13
28	C-88	7/2/12	-	7/9/12	0.02	0.02	0.03	< 0.03
29	C-88	7/9/12	-	7/16/12	0.31	0.05	0.05	< 0.14
30	C-88	7/16/12	-	7/23/12	0.62	0.11	0.14	< 0.13
31	C-88	7/23/12	-	7/30/12	< 0	0.02	0.005	< 0.01
32	C-88	7/30/12	-	8/6/12	0.05	0.03	< 0	< 0.17
33	C-88	8/6/12	-	8/13/12	0.01	< 0	< 0	< 0.02
34	C-88	8/13/12	-	8/20/12	0.04	0.09	< 0	< 0.02

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Location: Louisa County / Route 700 *continued*

Week #	Station	Date Start		Ended	Cs-134 Activity pCi/meter^3	Cs-137 Activity pCi/meter^3	I-131 Activity pCi/meter^3	Nuclide I-131 MDA pCi/meter^3
35	C-88	8/20/12	-	8/27/12	0.02	0.12	0.008	< 0.13
36*	C-88	8/29/12	-	9/3/12	0.14	0.12	< 0	< 0.19
37	C-88	9/3/12	-	9/10/12	0.09	0.05	< 0	< 0.13
38	C-88	9/10/12	-	9/17/12	0.09	0.07	0.003	< 0.14
39	C-88	9/17/12	-	9/24/12	0.11	0.09	0.08	< 0.14
40	C-88	9/24/12	-	10/1/12	< 0	0.04	< 0	< 0.12
41	C-88	10/1/12	-	10/8/12	0.08	< 0	0.001	< 0.14
42	C-88	10/8/12	-	10/15/12	0.03	0.05	< 0	< 0.13
43	C-88	10/15/12	-	10/22/12	0.06	0.03	< 0	< 0.14
44	C-88	10/22/12	-	10/31/12	0.26	0.08	< 0	< 0.11
45	C-88	10/31/12	-	11/6/12	0.29	0.07	< 0	< 0.17
46	C-88	11/6/12	-	11/12/12	< 0	< 0	< 0	< 0.16
47	C-88	11/12/12	-	11/19/12	0.008	< 0	0.001	< 0.13
48	C-88	11/19/12	-	11/26/12	< 0	0.06	0.02	< 0.13
49	C-88	11/26/12	-	12/3/12	0.002	0.09	0.03	< 0.15
50	C-88	12/3/12	-	12/11/12	0.26	0.07	< 0	< 0.12
51	C-88	12/11/12	-	12/17/12	0.38	0.02	0.10	< 0.18
52**	C-88		-					

*Note: Station 88 only in service 5 days due to change over in electrical power.

** No samples collected due to shortened holiday week.

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Silt

January 1, 2012 through December 31, 2012

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Location	Date collected	Gross Beta pCi/gram of Silt
James River	3/21/2012	28.8 +/- 5.2
Pier 1	5/17/2012	22.3 +/- 5.1
Newport News Shipyard	9/21/2012	24.2 +/- 4.5
S-15A	11/29/12	24.5 +/- 5.1
James River	3/21/2012	30.0 +/- 5.4
Shipway 11	5/17/2012	24.7 +/- 5.2
Newport News Shipyard	9/21/2012	31.0 +/- 4.8
S-16	11/29/12	27.2 +/- 5.2

Virginia Department of Health

Silt

January 1, 2012 through December 31, 2012

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Elizabeth River – Dry Dock #8
Norfolk Naval Shipyard S-18

Quarter	Date collected	Gamma Activity – pCi/gram (wet)				Gross Beta pCi/gram (DRY)	Gross Alpha pCi/gram (DRY)
		Cs-134	Cs-137	Co-58	C0-60		
1st	3/28/2012	<0.01	0.02	<0.1	<0.01	30.2+/-5.2	23.9+/-11.4
2nd	5/17/2012	<0.01	0.02	<0.01	<0.01	25.0+/-5.1	18.1+/-9.6
3rd	9/26/2012	<0.01	0.02	<0.01	<0.01	26.8+/-4.5	19.3+/-9.2
4th	11/29/2012	<0.01	0.02	<0.01	<0.01	27.4+/-5.2	12.1+/-7.2

Elizabeth River – Dry Dock #4
Norfolk Naval Shipyard S-19

Quarter	Date collected	Gamma Activity – pCi/gram (wet)				Gross Beta pCi/gram (DRY)	Gross Alpha pCi/gram (DRY)
		Cs-134	Cs-137	Co-58	C0-60		
1st	3/28/2012	<0.1	0.03	<0.01	<0.01	30.7+/-5.4	18.9+/-8.8
2nd	5/17/2012	<0.01	0.02	<0.01	<0.01	26.1+/-5.2	11.2+/-7.8
3rd	9/26/2012	<0.01	0.02	<0.01	<0.01	26.8+/-4.6	13.2+/-7.2
4th	11/29/2012	<0.01	0.02	<0.01	<0.01	26.9+/-5.2	21.3+/-8.7

Elizabeth River – Wet slip #1
Norfolk Naval Shipyard S-20

Quarter	Date collected	Gamma Activity – pCi/gram (wet)				Gross Beta pCi/gram (DRY)	Gross Alpha pCi/gram (DRY)
		Cs-134	Cs-137	Co-58	C0-60		
1st	3/28/2012	<0.01	0.03	<0.01	<0.01	27.8+/-5.3	13.7+/-7.6
2nd	5/17/2012	<0.01	0.03	<0.01	<0.01	25.5+/-5.1	10.4+/-6.9
3rd	9/26/2012	<0.01	0.02	<0.01	<0.01	109.2+/-7.2	21.8+/-8.0
4th	11/29/2012	<0.01	0.02	<0.01	<0.01	25.8+/-5.2	8.3+/-5.4

Virginia Department of Health

Silt

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Location	Date collected	Distance & Direction	Activity pCi/gram (dry weight)		
			Cs-134	**Cs-137**	**Co-60**
James River Surry Power Station Discharge Canal S-17	*	0.5 miles NNW	*	*	*
North Anna Power Waste Treatment Shoreline Soil S-24	4/9/2012	1.1 mile SSE	<0.01	0.01+/-0.01	<0.01
North Anna Power Waste Treatment Shoreline Soil S-24	10/23/2012	1.1 mile SSE	<0.01	0.14+/-0.01	0.01

*Sampling was discontinued at this location.

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SURFACE WATER

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James River – Pier 1
Newport News Shipyard W-15A

Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95	
1st	3/21/12	<7.0	<6.0	<10.0	<6.0	<12.0	<10.0	131.5+/-15.5
2nd	5/17/12	<20.0	<6.0	<50.0	<6.0	<13.0	<12.0	181.5+/-48.9
3rd	9/21/12	<12.0	<6.0	<20.0	<6.0	<12.0	<11.0	254.1+/-55.0
4th	11/29/12	<8.0	<4.0	<11.0	<6.0	<12.0	<10.0	187.3+/-51.2

James River – Shipway #11
Newport News Shipyard W-16

Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95	
1st	3/21/12	<9.0	<6.0	<13.0	<5.0	<12.0	<10.0	159.5+/-17.4
2nd	5/17/12	<16.0	<6.0	<36.0	<6.0	<11.0	<12.0	161.7+/-47.7
3rd	9/21/12	<10.0	<6.0	<16.0	<6.0	<12.0	<11.0	242.6+/-56.1
4th	11/29/12	<15.0	<6.0	<30.0	<5.0	<12.0	<12.0	247.7+/-55.1

N/A = not collected

Virginia Department of Health

SURFACE WATER

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Elizabeth River – Dry Dock #4
Norfolk Naval Shipyard W-37

Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta	Gross Alpha
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95		
1st	3/28/12	<8.0	<6.0	<11.0	<5.0	<12.0	<10.0	151.3+/-16.2	0.0+/-17.1
2nd	5/17/12	<23.0	<6.0	<64.0	<6.0	<13.0	<13.0	124.7+/-45.3	0.0+/-98.9
3rd	9/26/12	<8.0	<6.0	<11.0	<5.0	<12.0	<11.0	210.9+/-52.7	0.0+/-46.7
4th	11/29/12	<12.0	<6.0	<20.0	<6.0	<12.0	<11.0	186.1+/-51.2	0.0+/-54.4

Elizabeth River – Wet Slip #1
Norfolk Naval Shipyard W-38

Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta	Gross Alpha
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95		
1st	3/28/12	<8.0	<4.0	<10.0	<5.0	<11.0	<10.0	168.9+/-17.5	15.3+/-19.0
2nd	5/17/12	<22.0	<6.0	<56.0	<6.0	<12.0	<13.0	117.8+/-44.9	0.0+/-102.8
3rd	9/26/12	<7.0	<6.0	<9.0	<5.0	<11.0	<11.0	268.9+/-57.8	22.6+/-56.3
4th	11/29/12	<12.0	<6.0	<21.0	<5.0	<12.0	<11.0	168.3+/-50.1	0.0+/-62.4

Elizabeth River – Dry Dock #8
Norfolk Naval Shipyard W-39

Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta	Gross Alpha
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95		
1st	3/28/12	<7.0	<6.0	<9.0	<3.0	<12.0	<10.0	157.9+/-17.2	4.2+/-16.9
2nd	5/17/12	<28.0	<6.0	<76.0	<6.0	<13.0	<14.0	90.1+/-43.2	0.0+/-107.1
3rd	9/26/12	<8.0	<4.0	<13.0	<5.0	<13.0	<11.0	256.3+/-56.0	17.0+/-55.6
4th	11/29/12	<10.0	<6.0	<15.0	<6.0	<12.0	<11.0	192.0+/-51.5	47.0+/-86.2

N/A = not collected **GB = GROSS BETA (pCi/L) GA= GROSS ALPHA (pCi/L)**

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SURFACE WATER

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Surry Power Station – Discharge Canal - W-19
Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 Activity
D 1/4/12	<11	<5	<6	<6	<5	<18	<5	<12	<11	33.7	13.0		<221	
1/10/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR				<220	
1/18/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR				<209	
1/24/12	NDR	<14	<14	NDR	<13	NDR	NDR	NDR	NDR				<209	
1/31/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					150+/-30
2/7/12	NDR	<12	<15	NDR	<15	NDR	NDR	NDR	NDR					1126+/-67
2/14/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR				<208	
2/22/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR				<219	
2/28/12	NDR	<13	<15	NDR	<14	NDR	NDR	NDR	NDR					2327+/-94
3/6/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
3/13/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR				<208	
3/20/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					751+/-52
3/27/12	NDR	<13	<15	NDR	<13	NDR	NDR	NDR	NDR					300+/-30
D 4/3/12	<11	<5	<6	<6	<5	<19	<5	<12	<11	32.3	10.6			300+/-42
4/10/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					10135+/-202*
4/17/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					300+/-30
4/24/12	NDR	<14	<14	NDR	<16	NDR	NDR	NDR	NDR					526+/-43
5/1/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					225+/-30
5/8/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					75+/-30
5/15/12	NDR	<13	<16	NDR	<16	NDR	NDR	NDR	NDR					375+/-42
5/22/12	NDR	<13	<14	NDR	<13	NDR	NDR	NDR	NDR					601+/-52
5/29/12	NDR	<13	<14	NDR	<16	NDR	NDR	NDR	NDR					1276+/-73

*Note: Release in progress at time of sample. Confirmed by Station Personnel

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SURFACE WATER

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Surry Power Station – Discharge Canal - W-19 *continued*
Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
6/4/12	NDR	<12	<16	NDR	<14	NDR	NDR	NDR	NDR					225+/-30
6/12/12	NDR	<12	<15	NDR	<15	NDR	NDR	NDR	NDR				<209	
6/19/12	NDR	<13	<15	<14	NDR	NDR	NDR	NDR	NDR					150+/-30
6/26/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					300+/-43
D 7/3/12	<9	<5	<6	<6	<5	<12	<5	<12	<11	81.0	20.3			*7508+/-179
7/9/12	NDR	<12	<15	NDR	<15	NDR	NDR	NDR	NDR					450+/-42
7/17/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					150+/-30
7/23/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					225+/-30
7/31/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					450+/-42
8/7/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR				<220	
8/14/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					**5931+/-155
8/21/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					225+/-30
8/28/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					225+/-30
9/4/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR				<210	
9/11/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					450+/-42
9/18/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					150+/-30
9/25/12	NDR	<14	<16	NDR	<17	NDR	NDR	NDR	NDR					300+/-30
D 10/2/12	<13	<5	<6	<6	<6	<23	<5	<12	<11	104.3	37.3			751+/-52

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SURFACE WATER

January 1, 2012 through December 31, 2012

Surry Power Station – Discharge Canal - W-19 *continued*
Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
10/2/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					121+/-52
10/9/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR					901+/-60
10/16/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					18018+/-288*
10/23/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					1051+/-67
11/1/12	NDR	<13	<15	NDR	<13	NDR	NDR	NDR	NDR					3228+/-119
11/5/12	NDR	<13	<14	NDR	<13	NDR	NDR	NDR	NDR					375+/-42
11/13/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					601+/-52
11/19/12	NDR	<13	<15	NDR	<13	NDR	NDR	NDR	NDR					751+/-60
11/27/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR				<241	
12/4/12	NDR	<12	<15	NDR	<13	NDR	NDR	NDR	NDR					1426+/-79
12/11/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					826+/-60
12/18/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					1426+/-90

D = sample analyzed by DCLS

*Note: Release was in progress at time of sampling. Verified via telephone with Surry Power Station personnel. A copy of the Station Release Permit was obtained and is on record.

**Note: Release was in progress at time of sampling and follow up sample indicated 901pCi/L +/- 60 pCi/L and a copy of the Station Release Permit was obtained and is on record.

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

Surry Power Station – Scotland Wharf / baseline - W-79

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
D 1/4/12	<8	<5	<6	<5	<5	<11	<5	<12	<10	9.4	5.0		<221	
1/10/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR				<220	
1/18/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					150+/-30
1/24/12	NDR	<15	<15	NDR	<15	NDR	NDR	NDR	NDR				<209	
1/31/12	NDR	<14	<17	NDR	<15	NDR	NDR	NDR	NDR				<210	
2/7/12	NDR	<12	<14	NDR	<15	NDR	NDR	NDR	NDR				<210	
2/14/12	NDR	<13	<15	NDR	<14	NDR	NDR	NDR	NDR				<208	
2/22/12	NDR	<13	<16	NDR	<16	NDR	NDR	NDR	NDR				<219	
2/28/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					75+/-30
3/6/12	NDR	<15	<15	NDR	<17	NDR	NDR	NDR	NDR				<208	
3/13/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR				<208	
3/20/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR				<210	
3/27/12	NDR	<13	<13	NDR	<15	NDR	NDR	NDR	NDR				<221	
D 4/3/12	<9	<5	<6	<5	<5	<12	<3	<11	<10	3.9	2.5			225+/-30
4/10/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
4/17/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR				<209	
4/24/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					150+/-30
5/1/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR				<221	
5/8/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					70+/- 30
5/15/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
5/22/12	NDR	<14	<14	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
5/29/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR				<209	
6/4/12	NDR	<13	<14	NDR	<14	NDR	NDR	NDR	NDR				<208	

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

Surry Power Station – Scotland Wharf / baseline - W-79 *continued*

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
6/12/12	NDR	<13	<15	NDR	<13	NDR	NDR	NDR	NDR				<209	
6/19/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR				<220	
6/26/12	NDR	<12	<14	NDR	<14	NDR	NDR	NDR	NDR					225+/-30
D 7/3/12	<9	<6	<6	<6	<5	<13	<5	<12	<11	30.5	17.9			300+/-42
7/10/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					300+/-30
7/17/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					225+/-30
7/24/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					300+/-30
7/31/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					225+/-30
8/7/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR				<220	
8/14/12	NDR	<13	<16	NDR	<14	NDR	NDR	NDR	NDR				<209	
8/21/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR				<209	
8/28/12	NDR	<15	<16	NDR	<15	NDR	NDR	NDR	NDR					225+/-30
9/4/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
9/11/12	NDR	<14	<14	NDR	<13	NDR	NDR	NDR	NDR					225+/-30
9/18/12	NDR	<15	<16	NDR	<13	NDR	NDR	NDR	NDR					225+/-30
9/25/12	NDR	<13	<14	NDR	<14	NDR	NDR	NDR	NDR					375+/-42
D 10/2/12	<8	<5	<6	<6	<5	<12	<5	<12	<11	77.6	35.6			826+/-60
10/9/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					601+/-52
10/16/12	NDR	< 12	<14	NDR	<14	NDR	NDR	NDR	NDR					676+/-52
10/23/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR					751+/-60
11/1/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					2102+/-94
11/5/12	NDR	<12	<13	NDR	<15	NDR	NDR	NDR	NDR				<220	
11/13/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					676+/-52

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

Surry Power Station – Scotland Wharf / baseline - W-79 *continued*

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
11/19/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					450+/-42
11/27/12	NDR	<15	<15	NDR	<16	NDR	NDR	NDR	NDR				<220	
12/4/12	NDR	<13	<16	NDR	<16	NDR	NDR	NDR	NDR					901+/+67
12/11/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR					601+/-52
12/18/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR					1276+/-73

D = sample analyzed by DCLS

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna Power Station – Discharge Canal - W-33

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
D 1/3/12	<12	<6	<6	<6	<5	<21	<5	<12	<11	5.7	3.3			3453+/-123
1/9/12	NDR	<14	<14	NDR	<15	NDR	NDR	NDR	NDR					3078+/-115
1/17/12	NDR	<12	<15	NDR	<15	NDR	NDR	NDR	NDR					3829+/-127
1/23/12	NDR	<14	<14	NDR	<15	NDR	NDR	NDR	NDR					3078+/-112
1/30/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					3303+/-119
2/6/12	NDR	<13	<14	NDR	<14	NDR	NDR	NDR	NDR					3003+/-115
2/13/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					3003+/-115
2/21/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					3378+/-123
2/27/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR					3228+/-119
3/5/12	NDR	<14	<14	NDR	<16	NDR	NDR	NDR	NDR					3453+/-119
3/12/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					3453+/-119
3/19/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					3078+/-112
3/26/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					3228+/-116
D 4/2/12	<8	<5	<6	<6	<5	<12	<5	<11	<10	2.8	2.0			3378+/-124
4/9/12	NDR	<13	<16	NDR	<15	NDR	NDR	NDR	NDR					3078+/-116
4/16/12	NDR	<13	<16	NDR	<14	NDR	NDR	NDR	NDR					3003+/-112
4/23/12	NDR	<12	<15	NDR	<16	NDR	NDR	NDR	NDR					3153+/-117
4/30/12	NDR	<13	<17	NDR	<15	NDR	NDR	NDR	NDR					3078+/-112
5/7/12	NDR	<13	<16	NDR	<14	NDR	NDR	NDR	NDR					2928+/-113
5/14/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					3453+/-123
5/21/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					2928+/-112
5/29/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					2928+/-112

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna Power Station – Discharge Canal - W-33 *continued*
Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
6/4/12	NDR	<13	<13	NDR	<16	NDR	NDR	NDR	NDR					3303+/-119
6/11/12	NDR	<13	<12	NDR	<13	NDR	NDR	NDR	NDR					2402+/-104
6/18/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					2402+/-103
6/25/12	NDR	<13	<15	NDR	<12	NDR	NDR	NDR	NDR					2628+/-104
D 7/2/12	<9	<6	<6	<6	<6	<11	<5	<12	<10	5.0	3.5			2327+/-103
7/9/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					3529+/-111
7/16/12	NDR	<13	<14	NDR	NDR	NDR	NDR	NDR	NDR					2477+/-104
7/23/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR					2327+/-99
7/30/12	NDR	<13	<15	NDR	<14	NDR	NDR	NDR	NDR					2402+/-99
8/6/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					2027+/-94
8/13/12	NDR	<13	<16	NDR	<17	NDR	NDR	NDR	NDR					2628+/-108
8/20/12	NDR	<15	<16	NDR	<14	NDR	NDR	NDR	NDR					2252+/-99
8/27/12	NDR	<13	<15	NDR	<13	NDR	NDR	NDR	NDR					2327+/-99
9/3/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					2177+/-95
9/10/12	NDR	<14	<13	NDR	<13	NDR	NDR	NDR	NDR					1802+/-89
9/17/12	NDR	<14	<16	NDR	<13	NDR	NDR	NDR	NDR					2477+/-99
9/24/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					2177+/-99
D 10/1/12	<12	<5	<6	<6	<5	<22	<5	<12	<11	4.0	3.2			2928+/-113
10/1/12	NDR	<16	<19	NDR	<17	NDR	NDR	NDR	NDR					262+/-113
10/8/12	NDR	<13	<15	NDR	<16	NDR	NDR	NDR	NDR					2778+/-112
10/15/12	NDR	< 15	<17	NDR	<15	NDR	NDR	NDR	NDR					2778+/-116

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna Power Station – Discharge Canal - W-33 *continued*
Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
10/22/12	NDR	<15	<15	NDR	<16	NDR	NDR	NDR	NDR					2928+/-116
10/31/12	NDR	<15	<15	NDR	<14	NDR	NDR	NDR	NDR					11787+/-229*
11/6/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					3679+/-130
11/12/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					4204+/-141
11/19/12	NDR	<13	<14	NDR	<14	NDR	NDR	NDR	NDR					3679+/-130
11/26/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					4354+/-140
12/3/12	NDR	<13	<15	NDR	<14	NDR	NDR	NDR	NDR					3078+/-119
12/11/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					3754+/-133

D = sample analyzed by DCLS

*The release of a Boron Recovery Tank (BRT) was in progress at the time of sample. Sample was recounted and results confirmed. NAPS does liquid effluent releases on a continuous basis. A copy of the station's Liquid Waste Continuous Release Permit was obtained for time frame during which the sample was obtained.

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna River - W-27 / baseline

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
D 1/3/12	<13	<5	<6	<6	<5	<123	<5	<12	<11	3.3	0.09		<221	
1/9/12	NDR	<13	<17	NDR	<16	NDR	NDR	NDR	NDR				<221	
1/17/12	NDR	<12	<15	NDR	<14	NDR	NDR	NDR	NDR				<209	
1/23/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR				<209	
1/30/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR				<210	
2/6/12	NDR	<14	<15	NDR	<17	NDR	NDR	NDR	NDR				<210	
2/13/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					150+/-30
2/21/12	NDR	<14	<16	NDR	<14	NDR	NDR	NDR	NDR				<219	
2/27/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR				<208	
3/5/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR				<208	
3/12/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR				<208	
3/19/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR				<210	
3/26/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					150+/-30
D 4/2/12	<9	<5	<6	<5	<5	<12	<5	<12	<10	2.1	0.5			225+/-30
4/9/12	NDR	<14	<14	NDR	<16	NDR	NDR	NDR	NDR					75+/-90
4/16/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR				<209	
4/23/12	NDR	<15	<15	NDR	<16	NDR	NDR	NDR	NDR					300+/-30
4/30/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					300+/-30
5/7/12	NDR	<14	<16	NDR	<14	NDR	NDR	NDR	NDR					526+/-52
5/14/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					450+/-42
5/21/12	NDR	<14	<16	NDR	<14	NDR	NDR	NDR	NDR					300+/-30

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna River - W-27 / baseline *continued*

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
5/29/12	NDR	<14	<14	NDR	<16	NDR	NDR	NDR	NDR					450+/-42
6/5/12	NDR	<12	<16	NDR	<16	NDR	NDR	NDR	NDR					225+/-30
6/11/12	NDR	<14	<15	NDR	<13	NDR	NDR	NDR	NDR					1351+/-79
6/18/12	NDR	<14	<16	NDR	<13	NDR	NDR	NDR	NDR					1276+/-73
6/25/12	NDR	<12	<15	NDR	<15	NDR	NDR	NDR	NDR					1577+/-80
D 7/2/12	<8	<5	<6	<6	<5	<11	<5	<11	<10	3.4	0.8			1201+/-67
7/9/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					1426+/-73
7/16/12	NDR	<12	<14	NDR	<16	NDR	NDR	NDR	NDR					1351+/-73
7/23/12	NDR	<12	<14	NDR	<16	NDR	NDR	NDR	NDR					1426+/-79
7/30/12	NDR	<13	<15	NDR	<15	NDR	NDR	NDR	NDR					1727+/-84
8/6/12	NDR	<15	<15	NDR	<14	NDR	NDR	NDR	NDR					1201+/-73
8/13/12	NDR	<14	<16	NDR	<13	NDR	NDR	NDR	NDR					1502+/-79
8/20/12	NDR	<15	<15	NDR	<14	NDR	NDR	NDR	NDR					1426+/-73
8/27/12	NDR	<14	<16	NDR	<14	NDR	NDR	NDR	NDR					1577+/-79
9/3/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					1652+/-80
9/10/12	NDR	<14	<16	NDR	<15	NDR	NDR	NDR	NDR					1577+/-78
9/17/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					1952+/-90
9/24/12	NDR	<14	<15	NDR	<16	NDR	NDR	NDR	NDR					1652+/-84
D 10/1/12	<9	<5	<6	<6	<5	<14	<6	<11	<11	4.3	0.9			2327+/-100
10/1/12	NDR	<14	<16	NDR	<16	NDR	NDR	NDR	NDR					2327+/-100
10/8/12	NDR	<15	<16	NDR	<15	NDR	NDR	NDR	NDR					2252+/-104
10/15/12	NDR	<15	<15	NDR	<16	NDR	NDR	NDR	NDR					1952+/-94
10/22/12	NDR	<14	<15	NDR	<14	NDR	NDR	NDR	NDR					1952+/-95

Virginia Department of Health

SURFACE WATER

January 1, 2012 through December 31, 2012

North Anna River - W-27 / baseline *continued*

Gamma Activity – pCi/liter

Date	Ba-140	Cs-134	Cs-137	Co-58	Co-60	I-131	Mn-54	Zn-65	Zr/Nb 95	Gross Beta	+/-	BS	H3 MDA	H3 activity
10/31/12	NDR	<15	<14	NDR	<13	NDR	NDR	NDR	NDR					2252+/-99
11/6/12	NDR	<14	<14	NDR	<15	NDR	NDR	NDR	NDR					2778+/-112
11/12/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					2327+/-104
11/19/12	NDR	<13	<16	NDR	<14	NDR	NDR	NDR	NDR					1952+/-94
11/26/12	NDR	<14	<14	NDR	<14	NDR	NDR	NDR	NDR					1727+/-90
12/3/12	NDR	<13	<14	NDR	<15	NDR	NDR	NDR	NDR					1201+/-79
12/11/12	NDR	<14	<15	NDR	<15	NDR	NDR	NDR	NDR					1577+/-84
12/17/12	NDR	<13	<14	NDR	<13	NDR	NDR	NDR	NDR					1502+/-85

D = Sample analyzed by DCLS

Virginia Department of Health

VEGETATION

January 1, 2012 through December 31, 2012

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Location	Date collected	Type	Isotope	Results pCi/Gram (wet weight)
Surry County Private garden V-96B			I-131 Cs-134 Cs-137	
Louisa County Private Garden V-98B			I-131 Cs-134 Cs-137	

NOTE: Leafy vegetation was not available.

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF HEALTH

DIVISION OF RADIOLOGICAL HEALTH
109 Governor Street, Room 730 Richmond, Virginia 23218-2448
Office (804) 864-8150 Fax (804) 864-8165

BABCOCK & WILCOX

Virginia Department of Health

Babcock & Wilcox

AIR PARTICULATE COMPOSITE SAMPLES

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Eastern Site Boundary – Ball field **A-101**

Quarter	Date Start		Stop	Gross Beta Activity pCi/meter^3		
1st	1/11/12	-	1/18/12	0.001	+/-	0.001
2nd	4/18/12	-	4/24/12	0.001	+/-	0.001
3rd	7/11/12	-	7/17/12	0.001	+/-	0.001
4th	10/10/12	-	10/17/12	0.002	+/-	0.001

Virginia Department of Health

Babcock & Wilcox

SOIL

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location	Date	Distance & Direction	Type	Alpha Activity pCi/gram
Eastern Site Boundary Ball field **S-101**	8/23/2012	Site Boundary	Soil	0.0+/-0.1
James River Shoreline Near Six Mile Bridge "control" **S-102a**	8/23/2012	1.5 miles SW	Soil	0.0+/-0.1

Alpha * - Uranium separation followed by alpha counting

Virginia Department of Health

Babcock & Wilcox

SURFACE WATER

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location	Date	Distance & Direction	Alpha Activity pCi/gram
James River Shoreline Near Ball field at eastern site boundary W-101	8/23/2012	Approx. 3 miles downstream	0.0+/-0.1
James River Shoreline Near Six Mile Bridge "control" W-102	8/23/2012	Approx 1.5 Miles upstream	0.1+/-0.2

Virginia Department of Health

Babcock & Wilcox

VEGETATION

January 1, 2012 through December 31, 2012

ANNUAL REPORT 2012

Location	Date	Type	Distance & Direction	Alpha Activity pCi/gram
Eastern site boundary Ball field V-101	8/23/2012	Vegetation	Approx. 3 miles downstream	0.0+/-0.2
James River Shoreline off Rt. 460 “control” V-102	8/23/2012	Vegetation	Approx 4.5 Miles SW	0.2+/-0.3

Alpha * - Uranium separation followed by alpha counting

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF HEALTH

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APPENDIX I

LOWER LIMITS OF DETECTION "LLD"

LOWER LIMITS OF DETECTION
"LLD"

Definition: **"Lower Limit of Detection"** – The smallest amount, or concentration, of a radioactive or nonradioactive element that can be reliably detected in a sample.

All radioactive measurements for samples are reported with an uncertainty. The uncertainty arises for a number of reasons including imperfections in the apparatus or procedure, human error, and counting uncertainty. The counting uncertainty arises because radioactive decay is a random process. This means that if one counts the radioactive decay of a sample several times, each for a fixed time, one will find that the measured number of decays varies randomly. However, these random answers all cluster near an average value. It is usually assumed that the counting uncertainty is the dominant uncertainty. The uncertainties that are reported are the counting uncertainties only. The interpretation of this is that we are 95% confident that the true concentration in the sample lies somewhere between the measured concentration minus the counting uncertainty and the measured concentration plus the counting uncertainty.

One consequence of the uncertainties in a measurement of radioactivity is that it is not possible to determine a zero concentration of a radioisotope. Rather, when the uncertainty is such that one cannot distinguish between the sample and background counting rates, we report that the sample radioactivity is less than some concentration. This minimum concentration is termed the Lower Limit of Detection (LLD). Practical sample size, counting time, and background radiation all combine to determine the LLD. The LLD for most radioisotopes is at least several orders of magnitude (factors of ten) less than the standards for a level of a concern that has been set by the state or federal government.

CONDITIONS
Consolidated Laboratories

LLD values apply to samples analyzed immediately after collection with no decay corrections used in the calculations. Decay corrections normally required during sample processing may result in significant increases in the LLD's for the short-lived isotopes.

Gamma isotopic analysis is performed with a 4" X 4" Sodium Iodide (Tl) detector and a High Purity Germanium Detector.

Gross alpha, beta, Sr-89, and Sr-90 LLD's were based on variable averages normally encountered in sample processing. The LLD may vary from sample to sample depending on self-absorption corrections, counting efficiency, background changes, counting time, and recovery yields. Fish values will depend on the wet to ash weight ratio of the collected sample.

The lower limits of detection for all analysis were calculated using the methods found on the following pages:

LOWER LIMITS OF DETECTION (LLD's) FOR GAMMA COUNTING
Consolidated Laboratories

For solids such as Silt, Vegetation, Fish etc., as provided by
HPGE Detector – 1000 minute count time

Required Sample Size: 1 Kilogram

NOMINAL LLD's for selected isotopes are given below. Actual LLD's are determined at the time of analysis, and vary with decay time, background radiation, sample size, etc.

Isotope	LLD, pCi/Kilogram
Cs-134	5
Cs-137	6
Co-58	5
Co-60	5
I-131	7
Ru/Rh-106	50
Zn-65	12
Zr-95	10
Ba/La-140	8
Ag-110m	10
Mn-54	6
Fe-59	11

Canberra's Spectran-F Software calculates LLD using the following relationships:

LLD = $LD \left(\frac{e^{(.693*Td/T\square)}}{(T)(Y)(e)(V)(0.037)} \right)$

Where:
- Td = Decay Time
- T□ = Half-Life
- T = Count Time
- Y = Yield of the gamma ray in question
- E = Detector efficiency at the energy of gamma ray in question
- V = Sample size
- 0.037 = Conversion factor: gammas/second to picocuries

and: $LD = k^2 = (2)LC$

Where: LC is the weakest signal the instrument can detect as a peak.

and: k is a constant which depends on the desired confidence limit for the result. (At the 95% confidence level, k= 1.645.)

LOWER LIMITS OF DETECTION (LLD's) FOR GAMMA COUNTING
Consolidated Laboratories

For liquids such as Water, Milk, etc, as provided by HPGE detector – 1000 minute count time

Required Sample Size: 3.5 Liters

NOMINAL LLD's for selected isotopes are given below. Actual LLD's are determined at the time of analysis, and vary with decay time, background radiation, sample size, etc.

Isotope	LLD, pCi/Liter
Cs-134	7.3
Cs-137	7.6
Co-58	7.2
Co-60	12.0
I-131	7.9
Zn-65	21.0
Zr-95	15.0
Ba/La-140	10.0
Mn-54	7.8
Fe-59	19.0

Canberra's GAMMA-M Software calculates LLD using the following relationships:

LLD = $LD \left(\frac{e^{(.693*Td/T\square)}}{(T)(Y)(e)(V)(0.037)} \right)$

Where:

	Td	= Decay Time
	T□	= Half-Life
	T	= Count Time
	Y	= Yield of the gamma ray in question
	E	= Detector efficiency at the energy of gamma ray in question
	V	= Sample size
	0.037	= Conversion factor: gammas/second to picocuries

and: $LD = k^2 = (2)LC$

Where: LC is the weakest signal the instrument can detect as a peak.

and: k is a constant which depends on the desired confidence limit for the result. (At the 95% confidence level, k= 1.645.)

LOWER LIMITS OF DETECTION (LLD's) FOR GAMMA COUNTING
VDH-DRH Mobile Incident Command Vehicle

Charcoal Canister provided by HPGE detector - 100 minute count time

Required Sample Size: $300m^3$

Actual LLD is determined at the time of analysis and varies with decay time, background radiation, sample size, etc.

Isotope	LLD, pCi/m^3
I-131 in Charcoal Canister	0.01

Canberra's Gamma-M Software calculates LLD using the following relationships:

$$LLD = 4.65 \left(\frac{(R_b/T_s)^{1/2}}{(Y)(e)(V)(d)(2.22)} \right)$$

Where:

R_b=	Background rate (CPM)
T_s=	Sample Count Time
Y=	Chemical Yield (Gamma ray abundance for I-131 @ 364KeV)
e=	Detector efficiency = 23.9%
V=	Sample size
d=	Decay Correction Factor
2.22=	Conversion factor: counts/minute to picocuries

LOWER LIMITS OF DETECTION (LLD's) FOR BETA COUNTING

Consolidated Laboratories

For: Milk and Water (Radiochemical Analysis).

Matrix	LLD	Weight or Volume Required
Sr-89	4.00 pCi/Liter	1000 ml
Sr-90	1.00 pCi/Liter	1000 ml
I-131 in Water	0.34 pCi/Liter	1000 ml
I-131 in Milk	0.36 pCi/Liter	1000 ml

$$LLD = 4.65\left(\frac{\sqrt{p(R_b/T_s)}}{(Y)(e)(V)(d)(2.22)}\right)$$

Where:

R_b=	Background rate (CPM)
T_s=	Sample Count Time
Y=	Chemical Yield
e=	Detector efficiency
V=	Sample size
d=	Decay Correction Factor
2.22=	Conversion factor: counts/minute to picocuries
4.65=	95% Confidence Factor

LOWER LIMITS OF DETECTION (LLD's) FOR GROSS BETA COUNTING

Consolidated Laboratories (DCLS)
&
VDH-DRH Mobile Incident Command Laboratory (MICL)

For: Air Particulate, Surface/Saline Water, Silt/Soil and Fish.

Matrix	LLD	Weight or Volume Required
Air Particulate (MICL)	0.003 pCi/m3	300 m3
Surface Water (DCLS)	34.7 pCi/L	10 ml
Saline Water (DCLS)	40.8 pCi/Liter	10 ml
Silt/Soil (DCLS)	5.7 pCi/gram	100 mg
Fish (DCLS)	0.046 pCi/gram	1000 grams

$$LLD = 4.65 \left(\frac{(\sqrt{R_b/T_s})}{(Y)(e)(V)(d)(2.22)} \right)$$

Where:

R_b=	Background rate (CPM)
T_s=	Sample Count Time
Y=	Chemical Yield
e=	Detector efficiency
V=	Sample size
d=	Decay Correction Factor
2.22=	Conversion factor counts per minute to picocuries
4.65=	95% Confidence Factor

LOWER LIMITS OF DETECTION (LLD's) FOR GROSS ALPHA COUNTING

Consolidated Laboratories (DCLS)
&
VDH-DRH Mobile Incident Command Laboratory (MICL)

For: Air Particulate, Surface/Saline Water, and Silt/Soil.

Matrix	LLD	Weight or Volume Required
Air Particulate (MICL)	0.001 pCi/m^3	286 m^3
Surface Water (DCLS)	45.0 pCi/liter	10 ml
Saline Water (DCLS)	45.0 pCi/liter	10 ml
Silt/Soil (DCLS)	11.0 pCi/gram	100 mg

$$LLD = 4.65 \left(\frac{(2.71/T_s) + (\sqrt{(R_b/T_s)}}{(Y)(e)(V)(d)(2.22)} \right)$$

Where:

	R_b=	Background rate (CPM)
	T_s=	Sample Count Time
	Y=	Chemical Yield (Gamma ray abundance for I-131 @ 634 KeV)
	e=	Detector efficiency
	V=	Sample size
	d=	Decay Correction Factor
	2.22=	Conversion factor: counts/minute to picocuries
	4.65=	95% Confidence Factor
	2.71=	Conversion factor used to compensate for low backgrounds encountered in Alpha counting

LOWER LIMITS OF DETECTION (LLD's) FOR ALPHA COUNTING

Consolidated Laboratories

For: Water, Vegetation, Silt and Soil (Uranium Radiochemical Analysis).

Matrix	LLD	Weight or Volume Required
Water	0.20 pCi/Liter	1000 ml
Vegetation	0.02 pCi/gram	1000 grams
Silt	0.02 pCi/gram	1000 grams
Soil	0.02 pCi/gram	1000 grams

$$LLD = 4.65 \left(\frac{(2.71/T_s) + (\sqrt{(R_b/T_s)}.}{(Y)(e)(V)(d)(2.22)} \right)$$

Where:

R_b=	Background rate (CPM)
T_s=	Sample Count Time
Y=	Chemical Yield (Gamma ray abundance for I-131 @ 634 KeV)
e=	Detector efficiency
V=	Sample size
d=	Decay Correction Factor
2.22=	Conversion factor: counts/minute to picocuries
4.65=	95% Confidence Factor
2.71=	Conversion factor used to compensate for low backgrounds encountered in Alpha counting

LOWER LIMITS OF DETECTION (LLD's) FOR ALPHA COUNTING

Consolidated Laboratories

For: Air Particulate and Waste Water (Fluorometric Uranium Analysis).

Matrix	LLD	Weight or Volume Required
Air Particulate	2.00 E-09 ug/ml	1440 m^3
Waste Water	0.04 ug/Liter	1000 ml

$$LLD = 4.65 \left(\frac{(2.71/T_s) + (\sqrt{(R_b/T_s).}}{(Y)(e)(V)(d)(2.22)} \right)$$

Where:

R_b=	Background rate (CPM)
T_s=	Sample Count Time
Y=	Chemical Yield (Gamma ray abundance for I-131 @ 634 KeV)
e=	Detector efficiency
V=	Sample size
d=	Decay Correction Factor
2.22=	Conversion factor: counts/minute to picocuries
4.65=	95% Confidence Factor
2.71=	Conversion factor used to compensate for low backgrounds encountered in Alpha counting

LOWER LIMITS OF DETECTION (LLD) FOR TRITIUM ANALYSIS

VDH-DRH Mobile Incident Command Laboratory (MICL)

For: Surface Water

Minimum Required Sample Volume: 50 ml
Sample Aliquot = 6 ml

$$\text{LLD in pCi/L} = \frac{4.66(R_b/T)^{1/2}}{(2.22)(V)(E)}$$

Where:	R_b=	Background rate (CPM)
	T=	Background Counting Time = 60 minutes
	E=	Counter Efficiency = 65%
	V=	Sample Volume or Size
	4.66=	95% Confidence Factor
	LLD=	**225 pCi/L**

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APPENDIX II

SAMPLING LOCATIONS

Sampling Locations for Surry Nuclear Power Station

Photo courtesy of Dominion Power

LOCATION	TYPE	FREQUENCY
Milk		
M-66 Surry County * - W.B. Epps Dairy	Raw	Quarterly
Air		
A-20 Surry Power Station *	Air Particulate	Weekly
A-44 Jamestown State Park - Historical Site	Air Particulate	Weekly
Charcoal Filter		
C-20 Surry Power Station *	Release Gas	Weekly
C-44 Jamestown State Park - Historical Site	Release Gas	Weekly
Dosimeters		
D-20 Surry Power Station *	Gamma in Air	Quarterly
D-41 Surry Lebanon Baptist Church	Gamma in Air	Quarterly
D-42 Surry County - Lawnes Creek	Gamma in Air	Quarterly
D-43 Surry County - Route 628	Gamma in Air	Quarterly
D-44 Jamestown State Park - Historical Site	Gamma in Air	Quarterly
D-45 Newport News - Lee Hall	Gamma in Air	Quarterly
D-73 Naval Weapons Station - Enlisted Quarters	Gamma in Air	Quarterly
D-76 Newport News - Fort Eustis *	Gamma in Air	Quarterly
D-77 Williamsburg - Busch Gardens	Gamma in Air	Quarterly
D-78 Williamsburg - Williamsburg Airport	Gamma in Air	Quarterly
D-79 Surry County - Scotland Wharf	Gamma in Air	Quarterly
D-80 Surry County - Bacon's Castle *	Gamma in Air	Quarterly
D-81 Surry County – Alliance *	Gamma in Air	Quarterly
D-82 Surry County - Hog Point *	Gamma in Air	Quarterly
Silt		
S-17 James River - 1/2 Mile Off Discharge Canal	Silt	Annually

Surface Water

W-19 Surry Discharge Canal *	Surface Water	Weekly
W-79 James River - Scotland Wharf *	Surface Water	Weekly

Vegetation

V-96B Surry County * - local farms	Edible Vegetation	Annually

*** Virginia and Virginia Power Duplicate Sampling Sites**

Sampling Locations for North Anna Nuclear Power Station

Photo courtesy of Dominion Power

LOCATION	TYPE	FREQUENCY
Milk		
M-29 Louisa County - Lakeside Dairy *	Raw	Quarterly
Air		
A-88 Louisa County Route 700 *	Air Particulate	Weekly
A-86 Louisa County – Bumpass Volunteer Fire	Air Particulate	Weekly
Charcoal Filter		
C-88 Louisa County Route 700 *	Release Gas	Weekly
C-86 Louisa County – Bumpass Volunteer Fire	Release Gas	Weekly
Dosimeters		
D-35 NAPS *	Gamma in Air	Quarterly
D-50 Louisa County – Mineral *	Gamma in Air	Quarterly
D-51 Louisa County - Wares Crossroads *	Gamma in Air	Quarterly
D-52 Spotsylvania - Good Hope Church *	Gamma in Air	Quarterly
D-53 Spotsylvania - Route 614	Gamma in Air	Quarterly
D-54 Louisa County - Frederick's Hall	Gamma in Air	Quarterly
D-84 Louisa County - Route 685	Gamma in Air	Quarterly
D-85 Spotsylvania Co. - Route 713	Gamma in Air	Quarterly
D-86 Louisa County – Bumpass Volunteer Fire	Gamma in Air	Quarterly
D-87 Spotsylvania Co. - Levy *	Gamma in Air	Quarterly
D-88 Louisa Co. - Rt. 700 (near station) *	Gamma in Air	Quarterly
D-89 Louisa County - Aspen Hill *	Gamma in Air	Quarterly
Fish		
F-24 North Anna Lake - Second Cooling Lagoon	Edible Fish	2/Year
Soil		
S-24 NAPS Waste Treatment shoreline soil	Soil	Annually

Surface Water

W-27 North Anna River - Route 522 *	Surface Water	Weekly
W-33 North Anna Discharge Canal *	Surface Water	Weekly

Vegetation

V-98C Louisa County – local farmers *	Edible Vegetation	Annually

*** Virginia and Virginia Power Duplicate Sampling Sites**

Sampling Locations - Babcock & Wilcox

SAMPLE	LOCATION	TYPE	FREQUENCY
AIR			
A-101	Eastern Site Boundary Ballfield	Air Particulate	Quarterly
SURFACE WATER			
W-101	James River 3 mi. downstream of plant at eastern site boundary	Surface Water	Annually
W-102	James River 1.5 mi. upstream of plant at Six Mile Bridge control	Surface Water	Annually
SOIL			
S-101	Eastern Site Boundary Ballfield	Soil	Annually
S-102	LRAHL Bldg. Off Route 460 5 Miles SW Control	Soil	Annually
VEGETATION			
V-101	Eastern Site Boundary Ballfield	Grass	Annually
V-102	LRAHL Bldg. Off Route 460 5 Miles SW Control	Grass	Annually

Other Sampling Locations in Virginia

	LOCATION	TYPE	FREQUENCY
	Air		
A-40	Pocahontas State Park	Air Particulate	Weekly
	Silt		
S-15A	James River - NNSB - Pier 1	Silt	Quarterly
S-16	James River - NNSB- Shipway 11	Silt	Quarterly
S-18	Elizabeth River - NNSY - Drydock #8	Silt	Quarterly
S-19	Elizabeth River - NNSY - Drydock #4	Silt	Quarterly
S-20	Elizabeth River - NNSY - Wet Slip #1	Silt	Quarterly
	Charcoal Filter		
C-40	Pocahontas State Park	Air Particulate	Weekly
	Dosimeters		
D-40	Pocahontas State Park	Air Gamma	Quarterly
	Surface Water		
W-15	James River - NNSB- Pier 1	Surface Water	Quarterly
W-16	James River - NNSB- Shipway 11	Surface Water	Quarterly
W-37	Elizabeth River - NNSY - Drydock #8	Surface Water	Quarterly
W-38	Elizabeth River - NNSY - Drydock #4	Surface Water	Quarterly
W-39	Elizabeth River - NNSY - Wet Slip #1	Surface Water	Quarterly

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APPENDIX III EMERGENCY PREPAREDNESS

EMERGENCY PREPAREDNESS

The Division of Radiological Health (DRH) is one of the lead response agencies for emergencies involving the potential or actual release of radioactive materials. Overall, state level emergency response is described in the Commonwealth of Virginia Radiological Emergency Response Plan (COVRERP), which is developed and maintained by the Virginia Department of Emergency Management (VDEM) for the Commonwealth of Virginia. In addition to generic guidelines for responding to any major radiological emergency, the response procedures contain segments addressing response to several specific types of radiological incidents – including sections, which provide information needed for response to Licensee and Transportation accidents. Other sections contain background information and response guidance for accidents at fixed nuclear facilities. Plans are also being developed to respond to possible radiological terrorist attacks, which may include detonation of a radiological dispersion device (RDD aka “dirty bomb”), an improvised nuclear device (IND), or a military grade nuclear warhead.

When responding to any radiological emergency, the primary tasks of VDH-DRH are to locate, identify, and predict the impact of any radioactive materials released to the environment. Based on the predicted or known impact, VDH then recommends appropriate measures to protect the public. DRH would also be tasked with helping to supervise the cleanup of radiological contamination and ensuring the proper disposal of radioactive waste. A VDH-DRH duty officer maintains 24-hour coverage to provide initial assessment/assistance for local responders and may also initiate the mobilization/deployment of other trained staff to respond to a radiological emergency when needed.

Under the provisions of current Federal Emergency Management Agency regulations, the DRH conducts or participates in periodic drills that are designed to provide team training and to test emergency plan and procedures. The scope of these drills ranges from receiving and acknowledging simulated emergency communications to full-scale team deployment. In the latter case, the DRH personnel are presented with problems similar to those that might be encountered during an actual radiological emergency.

Federal regulations for commercial nuclear power generating facilities stipulate that a full-scale exercise involving appropriate local government participation and testing all significant response elements must be conducted and evaluated every other year. Because there are two such facilities, Surry and North Anna Nuclear Power Stations, Commonwealth of Virginia agencies will perform exercise activities on a yearly basis, alternating between the sites each year. The VDH, DRH, and VDEM have elected to participate in each exercise as fully as possible.