

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HEALTH

OFFICE OF RADIOLOGICAL HEALTH
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**ENVIRONMENTAL
RADIATION
MONITORING
PROGRAM**

**2016
ANNUAL REPORT**

ACKNOWLEDGEMENTS

The Office of Radiological Health acknowledges the following organizations and agencies that provide assistance to the Radiological Environmental Monitoring Program:

- Babcock & Wilcox
- Department of Agriculture and Consumer Services
 - Office of Dairy and Foods
- Department of Conservation and Recreation
 - Division of State Parks
- Department of Emergency Management
 - Preparedness Division
 - Recovery and Mitigation Division
- Department of General Services
 - Division of Consolidated Laboratory Services (DCLS)
- Dominion Virginia Power
- Newport News Shipbuilding
- Norfolk Naval Shipyard

PREFACE

The Office of Radiological Health (ORH) conducts an extensive environmental monitoring program in order to characterize radiological conditions around certain fixed nuclear facilities in the Commonwealth of Virginia. This program provides an independent assessment of each facility's compliance with applicable federal and state regulations as they related to offsite release limits. Each of these fixed nuclear facilities has its own routine surveillance program. The objectives of ORH's environmental monitoring program include:

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

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

- a) Maintenance of a database containing 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; and
- c) Maintenance of equipment and procedures used in emergency preparedness and response activities.

This report is distributed to the licensee, as well as state and local agencies, which have a direct interest in the results. This report is available for download at:

<http://www.vdh.virginia.gov/epidemiology/radiologicalhealth/Environmental/>

Readers are invited to submit any comments or questions regarding this report to the Office 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 2015**

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SAMPLING PROGRAM

AIR PARTICULATE AND RADIOGAS

Stationary air samplers are utilized at the Surry and North Anna Power Stations. In addition, a third stationary air sampler is located at Pocahontas State Park which serves as a control site. 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 and an air particulate filter which are analyzed weekly for gross beta and gamma activity with special emphasis on Iodine-131 retention. All stations, except the control site, are collocated with utility air samplers.

There is one air sampler located onsite at Babcock & Wilcox Technologies. This air pump is equipped with air particulate filters and runs approximately 168 hours per week with an average flow rate of 70 cubic feet per hour. Samples from this location are obtained quarterly and undergo gross alpha analysis

FISH

Fish samples are collected biannually in Lake Anna near the North Anna Power Station and from the discharge canal at Surry Power Station. Each sample consists of approximately one kilogram of flesh from a variety of fish species. 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 power station. 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. Samples are analyzed for gamma activity and Strontium-89 & 90. Milk samples are further radiochemically separated for Iodine-131.

SHELLFISH

Shellfish are indicators of incorporation of radioactivity in the food chain. Selected species are collected as a part of the environmental surveillance program around Surry Power Station (SPS). Samples consist of one kilogram of flesh and are collected annually approximately 0.5 mile off the mouth of the SPS discharge canal in the James River. All shellfish samples are counted for gamma activity with data based on activity per unit of wet weight.

SILT

Silt is an indicator of radioactive deposition in sediment. Samples are collected biannually next to the Waste Treatment Building at North Anna Power Station and from the discharge canal at Surry Power Station. Silt is also collected quarterly at the Norfolk Naval Shipyard on the Elizabeth River and at Newport News Shipbuilding on the James River. Silt samples are counted for gross alpha and/or beta activity depending on collection location. Selected silt samples are further analyzed for gamma activity. Data is based on activity per unit of dry weight.

SOIL

Two soil samples are collected annually at the Babcock & Wilcox facility. Samples are collected from a ball field on the facility's eastern boundary and from Riverside Park. Samples obtained undergo alpha analysis.

VEGETATION

Green leafy vegetation can serve as an indicator of incorporation of radioactivity in the food chain. Samples are collected biannually from home gardens or small farms located near each nuclear power station. Samples typically consist of approximately one kilogram of a broad leaf plant species such as kale, cabbage or turnip greens. When leafy vegetation is unavailable, tall grass or similar plants may be substituted. Vegetation is counted for gamma activity with data based on activity per unit wet weight.

In addition to vegetation collected near each nuclear power station, samples are collected annually from two sites at Babcock & Wilcox. Samples consist of approximately one kilogram of grass or a broad leaf plant species collected from the ball field at the eastern site boundary and from Riverside Park. These samples undergo alpha analysis.

SURFACE WATER

Surface water is collected weekly near the discharge point at each nuclear power facility. Automatic sampling units designed to pull three aliquots of water per day operate continuously throughout the week. All water collected is composited and tested to provide data on radioactive effluents. In addition to the samples collected near the power stations, control sites on Lake Anna and the James River are also tested on a weekly basis.

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 operations at these facilities result in minimal radioactive effluents.

Two surface water samples are collected annually from the James River at Babcock & Wilcox. Samples are collected from the ball field at the eastern site boundary and from Riverside Park. Samples undergo uranium separation followed by alpha counting.

AMBIENT GAMMA EXPOSURE

Ambient gamma exposure readings are collected using optically stimulated luminescence dosimeters (OSL) located strategically around each power station. There are a total of twelve OSL sample locations at North Anna Power Station and fourteen sites at Surry Power Station. One control OSL station is located at Pocahontas State Park. The OSL's are processed quarterly for net exposure by ORH staff using a Landauer microStar system. This analysis results in a millirem/quarter reading.

REPORTING PENDING SAMPLE ANALYSIS RESULTS

When sample data fields in this report indicate that results have not yet been performed or reported by DCLS at the time of report publication, then the report will be updated once those results are made available.

Sources of Radioactivity in the Environment

Naturally occurring or background radioactivity is found virtually everywhere within the environment. The decay of primordial terrestrial sources, such as uranium and thorium, is one contributing factor to this background radioactivity. Other sources are continually produced in our upper atmosphere through the interaction of atoms with cosmic rays.

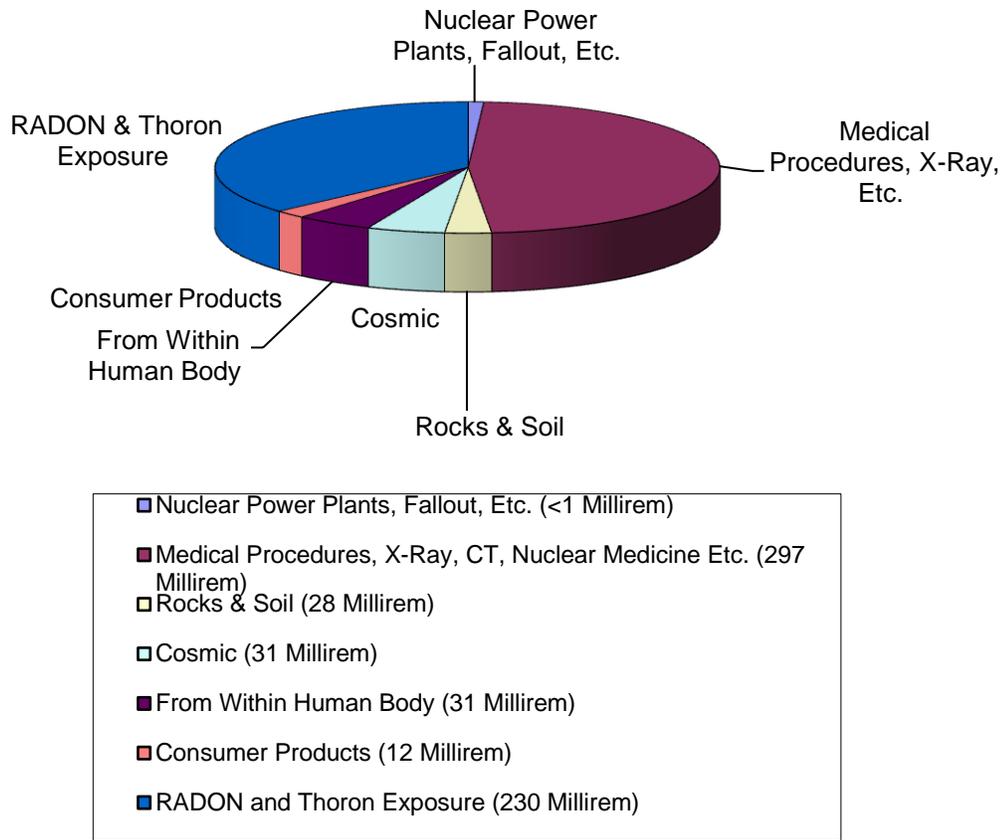
Environmental radiation levels are also influenced by human practices. The use of radioactive materials in the healing arts, uranium mining and milling operations, and nuclear power generation all are potentially contributing factors. In addition, background radiation levels were altered by residual 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 currently remain.

Dose 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 millirem/year from radon and less than 1 millirem/year from nuclear facilities; another 81 millirem/year are received from 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 whenever possible. This principle is termed "AS LOW AS REASONABLY ACHIEVABLE" (ALARA). In practice, this philosophy continues to result in very low average doses to the public from the nuclear facilities cited earlier. The environmental monitoring program maintained by the Office 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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Sampling Locations

Sampling Locations for Surry Nuclear Power Station



Photo courtesy of Dominion Power

LOCATION	TYPE	FREQUENCY
<u>Milk</u>		
M-66 Surry County - W.B. Epps Dairy	Raw	Quarterly
<u>Air</u>		
A-20 Surry Power Station	Air Particulate	Weekly
A-44 Jamestown State Park - Historical Site	Air Particulate	Weekly
<u>Charcoal Filter</u>		
C-20 Surry Power Station	Release Gas	Weekly
C-44 Jamestown State Park - Historical Site	Release Gas	Weekly
<u>Dosimeters</u>		
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
<u>Silt</u>		
S-17 James River - 1/2 Mile Off Discharge Canal	Silt	2x per year
<u>Fish</u>		
F-17 James River - 1/2 Mile Off Discharge Canal	Edible Fish	2x per year
R-17 James River – Various Locations	Shellfish	Annually
<u>Surface Water</u>		
W-19 Surry Discharge Canal	Surface Water	Weekly
W-79 James River – Scotland Wharf	Surface Water	Weekly
W-79A/W-90 James River – Robious Landing ¹	Surface Water	Weekly
<u>Vegetation</u>		
V-96D Surry County - local farms	Edible Vegetation	2x per year

¹ Sample number changed to W-90 effective 5/2/16

Sampling Locations for North Anna Nuclear Power Station



Photo courtesy of Dominion Power

LOCATION	TYPE	FREQUENCY
<u>Milk</u>		
M-29 Louisa County - Lakeside Dairy	Raw	Quarterly
<u>Air</u>		
A-88 Louisa County Route 700/North Anna Power Station	Air Particulate	Weekly
A-86 Louisa County – Bumpass Volunteer Fire	Air Particulate	Weekly
<u>Charcoal Filter</u>		
C-88 Louisa County Route 700/North Anna Power Station	Release Gas	Weekly
C-86 Louisa County – Bumpass Volunteer Fire	Release Gas	Weekly
<u>Dosimeters</u>		
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
<u>Fish</u>		
F-24 North Anna Lake - Second Cooling Lagoon	Edible Fish	2x per year
<u>Soil</u>		
S-24 NAPS Waste Treatment shoreline soil	Soil	2x per year
<u>Surface Water</u>		
W-27 Lake Anna - Route 522		
W-28 North Anna River @ Route 651 ¹	Surface Water	Weekly
W-33 North Anna Discharge Canal	Surface Water	Weekly
<u>Vegetation</u>		
V-98 Louisa County – local farms	Edible Vegetation	2x per year

¹ New control site initiated on 5/2/16

Sampling Locations - Babcock & Wilcox

SAMPLE	LOCATION	TYPE	FREQUENCY
<u>AIR</u>			
A-101	Eastern Site Boundary Ball field	Air Particulate	Quarterly
<u>SURFACE WATER</u>			
W-101	Eastern Site Boundary Ball field	Surface Water	Annually
W-102A	James River Riverside Park	Surface Water	Annually
<u>SOIL</u>			
S-101	Eastern Site Boundary Ball field	Soil	Annually
S-102A	James River Riverside Park	Soil	Annually
<u>VEGETATION</u>			
V-101	Eastern Site Boundary Ball field	Grass	Annually
V-102	James River Riverside Park	Grass	Annually

Other Sampling Locations in Virginia

LOCATION	TYPE	FREQUENCY
<u>Air</u>		
A-40	<i>Control/naturally occurring background</i> Pocahontas State Park	Air Particulate Weekly
<u>Charcoal Filter</u>		
C-40	<i>Control/naturally occurring background</i> Pocahontas State Park	Air Particulate Weekly
<u>Dosimeters</u>		
D-40	<i>Control/naturally occurring background</i> Pocahontas State Park	Air Gamma Quarterly
<u>Silt</u>		
S-15	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
<u>Surface Water</u>		
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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**MINIMUM
DETECTABLE
ACTIVITY
"MDA"**

Minimum Detectable Activity (MDA), as used in this report, is defined as the lowest level of radioactivity that can be consistently and accurately detected in a given sample.

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Analytical Results

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Pocahontas State Park (Control)

Week #	Station	Date		Gross Beta Activity pCi/meter ³
		Start	Stop	
1	A-40	12/28/15	- 01/04/16	0.03 +/- 0.01
2	A-40	01/04/16	- 01/11/16	0.03 +/- 0.0047
3	A-40	01/11/16	- 01/20/16	0.05 +/- 0.007
4	A-40	01/20/16	- 01/26/16	0.03 +/- 0.004
5	A-40	01/26/16	- 02/01/16	0.04 +/- 0.007
6 ¹	A-40	02/01/16	- 02/08/16	+/-
7	A-40	02/08/16	- 02/16/16	0.03 +/- 0.004
8	A-40	02/16/16	- 02/22/16	0.04 +/- 0.006
9	A-40	02/22/16	- 02/29/16	0.03 +/- 0.005
10	A-40	02/29/16	- 03/07/16	0.05 +/- 0.01
11	A-40	03/07/16	- 03/14/16	0.03 +/- 0.004
12	A-40	03/14/16	- 03/21/16	0.03 +/- 0.01
13	A-40	03/21/16	- 03/28/16	0.03 +/- 0.01
14 ²	A-40	03/28/16	- 04/04/16	+/-
15 ³	A-40	04/04/16	- 04/11/16	0.03 +/- 0.004
16	A-40	04/11/16	- 04/18/16	0.07 +/- 0.01
17	A-40	04/18/16	- 04/25/16	0.11 +/- 0.01
18	A-40	04/25/16	- 05/02/16	0.04 +/- 0.01
19	A-40	05/02/16	- 05/09/16	0.05 +/- 0.01

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

Virginia Department of Health
AIR PARTICULATE

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Location: Pocahontas State Park - Control – (continued)

Week #	Station	Start	Date		Gross Beta Activity pCi/meter ³		
			Stop				
20	A-40	05/09/16	-	05/16/16	0.03	+/-	0.004
21	A-40	05/16/16	-	05/23/16	0.03	+/-	0.004
22	A-40	05/23/16	-	05/31/16	0.05	+/-	0.01
23	A-40	05/31/16	-	06/06/16	0.03	+/-	0.01
24	A-40	06/06/16	-	06/13/16	0.08	+/-	0.010
25 ⁴	A-40	6/13/16	-	6/20/16		+/-	
26 ⁵	A-40	6/20/16	-	6/27/16		+/-	
27 ⁶	A-40	06/27/16	-	07/04/16		+/-	
28 ⁷	A-40	07/04/16	-	07/11/16	0.06	+/-	0.01
29	A-40	07/11/16	-	07/18/16	0.04	+/-	0.007
30	A-40	07/18/16	-	07/25/16	0.11	+/-	0.01
31	A-40	07/25/16	-	08/01/16	0.05	+/-	0.007
32	A-40	08/01/16	-	08/08/16	0.09	+/-	0.01
33 ⁸	A-40	08/08/16	-	08/15/16		+/-	
34	A-40	08/15/16	-	08/22/16	0.05	+/-	0.01
35	A-40	08/22/16	-	08/29/16	0.06	+/-	0.009
36	A-40	08/29/16	-	09/05/16	0.10	+/-	0.01
37 ⁹	A-40	09/05/16	-	09/12/16		+/-	

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were analyzed.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples analyzed.

⁹ Mobile Incident Command Laboratory (MICL) deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

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Location: Pocahontas State Park Control – (continued)

Week #	Station	Date		Gross Beta Activity		
		Start	Stop	pCi/meter ³	+/-	
38	A-40	09/05/16	- 09/19/16	0.05	+/-	0.006
39	A-40	09/19/16	- 09/26/16	0.07	+/-	0.01
40	A-40	09/26/16	- 10/03/16	0.07	+/-	0.01
41	A-40	10/03/16	- 10/11/16	0.08	+/-	0.01
42	A-40	10/11/16	- 10/17/16	0.12	+/-	0.02
43	A-40	10/17/16	- 10/24/16	0.09	+/-	0.01
44	A-40	10/24/16	- 10/31/16	0.06	+/-	0.01
45	A-40	10/31/16	- 11/08/16	0.12	+/-	0.02
46	A-40	11/08/16	- 11/14/16	0.10	+/-	0.02
47 ¹⁰	A-40	11/14/16	- 11/21/16		+/-	
48	A-40	11/14/16	- 11/28/16	0.07	+/-	0.01
49	A-40	11/28/16	- 12/05/16	0.04	+/-	0.01
50	A-40	12/05/16	- 12/13/16	0.05	+/-	0.008
51	A-40	12/13/16	- 12/19/16	0.04	+/-	0.006
52	A-40	12/19/16	- 12/27/16	0.04	+/-	0.01

¹⁰Due to the holiday, no samples were analyzed.

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Location: Surry Power Station (Onsite)

Week #	Station	Date			Gross Beta Activity		
		Start	Stop		pCi/meter ³		
1	A-20	12/28/15	-	01/04/16	0.02	+/-	0.004
2	A-20	01/04/16	-	01/11/16	0.03	+/-	0.0047
3	A-20	01/11/16	-	01/19/16	0.04	+/-	0.005
4	A-20	01/19/16	-	01/26/16	0.03	+/-	0.005
5	A-20	01/26/16	-	02/01/16	0.05	+/-	0.007
6 ¹	A-20	02/01/16	-	02/08/16		+/-	
7	A-20	02/08/16	-	02/16/16	0.03	+/-	0.004
8	A-20	02/16/16	-	02/22/16	0.06	+/-	0.009
9	A-20	02/22/16	-	02/29/16	0.14	+/-	0.02
10	A-20	02/29/16	-	03/07/16	0.03	+/-	0.005
11	A-20	03/07/16	-	03/14/16	0.03	+/-	0.004
12	A-20	03/14/16	-	03/21/16	0.03	+/-	0.004
13	A-20	03/21/16	-	03/28/16	0.03	+/-	0.004
14 ²	A-20	03/28/16	-	04/04/16		+/-	
15 ³	A-20	04/04/16	-	04/11/16	0.03	+/-	0.004
16	A-20	04/11/16	-	04/18/16	0.06	+/-	0.01
17	A-20	04/18/16	-	04/25/16	0.06	+/-	0.01
18	A-20	04/25/16	-	05/02/16	0.03	+/-	0.01
19	A-20	05/02/16	-	05/09/16	0.03	+/-	0.01

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed

³ Air samples were collected after a 14 day sampling period.

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Location: Surry Power Station Onsite – (continued)

Week #	Station	Start	Date		Gross Beta Activity pCi/meter ³		
			Stop				
20	A-20	05/09/16	-	05/16/16	0.02	+/-	0.004
21	A-20	05/16/16	-	05/23/16	0.02	+/-	0.003
22	A-20	05/23/16	-	05/31/16	0.03	+/-	0.004
23	A-20	05/31/16	-	06/06/16	0.02	+/-	0.004
24	A-20	06/06/16	-	06/13/16	0.04	+/-	0.006
25 ⁴	A-20	06/13/16	-	06/20/16		+/-	
26 ⁵	A-20	06/20/16	-	06/27/16		+/-	
27 ⁶	A-20	06/27/16	-	07/04/16		+/-	
28 ⁷	A-20	07/04/16	-	07/11/16	0.04	+/-	0.01
29	A-20	07/11/16	-	07/18/16	0.06	+/-	0.008
30	A-20	07/18/16	-	07/25/16	0.07	+/-	0.01
31	A-20	07/25/16	-	08/01/16	0.04	+/-	0.006
32	A-20	08/01/16	-	08/08/16	0.07	+/-	0.01
33 ⁸	A-20	08/08/16	-	08/15/16		+/-	
34	A-20	08/15/16	-	08/22/16	0.04	+/-	0.005
35	A-20	08/22/16	-	08/29/16	0.03	+/-	0.004
36	A-20	08/29/16	-	09/05/16	0.06	+/-	0.01
37 ⁹	A-20	09/05/16	-	09/12/16		+/-	

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were analyzed.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples were analyzed.

⁹ MICL deployed to HAZMAT Conference. No samples analyzed.

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Location: Surry Power Station Onsite – (continued)

Week #	Station	Date		Gross Beta Activity		
		Start	Stop	pCi/meter ³		
38	A-20	09/05/16	- 09/19/16	0.04	+/-	0.005
39	A-20	09/19/16	- 09/26/16	0.05	+/-	0.006
40	A-20	09/26/16	- 10/03/16	0.04	+/-	0.01
41	A-20	10/03/16	- 10/11/16	0.05	+/-	0.01
42	A-20	10/11/16	- 10/17/16	0.09	+/-	0.01
43	A-20	10/17/16	- 10/24/16	0.06	+/-	0.01
44	A-20	10/24/16	- 10/31/16	0.04	+/-	0.01
45	A-20	10/31/16	- 11/07/16	0.05	+/-	0.01
46	A-20	11/07/16	- 11/14/16	0.05	+/-	0.01
47 ¹⁰	A-20	11/14/16	- 11/21/16		+/-	
48	A-20	11/21/16	- 11/28/16	0.04	+/-	0.01
49	A-20	11/28/16	- 12/05/16	0.04	+/-	0.01
50	A-20	12/05/16	- 12/13/16	0.04	+/-	0.006
51	A-20	12/13/16	- 12/19/16	0.03	+/-	0.005
52	A-20	12/19/16	- 12/27/16	0.04	+/-	0.01

¹⁰Due to the holiday, no samples were analyzed.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Jamestown State Park & Historical Site

Week #	Station	Date			Gross Beta Activity		
		Start	Stop		pCi/meter ³		
1	A-44	12/28/15	-	01/04/16	0.03	+/-	0.004
2	A-44	01/04/16	-	01/11/16	0.02	+/-	0.0037
3	A-44	01/11/16	-	01/19/16	0.03	+/-	0.004
4	A-44	01/19/16	-	01/26/16	0.03	+/-	0.004
5	A-44	01/26/16	-	02/01/16	0.04	+/-	0.006
6 ¹	A-44	02/01/16	-	02/08/16		+/-	
7	A-44	02/08/16	-	02/16/16	0.02	+/-	0.003
8	A-44	02/16/16	-	02/22/16	0.03	+/-	0.005
9	A-44	02/22/16	-	02/29/16	0.03	+/-	0.004
10	A-44	02/29/16	-	03/07/16	0.02	+/-	0.003
11	A-44	03/07/16	-	03/14/16	0.02	+/-	0.003
12	A-44	03/14/16	-	03/21/16	0.02	+/-	0.003
13	A-44	03/21/16	-	03/28/16	0.02	+/-	0.003
14 ²	A-44	03/28/16	-	04/04/16		+/-	
15 ³	A-44	04/04/16	-	04/11/16	0.02	+/-	0.003
16	A-44	04/11/16	-	04/18/16	0.05	+/-	0.01
17	A-44	04/18/16	-	04/25/16	0.06	+/-	0.01
18	A-44	04/25/16	-	05/02/16	0.03	+/-	0.00
19	A-44	05/02/16	-	05/09/16	0.03	+/-	0.004

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Jamestown State Park & Historical Site – (continued)

Week #	Station	Date		Gross Beta Activity pCi/meter ³
		Start	Stop	
20	A-44	05/09/16	- 05/16/16	0.02 +/- 0.003
21	A-44	05/16/16	- 05/23/16	0.02 +/- 0.003
22	A-44	05/23/16	- 05/31/16	0.03 +/- 0.004
23	A-44	05/31/16	- 06/06/16	0.02 +/- 0.003
24	A-44	06/06/16	- 06/13/16	0.04 +/- 0.006
25 ⁴	A-44	06/13/16	- 06/20/16	+/-
26 ⁵	A-44	06/20/16	- 06/27/16	+/-
27 ⁶	A-44	06/27/16	- 07/04/16	+/-
28 ⁷	A-44	07/04/16	- 07/11/16	0.04 +/- 0.005
29	A-44	07/11/16	- 07/18/16	0.06 +/- 0.008
30	A-44	07/18/16	- 07/25/16	0.08 +/- 0.01
31	A-44	07/25/16	- 08/1/16	0.04 +/- 0.006
32	A-44	08/01/16	- 08/08/16	0.06 +/- 0.01
33 ⁸	A-44	08/08/16	- 08/15/16	+/-
34	A-44	08/15/16	- 08/22/16	0.03 +/- 0.004
35	A-44	08/22/16	- 08/29/16	0.03 +/- 0.004
36	A-44	08/29/16	- 09/05/16	0.07 +/- 0.01
37 ⁹	A-44	09/05/16	- 09/12/16	+/-

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were analyzed.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples were analyzed.

⁹ MICL deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Jamestown State Park & Historical Site – (continued)

Week #	Station	Date			Gross Beta Activity		
		Start		Stop	pCi/meter ³		
38	A-44	09/05/16	-	09/19/16	0.04	+/-	0.005
39	A-44	09/19/16	-	09/26/16	0.04	+/-	0.005
40	A-44	09/26/16	-	10/03/16	0.03	+/-	0.01
41	A-44	10/03/16	-	10/11/16	0.04	+/-	0.01
42	A-44	10/11/16	-	10/17/16	0.08	+/-	0.01
43	A-44	10/17/16	-	10/24/16	0.05	+/-	0.01
44	A-44	10/24/16	-	10/31/16	0.04	+/-	0.01
45	A-44	10/31/16	-	11/07/16	0.06	+/-	0.01
46	A-44	11/07/16	-	11/14/16	0.07	+/-	0.01
47 ¹⁰	A-44	11/14/16	-	11/21/16		+/-	
48	A-44	11/21/16	-	11/28/16	0.04	+/-	0.01
49	A-44	11/28/16	-	12/05/16	0.04	+/-	0.01
50	A-44	12/05/16	-	12/13/16	0.03	+/-	0.004
51	A-44	12/05/16	-	12/19/16	0.03	+/-	0.005
52	A-44	12/19/16	-	12/27/16	0.04	+/-	0.01

¹⁰ Due to the holiday, no samples were analyzed.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Bumpass Volunteer Fire Station

Week #	Station	Date			Gross Beta Activity		
		Start	Stop		pCi/meter ³		
1	A-86	12/28/15	-	01/04/16	0.04	+/-	0.01
2	A-86	01/04/16	-	01/11/16	0.02	+/-	0.0036
3	A-86	01/11/16	-	01/19/16	0.05	+/-	0.007
4	A-86	01/19/16	-	01/26/16	0.03	+/-	0.004
5	A-86	01/26/16	-	02/01/16	0.04	+/-	0.006
6 ¹	A-86	02/01/16	-	02/08/16		+/-	
7	A-86	02/08/16	-	02/16/16	0.03	+/-	0.004
8	A-86	02/16/16	-	02/22/16	0.04	+/-	0.006
9	A-86	02/22/16	-	02/29/16	0.04	+/-	0.01
10	A-86	02/29/16	-	03/07/16	0.04	+/-	0.01
11	A-86	03/07/16	-	03/14/16	0.03	+/-	0.004
12	A-86	03/14/16	-	03/21/16	0.03	+/-	0.01
13	A-86	03/21/16	-	03/28/16	0.03	+/-	0.005
14 ²	A-86	03/28/16	-	04/04/16		+/-	
15 ³	A-86	04/04/16	-	04/11/16	0.03	+/-	0.004
16	A-86	04/11/16	-	04/18/16	0.10	+/-	0.01
17	A-86	04/18/16	-	04/25/16	0.13	+/-	0.01
18	A-86	04/25/16	-	05/02/16		+/-	
19	A-86	05/02/16	-	05/09/16		+/-	

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Bumpass Volunteer Fire Station – (continued)

Week #	Station	Start	Date		Gross Beta Activity pCi/meter ³		
				Stop			
20	A-86	05/09/16	-	05/16/16	+/-		
21	A-86	05/16/16	-	05/23/16	+/-		
22	A-86	05/23/16	-	05/31/16	+/-		
23	A-86	05/31/16	-	06/06/16	+/-		
24	A-86	06/06/16	-	06/13/16	+/-		
25 ⁴	A-86	06/13/16	-	06/20/16	+/-		
26 ⁵	A-86	06/20/16	-	06/27/16	+/-		
27 ⁶	A-86	06/27/16	-	07/04/16	+/-		
28 ⁷	A-86	07/04/16	-	07/11/16	0.05	+/-	0.01
29	A-86	07/11/16	-	07/18/16	0.05	+/-	0.007
30	A-86	07/18/16	-	07/25/16	0.11	+/-	0.01
31	A-86	07/25/16	-	08/1/16	0.04	+/-	0.007
32	A-86	08/01/16	-	08/08/16	0.07	+/-	0.01
33 ⁸	A-86	08/08/16	-	08/15/16	+/-		
34	A-86	08/15/16	-	08/22/16	0.06	+/-	0.01
35	A-86	08/22/16	-	08/29/16	0.06	+/-	0.008
36	A-86	08/29/16	-	09/05/16	0.13	+/-	0.02
37 ⁹	A-86	09/05/16	-	09/12/16	+/-		

⁴ Power was unavailable to the air sampler from week 18-25 (lightning strike)

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were collected.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples were collected.

⁹ MICL deployed to HAZMAT Conference. No samples were collected.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Bumpass Volunteer Fire Station – (continued)

Week #	Station	Date			Gross Beta Activity		
		Start		Stop	pCi/meter ³		
38	A-86	09/05/16	-	09/19/16	0.04	+/-	0.005
39	A-86	09/19/16	-	09/26/16	0.06	+/-	0.009
40	A-86	09/26/16	-	10/03/16	0.06	+/-	0.01
41	A-86	10/03/16	-	10/11/16	0.05	+/-	0.01
42	A-86	10/11/16	-	10/17/16	0.15	+/-	0.02
43	A-86	10/17/16	-	10/24/16	0.06	+/-	0.01
44	A-86	10/24/16	-	10/31/16	0.03	+/-	0.005
45	A-86	10/31/16	-	11/07/16	0.07	+/-	0.01
46	A-86	11/07/16	-	11/14/16	0.13	+/-	0.02
47 ¹⁰	A-86	11/14/16	-	11/21/16		+/-	
48	A-86	11/21/16	-	11/28/16	0.06	+/-	0.01
49	A-86	11/28/16	-	12/05/16	0.03	+/-	0.005
50	A-86	12/05/16	-	12/13/16	0.03	+/-	0.005
51	A-86	12/13/16	-	12/19/16	0.04	+/-	0.006
52	A-86	12/19/16	-	12/27/16	0.04	+/-	0.01

¹⁰Due to the holiday, no samples were analyzed.

Virginia Department of Health
AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Route 700

Week #	Station	Start	Date	Stop	Gross Beta Activity pCi/meter³
1	A-88	12/28/15	-	01/04/16	0.03 +/- 0.01
2	A-88	01/04/16	-	01/11/16	0.02 +/- 0.0037
3	A-88	01/11/16	-	01/19/16	0.04 +/- 0.006
4	A-88	01/19/16	-	01/26/16	0.03 +/- 0.004
5	A-88	01/26/16	-	02/01/16	0.04 +/- 0.006
6 ¹	A-88	02/01/16	-	02/08/16	+/-
7	A-88	02/08/16	-	02/16/16	0.02 +/- 0.003
8	A-88	02/16/16	-	02/22/16	0.04 +/- 0.007
9	A-88	02/22/16	-	02/29/16	0.04 +/- 0.01
10	A-88	02/29/16	-	03/07/16	0.03 +/- 0.005
11	A-88	03/07/16	-	03/14/16	0.03 +/- 0.004
12	A-88	03/14/16	-	03/21/16	0.04 +/- 0.01
13	A-88	03/21/16	-	03/28/16	0.03 +/- 0.004
14 ²	A-88	03/28/16	-	04/04/16	+/-
15 ³	A-88	04/04/16	-	04/11/16	0.03 +/- 0.004
16	A-88	04/11/16	-	04/18/16	0.05 +/- 0.01
17 ⁴	A-88	04/18/16	-	04/25/16	+/-
18	A-88	04/25/16	-	05/02/16	0.04 +/- 0.00

Virginia Department of Health

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

⁴ Air sampler was not operational, no sample was collected.

AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Route 700

Week #	Station	Date		Gross Beta Activity pCi/meter ³		
		Start	Stop			
19	A-88	05/02/16	05/09/16	0.05	+/-	0.01
20	A-88	05/09/16	- 05/16/16	0.02	+/-	0.004
21	A-88	05/16/16	- 05/23/16	0.03	+/-	0.004
22	A-88	05/23/16	- 05/31/16	0.06	+/-	0.01
23	A-88	05/31/16	- 06/06/16	0.03	+/-	0.01
24	A-88	06/06/16	- 06/13/16	0.05	+/-	0.007
25 ⁵	A-88	06/13/16	- 06/20/16		+/-	
26 ⁶	A-88	06/20/16	- 06/27/16		+/-	
27 ⁷	A-88	06/27/16	- 07/04/16		+/-	
28 ⁸	A-88	07/04/16	- 07/11/16	0.04	+/-	0.01
29 ⁹	A-88	07/11/16	- 07/18/16		+/-	
30 ¹⁰	A-88	07/18/16	- 07/25/16		+/-	
31 ¹¹	A-88	07/25/16	- 08/1/16		+/-	
32	A-88	08/01/16	- 08/08/16	0.07	+/-	0.01
33 ¹²	A-88	08/08/16	- 08/15/16		+/-	
34	A-88	08/15/16	- 08/22/16	0.05	+/-	0.01
35	A-88	08/22/16	- 08/29/16	0.05	+/-	0.007

Virginia Department of Health

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs, no samples were analyzed.

⁷ Due to mobile laboratory repairs no samples were analyzed.

⁸ Due to mobile laboratory repairs, sample collection was extended to 2 weeks.

⁹ Due to a power failure, no sample was collected.

¹⁰ Due to a power failure, no sample was collected.

¹¹ Due to continued power issues, no sample was collected.

¹² Staff participated in VDOT exercise / training. No samples were analyzed.

AIR PARTICULATE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Route 700 – (Continued)

Week #	Station	Date		Gross Beta Activity pCi/meter ³		
		Start	Stop			
36	A-88	08/29/16	- 09/05/16	0.08	+/-	0.01
37 ¹³	A-88	09/05/16	- 09/12/16		+/-	
38	A-88	09/05/16	- 09/19/16	0.04	+/-	0.005
39	A-88	09/19/16	- 09/26/16	0.07	+/-	0.01
40	A-88	09/26/16	- 10/03/16	0.06	+/-	0.01
41	A-88	10/03/16	- 10/11/16	0.06	+/-	0.01
42	A-88	10/11/16	- 10/17/16	0.10	+/-	0.01
43	A-88	10/17/16	- 10/24/16	0.04	+/-	0.01
44	A-88	10/24/16	- 10/31/16	0.03	+/-	0.005
45	A-88	10/31/16	- 11/07/16	0.08	+/-	0.01
46	A-88	10/07/16	- 10/14/16	0.07	+/-	0.01
47 ¹⁴	A-88	11/14/16	- 11/21/16		+/-	
48	A-88	11/21/16	- 11/28/16	0.06	+/-	0.01
49	A-88	11/28/16	- 12/05/16	0.05	+/-	0.01
50	A-88	12/05/16	- 12/13/16	0.04	+/-	0.006
51	A-88	12/13/16	- 12/19/16	0.04	+/-	0.005
52	A-88	12/19/16	- 12/27/16	0.04	+/-	0.01

¹³ MICL deployed to HAZMAT Conference. No samples were collected.

¹⁴Due to the holiday, no samples were analyzed.

Virginia Department of Health
AMBIENT GAMMA EXPOSURE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Station	Quarter	Net Exposure Rate			
			mR/Std Qtr +/- 2 S.D.			
Pocahontas State Park (Control)	D-40	1 st	+/-	31.30	+/-	11.19
Pocahontas State Park	D-40	2 nd		46.62	+/-	13.66
Pocahontas State Park	D-40	3 rd		44.70	+/-	13.37
Pocahontas State Park	D-40	4 th		33.89	+/-	11.64
Surry Power Station	D-20	1 st		19.06	+/-	8.73
Surry Power Station	D-20	2 nd		29.95	+/-	10.94
Surry Power Station	D-20	3 rd		27.07	+/-	10.41
Surry Power Station	D-20	4 th		22.30	+/-	9.44
North Anna Power Station	D-35	1 st		23.65	+/-	9.73
North Anna Power Station	D-35	2 nd		40.18	+/-	12.66
North Anna Power Station	D-35	3 rd		32.64	+/-	11.43
North Anna Power Station	D-35	4 th		27.56	+/-	10.50
Surry – Lebanon Baptist Church	D-41	1 st		17.36	+/-	8.33
Surry – Lebanon Baptist Church	D-41	2 nd		23.50	+/-	9.69
Surry – Lebanon Baptist Church	D-41	3 rd		26.73	+/-	10.34
Surry – Lebanon Baptist Church	D-41	4 th		16.92	+/-	8.23
Surry – Lawnes Creek	D-42	1 st		20.98	+/-	9.16
Surry – Lawnes Creek	D-42	2 nd		30.18	+/-	10.99
Surry – Lawnes Creek	D-42	3 rd		31.19	+/-	11.17
Surry – Lawnes Creek	D-42	4 th		22.59	+/-	9.51
Surry – Route 628	D-43	1 st		19.66	+/-	8.87
Surry – Route 628 ¹	D-43	2 nd		+/-	+/-	+/-
Surry – Route 628	D-43	3 rd		28.79	+/-	10.73
Surry – Route 628	D-43	4 th		18.79	+/-	8.67
Jamestown – Historical site	D-44	1 st		21.16	+/-	9.20
Jamestown – Historical site	D-44	2 nd		25.46	+/-	10.09
Jamestown – Historical site	D-44	3 rd		30.38	+/-	11.02
Jamestown – Historical site	D-44	4 th		19.39	+/-	8.81
Newport News - Lee Hall	D-45	1 st		24.70	+/-	9.94
Newport News - Lee Hall	D-45	2 nd		39.41	+/-	12.54
Newport News - Lee Hall	D-45	3 rd		35.79	+/-	11.96
Newport News - Lee Hall	D-45	4 th		31.30	+/-	11.19
Louisa County - Mineral	D-50	1 st		20.53	+/-	9.06
Louisa County - Mineral	D-50	2 nd		35.14	+/-	11.86
Louisa County - Mineral	D-50	3 rd		28.88	+/-	10.75
Louisa County - Mineral	D-50	4 th		29.91	+/-	10.94
Louisa County – Wares Crossroads	D-51	1 st		20.45	+/-	9.05
Louisa County – Wares Crossroads	D-51	2 nd		27.07	+/-	10.41
Louisa County – Wares Crossroads	D-51	3 rd		27.90	+/-	10.56
Louisa County – Wares Crossroads	D-51	4 th		21.70	+/-	9.32

¹ Dosimeter was heavily damaged during deployment and could not be analyzed.

Virginia Department of Health
AMBIENT GAMMA EXPOSURE

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Station	Quarter	Net Exposure Rate		
			mR/Std Qtr	+/-	2 S.D.
Louisa County – Good Hope Church	D-52	1 st	22.48	+/-	9.48
Louisa County – Good Hope Church	D-52	2 nd	35.82	+/-	11.97
Louisa County – Good Hope Church	D-52	3 rd	35.46	+/-	11.91
Louisa County – Good Hope Church	D-52	4 th	26.58	+/-	10.31
Spotsylvania Route 614	D-53	1 st	19.58	+/-	8.85
Spotsylvania Route 614	D-53	2 nd	30.92	+/-	11.12
Spotsylvania Route 614	D-53	3 rd	28.55	+/-	10.69
Spotsylvania Route 614	D-53	4 th	23.02	+/-	9.60
Louisa County – Fred Hall	D-54	1 st	19.96	+/-	8.94
Louisa County – Fred Hall	D-54	2 nd	26.44	+/-	10.28
Louisa County – Fred Hall	D-54	3 rd	23.96	+/-	9.79
Louisa County – Fred Hall	D-54	4 th	21.90	+/-	9.36
Naval Weapons Station – 1	D-73	1 st	16.93	+/-	8.23
Naval Weapons Station – 1	D-73	2 nd	29.53	+/-	10.87
Naval Weapons Station – 1	D-73	3 rd	23.58	+/-	9.71
Naval Weapons Station – 1	D-73	4 th	23.98	+/-	9.79
Newport News – Fort Eustis	D-76	1 st	20.69	+/-	9.10
Newport News – Fort Eustis	D-76	2 nd	26.26	+/-	10.25
Newport News – Fort Eustis	D-76	3 rd	26.31	+/-	10.26
Newport News – Fort Eustis	D-76	4 th	22.35	+/-	9.46
Williamsburg – Busch Gardens	D-77	1 st	22.61	+/-	9.51
Williamsburg – Busch Gardens	D-77	2 nd	31.00	+/-	11.13
Williamsburg – Busch Gardens	D-77	3 rd	33.31	+/-	11.54
Williamsburg – Busch Gardens	D-77	4 th	26.38	+/-	10.27
Williamsburg – Airport	D-78	1 st	17.67	+/-	8.41
Williamsburg – Airport	D-78	2 nd	28.45	+/-	10.67
Williamsburg – Airport	D-78	3 rd	22.35	+/-	9.46
Williamsburg – Airport	D-78	4 th	24.16	+/-	9.83
Surry – Scotland Wharf	D-79	1 st	17.40	+/-	8.34
Surry – Scotland Wharf	D-79	2 nd	26.26	+/-	10.25
Surry – Scotland Wharf	D-79	3 rd	22.62	+/-	9.51
Surry – Scotland Wharf	D-79	4 th	22.15	+/-	9.41
Surry – Bacon's Castle	D-80	1 st	16.84	+/-	8.21
Surry – Bacon's Castle	D-80	2 nd	30.63	+/-	11.07
Surry – Bacon's Castle	D-80	3 rd	23.31	+/-	9.66
Surry – Bacon's Castle	D-80	4 th	22.80	+/-	9.55
Surry – Alliance	D-81	1 st	19.13	+/-	8.75
Surry – Alliance	D-81	2 nd	26.49	+/-	10.29
Surry – Alliance	D-81	3 rd	27.98	+/-	10.58
Surry – Alliance	D-81	4 th	20.45	+/-	9.05

Virginia Department of Health
AMBIENT GAMMA EXPOSURE

January 1, 2016 through December 31, 2016

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Location	Station	Quarter	Net Exposure Rate mR/Std Qtr +/- 2 S.D.		
Surry – Hog Point	D-82	1 st	19.01	+/-	8.72
Surry – Hog Point	D-82	2 nd	26.00	+/-	10.20
Surry – Hog Point	D-82	3 rd	24.90	+/-	9.98
Surry – Hog Point	D-82	4 th	21.68	+/-	9.31
Louisa County – Route 685	D-84	1 st	20.42	+/-	9.04
Louisa County – Route 685	D-84	2 nd	34.31	+/-	11.71
Louisa County – Route 685	D-84	3 rd	28.93	+/-	10.76
Louisa County – Route 685	D-84	4 th	26.80	+/-	10.35
Spotsylvania – Route 713	D-85	1 st	20.85	+/-	9.13
Spotsylvania – Route 713	D-85	2 nd	29.55	+/-	10.87
Spotsylvania – Route 713	D-85	3 rd	28.92	+/-	10.75
Spotsylvania – Route 713	D-85	4 th	21.85	+/-	9.35
Louisa County – Bumpass Fire Dept.	D-86	1 st	23.22	+/-	9.64
Louisa County – Bumpass Fire Dept.	D-86	2 nd	21.03	+/-	9.17
Louisa County – Bumpass Fire Dept.	D-86	3 rd	31.68	+/-	11.26
Louisa County – Bumpass Fire Dept.	D-86	4 th	25.57	+/-	10.11
Spotsylvania – Levy	D-87	1 st	21.94	+/-	9.37
Spotsylvania – Levy	D-87	2 nd	33.55	+/-	11.58
Spotsylvania – Levy	D-87	3 rd	32.26	+/-	11.36
Spotsylvania – Levy	D-87	4 th	26.55	+/-	10.30
Louisa County – Route 700	D-88	1 st	22.62	+/-	9.51
Louisa County – Route 700	D-88	2 nd	36.39	+/-	12.06
Louisa County – Route 700	D-88	3 rd	34.50	+/-	11.75
Louisa County – Route 700	D-88	4 th	28.37	+/-	10.65
Louisa County – Aspen Hill	D-89	1 st	26.95	+/-	10.38
Louisa County – Aspen Hill	D-89	2 nd	38.03	+/-	12.33
Louisa County – Aspen Hill	D-89	3 rd	27.42	+/-	10.47
Louisa County – Aspen Hill	D-89	4 th	29.51	+/-	10.87
Radiological Health	Control 1	1 st	12.95	+/-	7.20
Radiological Health	Control 1	2 nd	13.92	+/-	7.46
Radiological Health	Control 1	3 rd	17.31	+/-	8.32
Radiological Health	Control 1	4 th	12.39	+/-	7.04
Radiological Health	Control 2	1 st	13.83	+/-	7.44
Radiological Health	Control 2	2 nd	15.95	+/-	7.99
Radiological Health	Control 2	3 rd	16.37	+/-	8.09
Radiological Health	Control 2	4 th	14.70	+/-	7.67

Virginia Department of Health

FISH

January 1, 2016 through December 31, 2016

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Location Type of fish	Date Collected	Isotope	pCi/gram
Bi-Annual North Anna Second Cooling Lagoon F-24	4/19/16	Ba-140	<MDA
		Cs-134	<MDA
		Cs-137	0.01 +/- 0.01
		Co-58	<MDA
		Co-60	<MDA
		I-131	<MDA
		Fe-59	<MDA
		Mn-54	<MDA
		Ru-106	<MDA
		Ag-110M	<MDA
		Zn-65	<MDA
		Nb-95	<MDA
		Bi-Annual North Anna Second Cooling Lagoon F-24	11/07/16
Cs-134	<MDA		
Cs-137	0.01 +/- 0.01		
Co-58	<MDA		
Co-60	<MDA		
I-131	<MDA		
Fe-59	<MDA		
Mn-54	<MDA		
Ru-106	<MDA		
Ag-110M	<MDA		
Zn-65	<MDA		
Nb-95	<MDA		

Note: Fish samples collected during the 2nd and 4th quarter.

Virginia Department of Health

FISH

January 1, 2016 through December 31, 2016

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Location Type of fish	Date Collected	Isotope	pCi/gram
Surry Discharge Canal F-17	04/06/16	Ba-140	<MDA
		Cs-134	<MDA
		Cs-137	<MDA
		Co-58	<MDA
		Co-60	<MDA
		I-131	<MDA
		Fe-59	<MDA
		Mn-54	<MDA
		Ru-106	<MDA
		Ag-110M	<MDA
		Zn-65	<MDA
		Nb-95	<MDA
		Surry Discharge Canal Rockfish/Catfish F-17	10/07/15
Cs-134	<MDA		
Cs-137	<MDA		
Co-58	<MDA		
Co-60	<MDA		
I-131	<MDA		
Fe-59	<MDA		
Mn-54	<MDA		
Ru-106	<MDA		
Ag-110M	<MDA		
Zn-65	<MDA		
Nb-95	<MDA		

Note: Fish samples collected during the 2nd and 4th quarter.

Virginia Department of Health
SHELLFISH

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location Type of fish	Date Collected	Isotope	pCi/gram
Surry Power Station R-17 (Clams and Oysters)	03/18/16	Ba-140	<MDA
		Cs-134	<MDA
		Cs-137	<MDA
		Co-58	<MDA
		Co-60	<MDA
		I-131	<MDA
		Fe-59	<MDA
		Mn-54	<MDA
		Ru-106	<MDA
		Ag-110M ¹	
		Zn-65	<MDA
		Nb-95	<MDA
		Ba-140	<MDA
Surry Power Station R-17 (Clams and Oysters)	10/06/16	Cs-134	<MDA
		Cs-137	<MDA
		Co-58	<MDA
		Co-60	<MDA
		I-131	<MDA
		Fe-59	<MDA
		Mn-54	<MDA
		Ru-106	<MDA
		Ag-110M ²	
		Zn-65	<MDA
		Nb-95	<MDA
		Ba-140	<MDA

Note: Fish samples collected during the 2nd and 4th quarter.

¹ Sample was not analyzed for this isotope.

² Sample was not analyzed for this isotope.

Virginia Department of Health
Milk

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Louisa County - Lakeside Dairy M-29			
1 st Quarter Date: 03/31/16		2 nd Quarter Date: 4/1/16	
Isotope	Results - pCi/liter	Isotope	Results - pCi/liter
Ba	<MDA	Ba	<MDA
Cs-134	<MDA	Cs-134	<MDA
Cs-137	<MDA	Cs-137	<MDA
K-40*	1.7 +/- 0.1	K-40*	1.5 +/- 0.1
I-131	<MDA	I-131	<MDA
Sr-89	<MDA	Sr-89	<MDA
Sr-90	<MDA	Sr-90	<MDA
3 rd Quarter Date: 7/8/16		4 th Quarter Date: ¹	
Isotope	Results - pCi/liter	Isotope	Results - pCi/liter
Ba	<MDA	Ba	<MDA
Cs-134	<MDA	Cs-134	<MDA
Cs-137	<MDA	Cs-137	<MDA
K-40*	1.6 +/- 0.1	K-40*	<MDA
I-131	<MDA	I-131	<MDA
Sr-89	<MDA	Sr-89	<MDA
Sr-90	0.83 +/- 0.51	Sr-90	<MDA
Surry County - Epps Dairy M-66			
1 st Quarter Date: 03/31/16		2 nd Quarter Date: 4/5/16	
Isotope	Results - pCi/liter	Isotope	Results - pCi/liter
Ba	<MDA	Ba	<MDA
Cs-134	<MDA	Cs-134	<MDA
Cs-137	<MDA	Cs-137	<MDA
K-40*	1.5 +/- 0.1	K-40*	1.5 +/- 0.1
I-131	<MDA	I-131	<MDA
Sr-89	<MDA	Sr-89	<MDA
Sr-90	0.4 +/- 0.7	Sr-90	0.23 +/- 0.5
3 rd Quarter Date: 7/7/16		4 th Quarter Date: ²	
Isotope	Results - pCi/liter	Isotope	Results - pCi/liter
Ba	<MDA	Ba	<MDA
Cs-134	<MDA	Cs-134	<MDA
Cs-137	<MDA	Cs-137	<MDA
K-40*	1.5 +/- 0.1	K-40*	<MDA
I-131	<MDA	I-131	<MDA
Sr-89	<MDA	Sr-89	<MDA
Sr-90	1.33 +/- 0.63	Sr-90	<MDA

*K-40 data is reported in units of grams/liter.

¹ No sample was collected from this location during the 4th quarter.

² Results from DCLS not available

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Pocahontas State Park (Control)

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
1	C-40	12/28/15	-	01/04/16	<MDA	<MDA	<MDA
2	C-40	01/04/16	-	01/11/16	<MDA	<MDA	<MDA
3 ¹	C-40	01/11/16	-	01/20/16			
4	C-40	01/20/16	-	01/26/16	<MDA	<MDA	<MDA
5	C-40	01/26/16	-	02/01/16	<MDA	<MDA	<MDA
6 ²	C-40	02/01/16	-	02/08/16			
7	C-40	02/08/16	-	02/16/16	<MDA	<MDA	<MDA
8	C-40	02/16/16	-	02/22/16	<MDA	<MDA	<MDA
9	C-40	02/22/16	-	02/29/16	<MDA	<MDA	<MDA
10	C-40	02/29/16	-	03/07/16	<MDA	<MDA	<MDA
11	C-40	03/07/16	-	03/14/16	<MDA	<MDA	<MDA
12	C-40	03/14/16	-	03/21/16	<MDA	<MDA	<MDA
13	C-40	03/21/16	-	03/28/16	<MDA	<MDA	<MDA
14 ³	C-40	03/28/16	-	04/04/16			
15 ⁴	C-40	04/04/16	-	04/11/16	<MDA	<MDA	<MDA
16	C-40	04/11/16	-	04/18/16	<MDA	<MDA	<MDA
17	C-40	04/18/16	-	04/25/16	<MDA	<MDA	<MDA
18	C-40	04/25/16	-	05/02/16	<MDA	<MDA	<MDA
19	C-40	05/02/16	-	05/09/16	<MDA	<MDA	<MDA
20	C-40	05/09/16	-	05/16/16	<MDA	<MDA	<MDA
21	C-40	05/16/16	-	05/23/16	<MDA	<MDA	<MDA

¹ Due to state holiday and weather closings there was insufficient time to analyze this sample.

² Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

³ Due to staff training, no samples were analyzed.

⁴ Air samples were collected after a 14 day sampling period.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Pocahontas State Park (Control) - continued

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
22	C-40	5/23/16	- 5/31/16	<MDA	<MDA	<MDA
23	C-40	05/31/16	- 06/06/16	<MDA	<MDA	<MDA
24	C-40	06/06/16	- 06/13/16	<MDA	<MDA	<MDA
25 ⁵	C-40	06/13/16	- 06/20/16			
26 ⁶	C-40	06/20/16	- 06/27/16			
27 ⁷	C-40	06/27/16	- 07/04/16			
28 ⁸	C-40	07/04/16	- 07/11/16	<MDA	4.35 E -2	<MDA
29	C-40	07/11/16	- 07/18/16	<MDA	<MDA	<MDA
30	C-40	07/18/16	- 07/25/16	<MDA	<MDA	<MDA
31	C-40	07/25/16	- 08/01/16	<MDA	<MDA	<MDA
32	C-40	08/01/16	- 08/08/16	<MDA	<MDA	<MDA
33 ⁹	C-40	08/08/16	- 08/15/16			
34	C-40	08/15/16	- 08/22/16	<MDA	<MDA	<MDA
35	C-40	08/22/16	- 08/29/16	<MDA	<MDA	<MDA
36	C-40	08/29/16	- 09/5/16	<MDA	<MDA	<MDA
37 ¹⁰	C-40	09/05/16	- 09/12/16			
38	C-40	09/12/16	- 09/19/16	<MDA	<MDA	<MDA
39	C-40	09/19/16	- 09/26/16	<MDA	<MDA	<MDA
40	C-40	09/26/16	- 10/03/16	<MDA	<MDA	<MDA
41	C-40	10/03/16	- 10/11/16	<MDA	<MDA	<MDA

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs, no samples were analyzed.

⁷ Due to mobile laboratory repairs no samples were analyzed.

⁸ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁹ Staff participated in VDOT exercise / training. No samples were analyzed.

¹⁰ MICL deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Pocahontas State Park (Control) - continued

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
42	C-40	10/11/16	-	10/17/16	<MDA	<MDA	<MDA
43	C-40	10/17/16	-	10/24/16	<MDA	<MDA	<MDA
44	C-40	10/24/16	-	10/31/16	<MDA	<MDA	<MDA
45	C-40	10/31/16	-	11/07/16	<MDA	<MDA	<MDA
46	C-40	11/07/16	-	11/14/16	<MDA	<MDA	<MDA
47 ¹¹	C-40	11/14/16	-	11/21/16			
48	C-40	11/21/16	-	11/28/16	<MDA	<MDA	<MDA
49	C-40	11/28/16	-	12/05/16	<MDA	<MDA	<MDA
50	C-40	12/05/16	-	12/13/16	<MDA	<MDA	<MDA
51	C-40	12/13/16	-	12/19/16	<MDA	<MDA	<MDA
52	C-40	12/19/16	-	12/27/16	<MDA	<MDA	<MDA

¹¹ Due to the holiday, no samples were analyzed.

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Surry Power Station (Onsite)

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
1	C-20	12/28/15	- 01/04/16	<MDA	<MDA	<MDA
2	C-20	01/4/16	- 01/11/16	<MDA	<MDA	<MDA
3	C-20	01/11/16	- 01/19/16	<MDA	<MDA	<MDA
4	C-20	01/19/16	- 01/26/16	<MDA	<MDA	<MDA
5	C-20	01/26/16	- 02/01/16	<MDA	<MDA	<MDA
6 ¹	C-20	02/01/16	- 02/08/16			
7	C-20	02/08/16	- 02/16/16	<MDA	<MDA	<MDA
8	C-20	02/16/16	- 02/22/16	<MDA	<MDA	<MDA
9	C-20	02/22/16	- 02/29/16	<MDA	<MDA	<MDA
10	C-20	02/29/16	- 03/07/16	<MDA	<MDA	<MDA
11	C-20	03/07/16	- 03/14/16	<MDA	<MDA	<MDA
12	C-20	03/14/16	- 03/21/16	<MDA	<MDA	<MDA
13	C-20	03/21/16	- 03/28/16	1.39E-01	<MDA	<MDA
14 ²	C-20	03/28/16	- 04/04/16			
15 ³	C-20	04/04/16	- 04/11/16	<MDA	<MDA	<MDA
16	C-20	04/11/16	- 04/18/16	<MDA	<MDA	<MDA
17	C-20	04/18/16	- 04/25/16	<MDA	<MDA	<MDA
18	C-20	04/25/16	- 05/02/16	<MDA	<MDA	<MDA
19	C-20	05/02/16	- 05/09/16	<MDA	<MDA	<MDA
20	C-20	05/09/16	- 05/16/16	<MDA	<MDA	<MDA
21	C-20	05/16/16	- 05/23/16	<MDA	<MDA	<MDA

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Surry Power Station (Onsite) - *continued*

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
22	C-20	05/23/16	- 05/31/16	<MDA	<MDA	<MDA
23	C-20	05/31/16	- 06/06/16	<MDA	<MDA	<MDA
24	C-20	06/06/16	- 06/13/16	<MDA	<MDA	<MDA
25 ⁴	C-20	06/13/16	- 06/20/16			
26 ⁵	C-20	06/20/16	- 06/27/16			
27 ⁶	C-20	06/27/16	- 07/04/16			
28 ⁷	C-20	07/04/16	- 07/11/16	<MDA	<MDA	<MDA
29	C-20	07/11/16	- 07/18/16	<MDA	<MDA	<MDA
30	C-20	07/18/16	- 07/25/16	<MDA	<MDA	<MDA
31	C-20	07/25/16	- 08/01/16	<MDA	<MDA	<MDA
32	C-20	08/01/16	- 08/08/16	<MDA	<MDA	<MDA
33 ⁸	C-20	08/08/16	- 08/15/16			
34	C-20	08/15/16	- 08/22/16	<MDA	<MDA	<MDA
35	C-20	08/22/16	- 08/29/16	<MDA	<MDA	<MDA
36	C-20	08/29/16	- 09/05/16	<MDA	<MDA	<MDA
37 ⁹	C-20	09/05/16	- 09/12/16			
38	C-20	09/12/16	- 09/19/16	<MDA	<MDA	<MDA
39	C-20	09/19/16	- 09/26/16	<MDA	<MDA	<MDA
40	C-20	09/26/16	- 10/03/16	<MDA	<MDA	<MDA
41	C-20	10/03/16	- 10/11/16	<MDA	<MDA	1.72E-02

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were analyzed.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples were analyzed.

⁹ MICL deployed to HAZMAT Conference. No samples were analyzed.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Surry Power Station (Onsite) - *continued*

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
42	C-20	10/11/16	- 10/17/16	<MDA	<MDA	<MDA
43	C-20	10/17/16	- 10/24/16	<MDA	<MDA	<MDA
44	C-20	10/24/16	- 10/31/16	<MDA	<MDA	<MDA
45	C-20	10/31/16	- 11/07/16	<MDA	<MDA	<MDA
46	C-20	11/07/16	- 11/14/16	<MDA	<MDA	<MDA
47 ¹⁰	C-20	11/14/16	- 11/21/16			
48	C-20	11/21/16	- 11/28/16	<MDA	<MDA	<MDA
49	C-20	11/28/16	- 12/05/16	<MDA	<MDA	<MDA
50	C-20	12/05/16	- 12/13/16	2.16E-2	<MDA	<MDA
51	C-20	12/13/16	- 12/19/16	<MDA	<MDA	<MDA
52	C-20	12/19/16	- 12/27/16	<MDA	<MDA	<MDA

¹⁰ Due to the holiday, no samples were analyzed.

Virginia Department of Health Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Jamestown State Park & Historical Site

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
1	C-44	12/28/15	-	01/04/16	<MDA	<MDA	<MDA
2	C-44	01/04/16	-	01/11/16	<MDA	<MDA	<MDA
3 ¹	C-44	01/11/16	-	01/19/16			
4	C-44	01/19/16	-	01/26/16	<MDA	<MDA	<MDA
5	C-44	01/26/16	-	02/01/16	<MDA	<MDA	<MDA
6 ²	C-44	02/01/16	-	02/08/16			
7	C-44	02/08/16	-	02/16/16	<MDA	<MDA	<MDA
8	C-44	02/16/16	-	02/22/16	<MDA	<MDA	<MDA
9	C-44	02/22/16	-	02/29/16	<MDA	<MDA	<MDA
10	C-44	02/29/16	-	03/07/16	<MDA	<MDA	<MDA
11	C-44	03/07/16	-	03/14/16	<MDA	<MDA	<MDA
12	C-44	03/14/16	-	03/21/16	<MDA	<MDA	<MDA
13	C-44	03/21/16	-	03/28/16	<MDA	<MDA	<MDA
14 ³	C-44	03/28/16	-	04/04/16			
15 ⁴	C-44	04/04/16	-	04/11/16	<MDA	<MDA	<MDA
16	C-44	04/11/16	-	04/18/16	<MDA	<MDA	<MDA
17	C-44	04/18/16	-	04/25/16	<MDA	<MDA	<MDA
18	C-44	04/25/16	-	05/02/16	<MDA	<MDA	<MDA
19	C-44	05/02/16	-	05/09/16	<MDA	<MDA	<MDA
20	C-44	05/09/16	-	05/16/16	<MDA	<MDA	<MDA
21	C-44	05/16/16	-	05/23/16	<MDA	<MDA	<MDA

¹ Due to state holiday and weather closings there was insufficient time to analyze this sample.

² Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

³ Due to staff training, no samples were analyzed.

⁴ Air samples were collected after a 14 day sampling period.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

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

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
22	C-44	05/23/16	- 05/31/16	<MDA	<MDA	<MDA
23	C-44	5/31/16	- 06/06/16	<MDA	<MDA	<MDA
24	C-44	06/06/16	- 06/13/16	<MDA	<MDA	<MDA
25 ⁵	C-44	06/13/16	- 06/20/16			
26 ⁶	C-44	06/20/16	- 06/27/16			
27 ⁷	C-44	06/27/16	- 07/04/16			
28 ⁸	C-44	07/04/16	- 07/11/16	<MDA	<MDA	<MDA
29	C-44	07/11/16	- 07/18/16	<MDA	<MDA	<MDA
30	C-44	07/18/16	- 07/25/16	<MDA	<MDA	<MDA
31	C-44	07/25/16	- 08/01/16	<MDA	<MDA	<MDA
32	C-44	08/01/16	- 08/08/16	<MDA	<MDA	<MDA
33 ⁹	C-44	08/08/16	- 08/15/16			
34	C-44	08/15/16	- 08/22/16	<MDA	<MDA	<MDA
35	C-44	08/22/16	- 08/29/16	<MDA	<MDA	<MDA
36	C-44	08/29/16	- 09/05/16	<MDA	<MDA	<MDA
37 ¹⁰	C-44	09/05/16	- 09/12/16			
38	C-44	09/12/16	- 09/19/16	<MDA	<MDA	<MDA
39	C-44	09/19/16	- 09/26/16	5.65 E-02	<MDA	<MDA
40	C-20	09/26/16	- 10/03/16	<MDA	<MDA	<MDA

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs, no samples were analyzed.

⁷ Due to mobile laboratory repairs no samples were analyzed.

⁸ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁹ Staff participated in VDOT exercise / training. No samples were analyzed.

¹⁰ MICL deployed to HAZMAT Conference. No samples were analyzed.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

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

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
41	C-20	10/03/16	- 10/11/16	<MDA	<MDA	1.72E-02
42	C-20	10/11/16	- 10/17/16	<MDA	<MDA	<MDA
43	C-20	10/17/16	- 10/24/16	<MDA	<MDA	<MDA
44	C-20	10/24/16	- 10/31/16	<MDA	<MDA	<MDA
45	C-20	10/31/16	- 11/07/16	<MDA	<MDA	<MDA
46	C-20	11/07/16	- 11/14/16	<MDA	<MDA	<MDA
47 ¹¹	C-20	11/14/16	- 11/21/16			
48	C-20	11/21/16	- 11/28/16	<MDA	<MDA	<MDA
49	C-20	11/28/16	- 12/05/16	<MDA	<MDA	<MDA
50	C-20	12/05/16	- 12/13/16	2.16E-2	<MDA	<MDA
51	C-20	12/13/16	- 12/19/16	<MDA	<MDA	<MDA
52	C-20	12/19/16	- 12/27/16	<MDA	<MDA	<MDA

¹¹ Due to the holiday, no samples were analyzed.

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Louisa County / Bumpass Volunteer Fire Station

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
1	C-86	12/28/15	-	01/04/16	<MDA	<MDA	<MDA
2	C-86	01/04/16	-	01/11/16	<MDA	<MDA	<MDA
3	C-86	01/11/16	-	01/19/16	<MDA	<MDA	<MDA
4	C-86	01/19/16	-	01/26/16	<MDA	<MDA	<MDA
5	C-86	01/26/16	-	02/01/16	<MDA	<MDA	<MDA
6 ¹	C-86	02/01/16	-	02/08/16			
7	C-86	02/08/16	-	02/16/16	<MDA	<MDA	<MDA
8	C-86	02/16/16	-	02/22/16	<MDA	<MDA	<MDA
9	C-86	02/22/16	-	02/29/16	<MDA	<MDA	<MDA
10	C-86	02/29/16	-	03/07/16	<MDA	<MDA	<MDA
11	C-86	03/07/16	-	03/14/16	<MDA	<MDA	<MDA
12	C-86	03/14/16	-	03/21/16	<MDA	<MDA	<MDA
13	C-86	03/21/16	-	03/28/16	<MDA	<MDA	<MDA
14 ²	C-86	03/28/16	-	04/04/16			
15 ³	C-86	04/04/16	-	04/11/16	<MDA	<MDA	<MDA
16	C-86	04/11/16	-	04/18/16	<MDA	<MDA	<MDA
17	C-86	04/18/16	-	04/25/16	<MDA	<MDA	<MDA
18	C-86	04/25/16	-	05/02/16			
19	C-86	05/02/16	-	05/09/16			
20	C-86	05/09/16	-	05/16/16			
21	C-86	05/16/16	-	05/23/16			

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

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

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
22	C-86	05/23/16	-	05/31/16		
23	C-86	05/31/16	-	06/06/16		
24	C-86	06/06/16	-	06/13/16		
25 ⁴	C-86	06/13/16	-	06/20/16		
26 ⁵	C-86	06/20/16	-	06/27/16		
27 ⁶	C-86	06/27/16	-	07/04/16		
28 ⁷	C-86	07/04/16	-	07/11/16	<MDA	<MDA
29	C-86	07/11/16	-	07/18/16	<MDA	<MDA
30	C-86	07/18/16	-	07/25/16	<MDA	<MDA
31	C-86	07/25/16	-	08/01/16	<MDA	<MDA
32	C-86	08/01/16	-	08/08/16	<MDA	<MDA
33 ⁸	C-86	08/08/16	-	08/15/16		
34	C-86	08/15/16	-	08/22/16	<MDA	<MDA
35	C-86	08/22/16	-	08/29/16	<MDA	<MDA
36	C-86	08/29/16	-	09/05/16	<MDA	<MDA
37 ⁹	C-86	09/05/16	-	09/12/16		
38	C-86	09/12/16	-	09/19/16	3.59 E-02	<MDA
39	C-86	09/19/16	-	09/26/16	<MDA	<MDA
40	C-86	09/26/16	-	10/03/16	<MDA	<MDA
41	C-86	10/03/16	-	10/11/16	<MDA	<MDA

⁴ Power was unavailable to the air sampler from week 18-25 (lightning strike)

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs no samples were analyzed.

⁷ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁸ Staff participated in VDOT exercise / training. No samples were analyzed.

⁹ MICL deployed to HAZMAT Conference. No samples were analyzed.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

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

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
42	C-86	10/11/16	-	10/17/16	<MDA	<MDA	<MDA
43	C-86	10/17/16	-	10/24/16	<MDA	<MDA	<MDA
44	C-86	10/24/16	-	10/31/16	<MDA	<MDA	<MDA
45	C-86	10/31/16	-	11/07/16	<MDA	<MDA	<MDA
46	C-86	11/07/16	-	11/14/16	<MDA	<MDA	<MDA
47 ¹⁰	C-86	11/14/16	-	11/21/16			
48	C-86	11/21/16	-	11/28/16	<MDA	<MDA	<MDA
49	C-86	11/28/16	-	12/05/16	<MDA	<MDA	<MDA
51	C-86	12/05/16	-	12/13/16	<MDA	<MDA	<MDA
52	C-86	12/13/16	-	12/19/16	<MDA	<MDA	<MDA
42	C-86	10/11/16	-	10/17/16	<MDA	<MDA	<MDA

¹⁰ Due to the holiday, no samples were analyzed.

Virginia Department of Health
Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Louisa County / Route 700

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
1	C-88	12/28/15	-	01/04/16	<MDA	3.27E-2	<MDA
2	C-88	01/04/16	-	01/11/16	<MDA	<MDA	<MDA
3	C-88	01/11/16	-	01/19/16	<MDA	<MDA	<MDA
4	C-88	01/19/16	-	01/26/16	<MDA	<MDA	<MDA
5	C-88	01/26/16	-	02/01/16	<MDA	<MDA	<MDA
6 ¹	C-88	02/01/16	-	02/08/16			
7	C-88	02/08/16	-	02/16/16	<MDA	<MDA	<MDA
8	C-88	02/16/16	-	02/22/16	<MDA	<MDA	<MDA
9	C-88	02/22/16	-	02/29/16	<MDA	<MDA	<MDA
10	C-88	02/29/16	-	03/07/16	<MDA	<MDA	<MDA
11	C-88	03/07/16	-	03/14/16	<MDA	<MDA	<MDA
12	C-88	03/14/16	-	03/21/16	<MDA	<MDA	<MDA
13	C-88	03/21/16	-	03/28/16	<MDA	<MDA	<MDA
14 ²	C-88	03/28/16	-	04/04/16			
15 ³	C-88	04/04/16	-	04/11/16	<MDA	<MDA	<MDA
16	C-88	04/11/16	-	04/18/16	<MDA	<MDA	<MDA
17 ⁴	C-88	04/18/16	-	04/25/16			
18	C-88	04/25/16	-	05/02/16	<MDA	<MDA	<MDA
19	C-88	05/02/16	-	05/09/16	1.70E-1	<MDA	<MDA
20	C-88	05/09/16	-	05/16/16	<MDA	<MDA	<MDA
21	C-88	05/16/16	-	05/23/16	<MDA	<MDA	<MDA

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Air samples were collected after a 14 day sampling period.

⁴ Air sampler was not operational during the collection week, no sample was collected.

**Virginia Department of Health
Gamma & Radiogas in Air**

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location: Louisa County / Route 700 – (continued)

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³
		Start	Ended			
22	C-88	05/23/16	- 05/31/16	<MDA	<MDA	<MDA
23	C-88	05/31/16	- 06/06/16	<MDA	<MDA	<MDA
24	C-88	06/06/16	- 06/13/16	<MDA	<MDA	<MDA
25 ⁵	C-88	06/13/16	- 06/20/16			
26 ⁶	C-88	06/20/16	- 06/27/16			
27 ⁷	C-88	06/27/16	- 07/04/16			
28 ⁸	C-88	07/04/16	- 07/11/16	<MDA	<MDA	<MDA
29 ⁹	C-88	07/11/16	- 07/18/16			
30 ¹⁰	C-88	07/18/16	- 07/25/16			
31 ¹¹	C-88	07/25/16	- 08/1/16			
32	C-88	08/01/16	- 08/08/16	<MDA	<MDA	<MDA
33 ¹²	C-88	08/08/16	- 08/15/16			
34	C-88	08/15/16	- 08/22/16	<MDA	<MDA	<MDA
35	C-88	08/22/16	- 08/29/16	<MDA	<MDA	<MDA
36	C-88	08/29/16	- 09/05/16	<MDA	<MDA	<MDA
37 ¹³	C-88	09/05/16	- 09/12/16			
38	C-88	09/12/16	- 09/19/16	<MDA	<MDA	<MDA
39	C-88	09/19/16	- 09/26/16	<MDA	<MDA	<MDA

Virginia Department of Health

⁵ Due to mobile laboratory repairs, no samples were analyzed.

⁶ Due to mobile laboratory repairs, no samples were analyzed.

⁷ Due to mobile laboratory repairs, no samples were analyzed.

⁸ Due to mobile laboratory repairs, sample collection times were extended to 2 weeks.

⁹ Due to a power failure, no sample was collected.

¹⁰ Due to a power failure, no sample was collected.

¹¹ Due to continued power failure, no sample was collected.

¹² Staff participated in VDOT exercise / training. No samples were analyzed.

¹³ MICL deployed to HAZMAT Conference. No samples were analyzed.

Gamma & Radiogas in Air

January 1, 2016 through December 31, 2016

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Location: Louisa County / Route 700 – continued

Week #	Station	Date		Cs-134 Activity pCi/meter ³	Cs-137 Activity pCi/meter ³	I-131 Activity pCi/meter ³	
		Start	Ended				
40	C-88	09/26/16	-	10/03/16	<MDA	<MDA	<MDA
41	C-88	10/03/16	-	10/11/16	<MDA	<MDA	<MDA
42	C-88	10/11/16	-	10/17/16	<MDA	<MDA	<MDA
43	C-88	10/17/16	-	10/24/16	<MDA	<MDA	<MDA
44	C-88	10/24/16	-	10/31/16	<MDA	<MDA	<MDA
45	C-88	10/31/16	-	11/07/16	<MDA	<MDA	<MDA
46	C-88	11/07/16	-	11/14/16	<MDA	<MDA	<MDA
47 ¹⁴	C-88	11/14/16	-	11/21/16			
48	C-88	11/21/16	-	11/28/16	<MDA	<MDA	<MDA
49	C-88	11/28/16	-	12/05/16	<MDA	<MDA	<MDA
50	C-88	12/05/16	-	12/13/16	<MDA	<MDA	<MDA
51	C-88	12/13/16	-	12/19/16	<MDA	<MDA	<MDA
52	C-88	12/19/16	-	12/27/16	<MDA	<MDA	<MDA

¹⁴ Due to the holiday, no samples were analyzed.

Virginia Department of Health
Silt

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Date collected	Gross Beta pCi/gram of Silt
James River Pier 1	03/17/16	33.1 +/- 4.4
Newport News Shipyard S-15	06/03/16	26.4 +/- 4.7
	08/11/16	32.7 +/- 5.3
	11/03/16	27.7 +/- 4.8

Virginia Department of Health
Silt

January 1, 2016 through December 31, 2016

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Location	Date collected	Gross Beta pCi/gram of Silt
James River Shipway 11 Newport News Shipyard S-16	03/17/16	22.8 +/- 3.1
	N/A ¹	
	08/11/16	16.9 ± 4.1
	11/03/16	26.7 ± 5.8

¹ The sample area had recently been dredged, sample could not be collected.

Virginia Department of Health
Silt

January 1, 2016 through December 31, 2016

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Elizabeth River – Dry Dock #8 Norfolk Naval Shipyard S-18
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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	03/17/16	<MDA	0.02 +/- 0.01	<MDA	<MDA	29.2 +/- 4.6	7.64 +/- 3.8
2 nd	06/03/16	<MDA	0.02 +/- 0.01	<MDA	<MDA	34.3 +/- 5.4	<MDA
3 rd	08/11/16	<MDA	0.02 ± 0.01	<MDA	<MDA	30 ± 5.1	19 ± 9.0
4 th	11/03/16	<MDA	0.02 ± 0.01	<MDA	<MDA	26.6 ± 4.8	21.54 ± 9.1

Elizabeth River – Dry Dock #4 Norfolk Naval Shipyard S-19
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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	03/17/16	<MDA	0.03 +/- 0.01	<MDA	<MDA	32.5 +/- 4.9	13.98 +/- 5.4
2 nd	06/03/16	<MDA	0.02 +/- 0.01	<MDA	<MDA	32.9 +/- 5.3	<MDA
3 rd	08/11/16	<MDA	0.03 ± 0.01	<MDA	<MDA	38 ± 5.8	35 ± 11
4 th	11/03/16	<MDA	0.02 ± 0.01	<MDA	<MDA	29.3 ± 5	<MDA

Virginia Department of Health
Silt

January 1, 2016 through December 31, 2016

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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		
1 st	03/17/16	<MDA	0.02 +/- 0.01	<MDA	<MDA	31 +/- 4.2	13.95 +/- 5.3
2 nd	06/03/16	<MDA	0.02 +/- 0.01	<MDA	<MDA	31.2 +/- 5.2	19.8 +/- 9.8
3 rd	08/11/16	<MDA	0.03 ± 0.01	<MDA	<MDA	14.2 ± 3.8 pCi/g	9.1 ± 4.3
4 th	11/03/16	<MDA	0.02 ± 0.01	<MDA	<MDA	26.1 ± 4.7	14.29 ± 6.7

Virginia Department of Health
Silt

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**James River – Surry Power Station
Discharge Canal S-17**

Quarter	Date collected	Gamma Activity – pCi/gram (wet)				Gross Beta pCi/gram (DRY)
		Cs-134	Cs-137	Co-58	Co-60	
1 st	02/02/16	<MDA	<MDA	<MDA	<MDA	6.8 +/- 2
2 nd	N/A					
3 rd	08/09/16	<MDA	<MDA	<MDA	<MDA	6.7 ± 3.1
4 th	N/A					

**North Anna Power Station
Waste Treatment S-24**

Quarter	Date collected	Gamma Activity – pCi/gram (wet)				Gross Beta pCi/gram (DRY)
		Cs-134	Cs-137	Co-58	Co-60	
1 st	N/A					
2 nd	05/05/16	<MDA	<MDA	<MDA	<MDA	<MDA
3 rd	N/A					
4 th	10/18/16	<MDA	0.01 ± 0.01	<MDA	<MDA	<MDA

Note: Silt samples are collected bi-annually.

**Virginia Department of Health
SURFACE WATER**

January 1, 2016 through December 31, 2016

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<p>James River – Pier 1 Newport News Shipyard W-15</p>

Qtr	Date Collected	Gamma Activity – pCi/liter						Gross Beta pCi/liter
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95	
1st	03/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	177.3 +/- 23.7
2 nd	06/17/15	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	170.7 +/- 23.7
3 rd	08/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	123.5 +/- 13.9
4 th	11/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	184.2 ± 17.8

<p>James River – Shipway #11 Newport News Shipyard W-16</p>
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Qtr	Date Collected	Gamma Activity – pCi/liter						Gross Beta pCi/liter
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/Nb95	
1st	03/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 16.1
2 nd	06/17/15	<MDA	2.6 +/- 0.5	<MDA	<MDA	<MDA	<MDA	144.9 +/- 22.5
3 rd	08/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	167.2 +/- 17.8
4 th	11/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	189.8 ± 18.6

Virginia Department of Health
SURFACE WATER
 January 1, 2016 through December 31, 2016

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Elizabeth River – Dry Dock #4 Norfolk Naval Shipyard W-37
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Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta	Gross Alpha
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/ Nb95		
1st	03/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 16.1	<MDA
2 nd	06/17/15	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	186.3 ± 24.5	<MDA
3 rd	08/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	185.4 ± 25.3	<MDA
4 th	11/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	166.7 ± 16.8	<MDA

Elizabeth River – Wet Slip #1 Norfolk Naval Shipyard W-38
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Qtr	Date collected	Gamma Activity – pCi/liter						Gross Beta	Gross Alpha
		Ba-140	Cs-137	I-131	Mn-54	Zn-65	Zr95/ Nb95		
1 st	03/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	165.7 ± 17.2	<MDA
2 nd	06/17/15	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	161.2 ± 23.5	<MDA
3 rd	08/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	172.1 ± 25	<MDA
4 th	11/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	160.4 ± 16.5	<MDA

Virginia Department of Health
SURFACE WATER
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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		
1 st	03/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	151.5 +/- 16	26 +/- 25.6
2 nd	06/01/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	173.4 +/- 24	<MDA
3 rd	08/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	181.5 ± 26.1	<MDA
4 th	11/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	168.3 ± 16.9	<MDA

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

Surry Power Station – Discharge Canal - W-19
Gamma, Beta, and Tritium 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	H3 Activity
1/4/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
1/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
1/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
1/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1802 +/- 85
2/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	375 +/- 42
2/8/16 ¹											
2/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	375 +/- 42
2/16/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
2/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
2/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
3/7/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	375 +/- 43
3/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1351 +/- 74
3/21/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
3/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	450 +/- 42
4/4/16 ²											
4/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1051 +/- 60
4/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	676 +/- 52
4/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1652 +/- 79
5/2/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	526 +/- 42
5/9/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	300 +/- 30
5/9/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	13 +/- 2.6	<MDA
5/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30
5/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	300 +/- 30
5/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	300 +/- 30
6/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1802 +/- 85
6/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
6/20/16 ³											
6/27/16 ⁴											
7/4/16 ⁵											
7/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	676 +/- 52
7/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	676 +/- 52
7/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	450 +/- 42
8/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	225 +/- 30
8/8/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	450 +/- 43
8/8/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	61.6 +/- 10.1	<MDA
8/15/16 ⁶											
8/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
8/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30
9/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	751 +/- 52
9/12/16 ⁷											
9/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Due to mobile laboratory repairs, no samples were analyzed.

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs no samples were analyzed.

⁶ Staff participated in VDOT exercise / training. No samples were analyzed.

⁷ MICL deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

Surry Power Station – Discharge Canal - W-19 (Continued)
Gamma, Beta, and Tritium 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	H3 Activity
9/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		976 +/- 60
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		751 +/- 52
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		976 +/- 60
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 43
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 43
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		4505 +/- 138
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		826 +/- 60
11/07/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	70 ± 11.2 pCi/L	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		826 +/- 60
11/21/16 ⁸											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		450 +/- 43
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		901 +/- 60
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		601 +/- 52
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		450 +/- 43
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		450 +/- 43

⁸ Due to the holiday, no samples were analyzed.

Virginia Department of Health

SURFACE WATER

January 1, 2016 through December 31, 2016

North Anna River - W-27 / baseline Gamma, Beta and Tritium 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	H3 Activity
1/4/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
1/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2778 +/- 104
1/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
1/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		751 +/- 52
2/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		601 +/- 52
2/8/16 ¹											
2/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
2/16/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
2/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
2/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
3/7/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
3/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		676 +/- 52
3/21/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 43
3/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		450 +/- 42
4/4/16 ²											
4/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
4/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1126 +/- 67
4/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1126 +/- 67
5/2/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		526 +/- 42
5/9/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		526 +/- 42
5/9/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.7 +/- 1.8	
5/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
5/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
5/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1502 +/- 80
6/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1577 +/- 80
6/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		601 +/- 52
6/20/16 ³											
6/27/16 ⁴											
7/4/16 ⁵											
7/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1.24E+1		1727 +/- 85
7/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2928 +/- 108
7/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2177 +/- 95
8/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2252 +/- 95
8/8/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2327 +/- 95
8/8/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	3.1 +/- 1	
8/15/16 ⁶											
8/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1426 +/- 80
8/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1952 +/- 91
9/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1727 +/- 85
9/12/16 ⁷											
9/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	11.6	<MDA	<MDA	<MDA		2177 +/- 95
9/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3228 +/- 113

¹ Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

² Due to staff training, no samples were analyzed.

³ Due to mobile laboratory repairs, no samples were analyzed.

⁴ Due to mobile laboratory repairs, no samples were analyzed.

⁵ Due to mobile laboratory repairs no samples were analyzed.

⁶ Staff participated in VDOT exercise / training. No samples were analyzed.

⁷ MICL deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

North Anna River - W-27 / baseline (Continued)
Gamma, Beta and Tritium 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	H3 Activity
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2928 +/- 108
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1.18E+1	<MDA	<MDA		1952 +/- 90
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3529 +/- 117
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1952 +/- 90
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2402 +/- 105
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3003 +/- 109
11/09/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2027 +/- 95
11/21/16 ⁸											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2027 +/- 95
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1802 +/- 85
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1351 +/- 80
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1276 +/- 74
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		1126 +/- 67

⁸ Due to the holiday, no samples were analyzed.

Virginia Department of Health
SURFACE WATER

April 1, 2016 through June 30, 2016

North Anna River @ Rt. 651/Control - W-28¹
Gamma, Beta and Tritium 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	H3 Activity
5/2/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
5/9/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
5/9/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
5/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
5/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
5/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
6/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 30
6/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
6/20/16 ²											
6/27/16 ³											
7/4/16 ⁴											
7/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
7/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		526 +/- 43
7/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
8/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
8/8/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
8/8/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.2 +/- 1	
8/15/16 ⁵											
8/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
8/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
9/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
9/12/16 ⁶											
9/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		826 +/- 60
9/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 30
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
11/09/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.3 ± 0.9	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 100
11/21/16 ⁷											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		601 +/- 52
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 95

¹ New control sample initiated on 5/2/16.

² Due to mobile laboratory repairs, no samples were analyzed.

³ Due to mobile laboratory repairs, no samples were analyzed.

⁴ Due to mobile laboratory repairs no samples were analyzed.

⁵ Staff participated in VDOT exercise / training. No samples were analyzed.

⁶ MICL deployed to HAZMAT Conference. No samples were analyzed.

⁷ Due to the holiday, no samples were analyzed.

Virginia Department of Health

SURFACE WATER

January 1, 2016 through December 31, 2016

North Anna Power Station – Discharge Canal - W-33

Gamma, Beta and Tritium 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	H3 Activity
01/04/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		2553 +/- 104
01/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
01/19/16 ¹	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		18243 +/- 271
01/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3003 +/- 109
02/01/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3378 +/- 116
02/08/16 ²											
02/16/16 ³	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		13063 +/- 230
02/16/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
02/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5105 +/- 144
02/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		4279 +/- 134
03/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5931 +/- 156
03/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5556 +/- 150
03/21/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5856 +/- 157
03/28/16 ⁴	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		6607 +/- 161
04/04/16 ⁵											
04/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5255 +/- 60
04/18/16 ⁶	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		14715 +/- 247
04/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		6682 +/- 382
05/02/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		6607 +/- 165
05/09/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		7207 +/- 173
05/09/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
05/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5706 +/- 156
05/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5631 +/- 154
05/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5480 +/- 151
06/06/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3529 +/- 128
06/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3679 +/- 128
06/20/16 ⁷											
06/27/16 ⁸											
07/04/16 ⁹											
07/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		4354 +/- 135
07/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3679 +/- 128
07/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		3979 +/- 127
08/01/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		4429 +/- 134
08/08/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		5631 +/- 151
08/08/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	1.7 +/- 0.8	
08/15/16 ¹⁰											

¹ Elevated tritium level was due to release of a Boron Recovery Tank from 1/11/-16-1/14/16 per North Anna Power Station count room personnel.

² Due to a North Anna Power Station Full Scale Exercise, no samples were analyzed.

³ Elevated tritium level was due to a release at the time of sampling as confirmed by North Anna Power Station personnel.

⁴ Elevated tritium level was due to refueling and maintenance outage activities at North Anna Power Station. Two new samples were analyzed and confirmed these results.

⁵ Due to staff training, no samples were analyzed.

⁶ Elevated results due to the release of a Boron Recovery Tank from 4/14/16-4/18/16 per NAPS count room personnel.

⁷ Due to mobile laboratory repairs, no samples were analyzed.

⁸ Due to mobile laboratory repairs, no samples were analyzed.

⁹ Due to mobile laboratory repairs, no samples were analyzed.

¹⁰ Staff participated in VDOT exercise/training. No samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

North Anna Power Station – Discharge Canal - W-33 (Continued)
Gamma, Beta and Tritium 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	H3 Activity
08/22/16 ¹¹	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	9084 +/- 193	
08/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	6006 +/- 160	
09/06/16 ¹²	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	7282 +/- 176	
09/12/16 ¹³											
09/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5255 +/- 148	
09/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	6306 +/- 160	
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5255 +/- 147	
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	4129 +/- 135	
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5556 +/- 30	
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5856 +/- 153	
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	3829 +/- 132	
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5781 +/- 157	
11/09/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	3.6 ± 0.9	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	4204 +/- 138	
11/21/16 ¹⁴											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	3529 +/- 128	
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5631 +/- 153	
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	3754 +/- 128	
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5405 +/- 151	
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5105 +/- 148	

¹¹ Initial tritium results yielded 7658 +/- 185 pCi/L. This indicated a release may have occurred. The sample was analyzed again with 2 new aliquots and yielded 9084 +/- 193 pCi/L. NAPS personnel were notified and they confirmed that a release had occurred during the collection period.

¹² Sample results indicated a release may have occurred. Two new aliquots were analyzed and the results were similar to the original sample. NAPS was preparing for refueling outage so ongoing releases were expected.

¹³ MICL deployed to HAZMAT conference. No samples were analyzed.

¹⁴ Due to the holiday, no samples were analyzed.

Virginia Department of Health
SURFACE WATER
 April 1, 2016 through June 30, 2016

James River @ Scotland Wharf - W-79¹
Gamma, Beta and Tritium 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	H3 Activity
5/2/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30	
5/9/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	225 +/- 30	
5/9/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
5/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30	
5/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
5/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
6/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
6/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
6/20/16 ²											
6/27/16 ³											
7/4/16 ⁴											
7/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
7/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	751 +/- 60	
7/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30	
8/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
8/8/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30	
8/8/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	14.1 +/- 2	
8/15/16 ⁵											
8/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	225 +/- 30	
8/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
9/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	300 +/- 30	
9/12/16 ⁶											
9/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
9/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	150 +/- 30	
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	300 +/- 30	
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	75 +/- 135	
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	

¹ As of 5/2/16, sample collection from this location was reinstated.

² Due to mobile laboratory repairs, no samples were analyzed.

³ Due to mobile laboratory repairs, no samples were analyzed.

⁴ Due to mobile laboratory repairs no samples were analyzed.

⁵ Staff participated in VDOT exercise / training. No samples were analyzed.

⁶ MICL deployed to HAZMAT Conference. No samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

James River @ Scotland Wharf - W-79 (Continued)
Gamma, Beta and Tritium 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	H3 Activity
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 43
11/07/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	37.4 ± 9.4	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
11/21/16 ⁷											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		751 +/- 60
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 43
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 95
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30

D = Sample analyzed by DCLS

⁷ Due to the holiday, no samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

Surry Power Station - James River @ Robious Landing-W-79A / W-90¹
Gamma, Beta and Tritium 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	H3 Activity
01/04/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
01/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
01/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
01/26/16 ²	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		526 +/- 43
02/01/16 ³	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
02/08/16 ⁴											
02/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
02/16/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	16.1	
02/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
02/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
03/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
03/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		375 +/- 42
03/21/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
03/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		450 +/- 42
04/04/16 ⁵											
04/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
04/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		676 +/- 95
04/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
05/02/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
05/09/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
05/09/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	
05/16/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
05/23/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
05/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
06/6/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
06/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
06/20/16 ⁶											
06/27/16 ⁷											
07/04/16 ⁸											
07/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
07/18/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
07/25/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
08/1/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
08/08/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
08/08/16D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.3 +/- 0.8	

¹ As of 5/2/16 the sample designation for this sample was changed from W-79A to W-90.

² The sample was collected at an alternate control site (w-79) due to safety concerns associated with inclement weather.

³ The sample was collected at an alternate control site (W-79) due to safety concerns associated with inclement weather.

⁴ Due to a NAPS Full Scale Exercise, no samples were analyzed.

⁵ Due to staff training, no samples were analyzed.

⁶ Due to mobile laboratory repairs, no samples were analyzed.

⁷ Due to mobile laboratory repairs, no samples were analyzed.

⁸ Due to mobile laboratory repairs, no samples were analyzed.

Virginia Department of Health
SURFACE WATER

January 1, 2016 through December 31, 2016

Surry Power Station - James River @ Robious Landing-W-79A / W-90
Gamma, Beta and Tritium 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	H3 Activity
08/15/16 ⁹											
08/22/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
08/29/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
09/06/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
09/12/16 ¹⁰											
09/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		526 +/- 43
09/26/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
10/03/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		300 +/- 30
10/11/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
10/17/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
10/24/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
10/31/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
11/07/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		150 +/- 30
11/09/16 ^D	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	2.8 ± 1.0	
11/14/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		75 +/- 100
11/21/16 ¹¹											
11/28/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
12/05/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		225 +/- 30
12/13/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
12/19/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA
12/27/16	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA		<MDA

⁹ Staff participated in VDOT exercise/training. No samples were analyzed.

¹⁰ MICL deployed to HAZMAT Conference. No samples were analyzed.

¹¹ Due to the holiday, no samples were analyzed.

Virginia Department of Health
VEGETATION¹

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2015

Location	Date collected	Type	Isotope	Results pCi/Gram (wet weight)
Surry County Private garden V-96	N/A	Mixed Greens (Cabbage)	I-131 Cs-134 Cs-137	
	9/6/16	Vegetation	I-131 Cs-134 Cs-137	<MDA <MDA <MDA
Louisa County Private Garden V-98	6/6/16	Mixed Greens	I-131 Cs-134 Cs-137	<MDA <MDA <MDA
	9/6/16	Sweet Potato Leaves	I-131 Cs-134 Cs-137	<MDA <MDA <MDA

Note: Vegetation is collected bi-annually when available.

¹ Site V-96 results for the 3rd quarter have not been received from DCLS.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HEALTH

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BABCOCK & WILCOX

Virginia Department of Health

Babcock & Wilcox

AIR PARTICULATE COMPOSITE SAMPLES

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Eastern Site Boundary – Ball field A-101						
Quarter	Start	Date		Gross Alpha Activity		
		Stop	pCi/meter ³			
1st	01/13/16	-	01/19/16	0.001	+/-	0.0004
2 nd	04/06/16	-	04/12/16	0.001	+/-	0.0004
3 rd	07/06/16	-	07/12/16	0.001	+/-	0.0004
4 th	10/05/16	-	10/11/15	0.001	+/-	0.0004

SOIL

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Date	Distance & Direction	Type	Alpha Activity
				pCi/gram
Eastern Site Boundary Ball field S-101	6/8/16	Site Boundary	Soil	<MDA
James River Shoreline Near Six Mile Bridge "control" S-102a	6/8/16	1.5 miles SW	Soil	<MDA

Note: Uranium separation followed by alpha counting.

*Vegetation, Soil, Water Collected Annually

Virginia Department of Health

Babcock & Wilcox

SURFACE WATER

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Date	Distance & Direction	Alpha Activity pCi/gram
James River Shoreline Near Ball field at eastern site boundary W-101	6/8/16	Approx. 3 miles downstream	<MDA
James River Shoreline Near Six Mile Bridge "control" W-102	6/8/16	Approx. 1.5 Miles upstream	<MDA

VEGETATION

January 1, 2016 through December 31, 2016

ANNUAL REPORT 2016

Location	Date	Type	Distance & Direction	Alpha Activity pCi/gram
Eastern site boundary Ball field V-101	6/8/16	Vegetation	Approx. 3 miles downstream	<MDA
James River Shoreline off Rt. 460 "control" V-102	6/8/16	Vegetation	Approx. 4.5 Miles SW	<MDA

Note: Uranium separation followed by alpha counting.

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF HEALTH

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**EMERGENCY
PREPAREDNESS**

EMERGENCY PREPAREDNESS

The Office of Radiological Health (ORH) located within the Virginia Department of Health (VDH) 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). 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. This includes 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 the Office of Radiological Health are to locate, identify, and predict the impact of any radioactive materials released to the environment. Based on the predicted or known impact, ORH then recommends appropriate measures to protect the public. ORH would also be tasked with helping to supervise the cleanup of radiological contamination and ensuring the proper disposal of radioactive waste. An ORH 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 (FEMA) regulations, ORH conducts or participates in periodic drills that are designed to provide team training and to test emergency plans and procedures. The scope of these drills ranges from receiving and acknowledging simulated emergency communications to full-scale team deployment.

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.