Serial No. 18-151
Docket Nos.: 50-280
50-281
72-2
72-55

ATTACHMENT 1

2017 Annual Radiological Environmental Operating Report

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

2017 Annual Radiological Environmental Operating Report

Surry Power Station

Dominion Energy

Dominion Energy

Surry Power Station

Radiological Environmental Monitoring Program

January 1, 2017 to December 31, 2017

Annual Radiological Environmental Operating Report

Surry Power Station

January 1, 2017 to December 31, 2017

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PREFACE

This report is submitted as required by Technical Specification 6.6.B.2, Annual Radiological Environmental Operating Report, for Surry, Units 1 and 2, Virginia Electric and Power Company Docket Nos. 50-280 and 50-281, and the Surry Independent Spent Fuel Storage Installation (ISFSI) Technical Specifications, Appendix C, Item 1.3.1.

1. EXECUTIVE SUMMARY

This document is a detailed report of the 2017 Surry Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels from January 1 through December 31, 2017, in air, water, silt, shoreline sediment, milk, aquatic biota, food products and direct exposure pathways have been analyzed, evaluated and summarized. The REMP is designed to confirm that radiological effluent releases are As Low As (is) Reasonably Achievable (ALARA), no undue environmental effects occur and the health and safety of the public are protected. The program also detects any unexpected environmental processes that could allow radiation accumulations in the environment or food pathway chains.

Radiation and radioactivity in the environment are monitored within a 20-mile radius of the station. Surry Power Station personnel collect a variety of samples within this area. A number of sampling locations for each medium are selected using available meteorological, land use, and water use data. Two types of samples are obtained. The first type, control samples, is collected from areas that are beyond the measurable influence of Surry Power Station or any other nuclear facility. These samples represent normal background radiation levels. Background radiation levels can be compared to the environment surrounding the station. Indicator samples are the second sample type obtained. These samples show how much radiation is contributed to the environment by the station. Indicator samples are taken from areas close to the station where any station contribution will be at the highest concentration.

Prior to station operation, samples were collected and analyzed to determine the amount of radioactivity present in the area. The resulting values are used as a "pre-operational baseline." Analysis results from the indicator samples are compared to control sample values and the pre-operational baseline to determine if changes in radioactivity levels are attributable to station operations, or natural variation, or other causes such as the Chernobyl and Fukushima Daiichi accidents that released radioactive material to the environment.

Teledyne Brown Engineering, Inc. (TBE) provides radioanalyses for this program and Mirion Technologies provides thermoluminescent dosimetry (TLD) services. Participation in an Interlaboratory Comparison Program provides an independent check of sample measurement precision and accuracy. Typically, radioactivity levels in the environment are so low that analysis values frequently fall below the minimum detection limits of state-of-the-art measurement methods. Because of this, the United States Nuclear Regulatory Commission (USNRC) requires that equipment used for radiological environmental monitoring must be able to detect specified minimum Lower Limits of Detection (LLDs). This ensures that analyses are as accurate as possible. The USNRC also mandates a reporting level for radionuclides. Licensed nuclear facilities must report the radionuclide activities in those environmental samples that are equal to or greater than the specified reporting level. Environmental radiation levels are sometimes referred to as a percent of the reporting level.

Analytical results are reported for all possible radiation exposure pathways to man. These pathways include airborne, aquatic, terrestrial and direct radiation exposure. The airborne exposure pathway includes radioactive airborne iodine and particulates. The 2017 airborne results were similar to previous years. No station related radioactivity was detected and natural radioactivity levels remained at levels consistent with past years' results. Aquatic exposure pathway samples include well and river water, silt and shoreline sediments, crabs, fish, clams and oysters. Naturally occurring radionuclides such as beryllium-7, potassium-40, radium-226, thorium-228 and thorium-232 were detected at average environmental levels. No man-made radionuclides were detected in well water. This trend is consistent throughout the operational environmental monitoring program. No man-made radionuclides were detected in river water. Silt samples indicated the presence of cesium-137 and naturally occurring radionuclides. The cesium-137 activity was present in the control location and is attributable to global fallout from past nuclear weapons testing and nuclear accidents such as Chernobyl. Shoreline sediment, which may provide a direct exposure pathway, contained no station related radionuclides. Naturally occurring radionuclides potassium-40, radium-226 thorium-228 and thorium-232 were detected at average environmental levels. The terrestrial exposure pathway includes milk and food products. Iodine-131 was not detected in any 2017 milk samples and has not been detected in milk prior to or since the 1986 Chernobyl accident. Strontium-90 was detected in milk and this activity is attributable to past atmospheric nuclear weapons testing. No man-made radionuclides were detected in food product samples. Consistent with historical data, naturally occurring potassium-40 was detected in milk. Naturally occurring potassium-40 was detected in food products. The direct exposure pathway measures environmental radiation doses using TLDs. TLD results have remained relatively constant over the years.

During 2017, as in previous years, the operation of Surry Power Station has created no adverse environmental effects or health hazards. The maximum total body dose calculated for a hypothetical individual at the station site boundary due to liquid and gaseous effluents released from the station during 2017 was 0.055 millirem. For reference, this dose may be compared to the 620 millirem average annual exposure to every person in the United States from natural and man-made sources. Natural sources in the environment provide approximately 50% of radiation exposure to man, while nuclear power contributes less than 0.1%. These results demonstrate compliance with federal and state regulations and also demonstrate the adequacy of radioactive effluent controls at Surry Power Station.

2. PROGRAM DESCRIPTION

2.1 Introduction

This report documents the 2017 Surry Power Station operational Radiological Environmental Monitoring Program (REMP). Dominion Energy's Surry Power Station is located on the Gravel Neck peninsula adjacent to the James River, approximately 25 miles upstream of the Chesapeake Bay. The site consists of two units, each with a pressurized water reactor (PWR) nuclear steam supply system and turbine generator furnished by Westinghouse Electric Corporation. Each unit is designed with a nominal gross electrical output of 910 megawatts electric (MWe). Unit 1 achieved commercial operation on December 22, 1972, and Unit 2 on May 1, 1973.

The United States Nuclear Regulatory Commission regulations (10CFR50.34a) require that nuclear power plants be designed, constructed and operated to keep levels of radioactive material in effluents to unrestricted areas As Low As (is) Reasonably Achievable. To ensure these criteria are met, the operating license for Surry Power Station includes Technical Specifications that address the release of radioactive effluents. In-plant monitoring is used to ensure that these release limits are not exceeded. As a precaution against unexpected or undefined environmental processes, which might allow undue accumulation of radioactivity in the environment, a program for monitoring the station environs is also included in Surry Power Station Technical Specifications.

Dominion personnel are responsible for collecting the various indicator and control environmental samples. Mirion Technologies is responsible for processing the TLDs. Teledyne Brown Engineering is responsible for sample analyses. The results of the analyses are used to determine if changes in radioactivity levels may be attributable to station operations. Measured values are compared with control values, which vary with time due to external events, such as cosmic ray bombardment, nuclear weapons test fallout and seasonal variations of naturally occurring radionuclides. Data collected prior to station operation is used to indicate the degree of natural variation to be expected. This pre-operational data is compared with data collected during the operational phase to assist in evaluating any radiological impact of station operation.

Occasionally, samples of environmental media may show the presence of man-made radionuclides. As a method of referencing the measured radionuclide concentrations in the sample media to a dose consequence to man, the data is compared to the reporting level concentrations listed in the USNRC Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", (December, 1975) and VPAP-2103S, Offsite Dose Calculation Manual (Surry). These concentrations are based upon the annual dose commitment recommended by 10CFR50, Appendix I, to meet the criterion of "As Low As (is) Reasonably Achievable."

This report documents the results of the REMP for 2017 and satisfies the following objectives of the program:

- To provide measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposure of the maximum exposed member of the public resulting from station operations.

- To supplement the radiological effluent monitoring program by verifying that radioactive effluents are within allowable limits.

- To identify changes in radioactivity in the environment.

- To verify that station operations have no detrimental effect on the health and safety of the public.

2.2 Sampling and Analysis Program

Table 2-1 summarizes the 2017 sampling program for Surry Power Station. All samples listed in Table 2-1 are taken at indicator locations except those labeled "control." Dominion Energy personnel collect all samples listed in Table 2-1.

Table 2-2 summarizes the analysis program conducted by Teledyne Brown Engineering and Mirion Technologies for Surry Power Station. All samples, with the exception of the TLDs, are shipped to Teledyne Brown Engineering, located in Knoxville, TN, for analysis. The TLDs are shipped to Mirion Technologies, located in Irvine, CA, for processing.

The Surry Radiological Monitoring Locations maps (Figures 1 – 5) denote sample locations for Surry Power Station. The locations are color coded to designate sample types.

Table 2-1

SURRY - 2017
RADIOLOGICAL SAMPLING STATIONS
DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Environmental	Control	(00)	-	-	-	Quarterly	Onsite (Stored in a lead shield outside the protected area)
TLDs	West North West	(02)	0.2	WNW	293°	Quarterly	Site Boundary
	Surry Station Discharge	(03)	0.4	NW	321°	Quarterly	Site Boundary
	North North West	(04)	0.2	NNW	329°	Quarterly	Site Boundary
	North	(05)	0.3	N	4°	Quarterly	Site Boundary
	North North East	(06)	0.3	NNE	28°	Quarterly	Site Boundary
	North East	(07)	0.3	NE	44°	Quarterly	Site Boundary
	East North East	(08)	0.4	ENE	67°	Quarterly	Site Boundary
	East	(09)	0.3	E	89°	Quarterly	Site Boundary
	West	(10)	0.1	W	271°	Quarterly	Site Boundary
	West South West	(11)	0.4	WSW	252°	Quarterly	Site Boundary
	South West	(12)	0.3	SW	228°	Quarterly	Site Boundary
	South South West	(13)	0.3	SSW	201°	Quarterly	Site Boundary
	South	(14)	0.4	S	182°	Quarterly	Site Boundary
	South South East	(15)	0.6	SSE	157°	Quarterly	Site Boundary
	South East	(16)	0.9	SE	135°	Quarterly	Site Boundary
	Station Intake	(18)	1.6	ESE	115°	Quarterly	Site Boundary
	Hog Island Reserve	(19)	2.0	NNE	26°	Quarterly	Near Resident
	Bacon's Castle	(20)	4.5	SSW	202°	Quarterly	Apx. 5 mile
	Route 633	(21)	4.9	SW	227°	Quarterly	Apx. 5 mile
	Alliance	(22)	5.1	WSW	247°	Quarterly	Apx. 5 mile
	Surry	(23)	7.7	WSW	256°	Quarterly	Population Center
	Route 636 and 637	(24)	4.0	W	270°	Quarterly	Apx. 5 mile
	Scotland Wharf	(25)	5.0	WNW	284°	Quarterly	Apx. 5 mile
	Jamestown	(26)	6.3	NW	308°	Quarterly	Apx. 5 mile
	Colonial Parkway	(27)	3.8	NNW	333°	Quarterly	Apx. 5 mile
	Route 617 and 618	(28)	4.9	NNW	340°	Quarterly	Apx. 5 mile
	Kingsmill	(29)	4.6	N	2°	Quarterly	Apx. 5 mile
	Williamsburg	(30)	7.8	N	0°	Quarterly	Population Center
	Kingsmill North	(31)	5.5	NNE	12°	Quarterly	Apx. 5 mile
	Budweiser	(32)	5.8	NNE	27°	Quarterly	Population Center
	Water Plant	(33)	5.0	NE	46°	Quarterly	Apx. 5 mile

Table 2-1

SURRY - 2017

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Environmental TLDs	BASF	(34)	5.1	ENE	70°	Quarterly	Apx. 5 mile
	Lee Hall	(35)	7.1	ENE	75°	Quarterly	Population Center
	Goose Island	(36)	5.1	E	90°	Quarterly	Apx. 5 mile
	Fort Eustis	(37)	4.9	ESE	104°	Quarterly	Apx. 5 mile
	Newport News	(38)	19.3	SE	130°	Quarterly	Population Center
	James River Bridge	(39)	17.1	SE	142°	Quarterly	Control Location
	Benn's Church	(40)	17.0	SSE	159°	Quarterly	Control Location
	Smithfield	(41)	13.4	SSE	167°	Quarterly	Control Location
	Rushmere	(42)	5.3	SSE	156°	Quarterly	Apx. 5 mile
	Route 628	(43)	5.1	S	177°	Quarterly	Apx. 5 mile
Air Charcoal and Particulate	Surry Station	(SS)	0.3	NNE	18°	Weekly	Site boundary location with highest D/Q
	Hog Island Reserve	(HIR)	2.0	NNE	26°	Weekly	
	Bacon's Castle	(BC)	4.5	SSW	202°	Weekly	
	Alliance	(ALL)	5.1	WSW	247°	Weekly	
	Colonial Parkway	(CP)	3.8	NNW	333°	Weekly	
	BASF	(BASF)	5.1	ENE	70°	Weekly	
	Fort Eustis	(FE)	4.9	ESE	104°	Weekly	
	Newport News	(NN)	19.3	SE	130°	Weekly	Control Location
River Water	Surry Station Discharge	(SD)	0.4	NW	323°	Monthly	
	Scotland Wharf	(SW)	4.9	WNW	284°	Monthly	Control Location
Well Water	Surry Station	(SS)	0.1	SW	227°	Quarterly	Onsite
	Hog Island Reserve	(HIR)	2.0	NNE	28°	Quarterly	
	Construction Site	(CS)	0.3	E	87°	Quarterly	
Shoreline Sediment	Hog Island Reserve	(HIR)	0.6	N	7°	Semi-Annually	
	Chickahominy River	(CHIC)	11.2	WNW	301°	Semi-Annually	Control Location
Silt	Chickahominy River	(CHIC)	11.2	WNW	300°	Semi-Annually	Control Location
	Surry Station Discharge	(SD)	1.3	NNW	341°	Semi-Annually	
	Surry Station Intake	(SI)	1.8	ESE	112°	Semi-Annually	

Table 2-1

SURRY - 2017

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Milk	Colonial Parkway	(CP)	3.7	NNW	336°	Monthly	
	Lover Retreat	(LRD)	30.6	NNW	5°	Monthly	Control Location
	Epps	(EPPS)	4.8	SSW	200°	Monthly	
Oysters	Point of Shoals	(POS)	6.4	SSE	157°	Semi-Annually	
	Mulberry Point	(MP)	4.9	ESE	124°	Semi-Annually	
	Swash Hole Island	(SHI)	6.8	SE	130°	Semi-Annually	
Clams	Chickahominy River	(CHIC)	11.2	WNW	300°	Semi-Annually	Control Location
	Surry Station Discharge	(SD)	1.3	NNW	341°	Semi-Annually	
	Jamestown Island	(JI)	3.9	NW	324°	Semi-Annually	
Fish	Surry Station Discharge	(SD)	1.3	NNW	341°	Semi-Annually	
Crabs	Surry Station Discharge	(SD)	1.3	NNW	341°	Annually	
Crops	Brock's Farm	(BROCK)	3.8	S	183°	Annually	
(Corn, Peanuts, Soybeans)	Slade's Farm	(SLADE)	3.2	S	179°	Annually	

Table 2-2

SURRY - 2017

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Thermoluminescent Dosimetry (TLD)	Quarterly	Gamma Dose	2	mR/Std. Month
Air Iodine	Weekly	I-131	0.07	pCi/m^3
Air Particulate	Weekly	Gross Beta	0.01	pCi/m^3
	Quarterly (a)	Gamma Isotopic		pCi/m^3
		Cs-134	0.05	
		Cs-137	0.06	
River Water	Quarterly Composite of monthly sample	Tritium (H-3)	2000	pCi/L
	Monthly	I-131	10	pCi/L
		Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
Well Water	Quarterly	Tritium (H-3)	2000	pCi/L
		I-131	1	
		Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	

Footnotes located at end of table.

Table 2-2

SURRY - 2017

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Shoreline Sediment	Semi-Annually	Gamma Isotopic		pCi/kg - dry
		Cs-134	150	
		Cs-137	180	
Silt	Semi-Annually	Gamma Isotopic		pCi/kg - dry
		Cs-134	150	
		Cs-137	180	
Milk	Monthly	I-131	1	pCi/L
		Gamma Isotopic		pCi/L
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
	Quarterly Composite of CP monthly sample	Sr-89	NA	pCi/L
		Sr-90	NA	
Oysters	Semi-Annually	Gamma Isotopic		pCi/kg - wet
		Mn-54	130	
		Fe-59	260	
		Co-58	130	
		Co-60	130	
		Zn-65	260	
		Cs-134	130	
		Cs-137	150	
Clams	Semi-Annually	Gamma Isotopic		pCi/kg - wet
		Mn-54	130	
		Fe-59	260	
		Co-58	130	
		Co-60	130	
		Zn-65	260	
		Cs-134	130	
		Cs-137	150	
Crabs	Annually	Gamma Isotopic		pCi/kg - wet
		Mn-54	130	
		Fe-59	260	
		Co-58	130	
		Co-60	130	
		Zn-65	260	
		Cs-134	130	
		Cs-137	150	

Footnotes located at end of table.

Table 2-2

SURRY - 2017

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Fish	Semi-Annually	Gamma Isotopic		pCi/kg - wet
		Mn-54	130	
		Fe-59	260	
		Co-58	130	
		Co-60	130	
		Zn-65	260	
		Cs-134	130	
		Cs-137	150	
Food Products	Annually	Gamma Isotopic		pCi/kg - wet
		I-131	60	
		Cs-134	60	
		Cs-137	80	

Note: This table is not a complete listing of nuclides that can be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, are also identified and reported.

* LLD is the Lower Limit of Detection as defined and required in the USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979. LLDs indicate those concentrations to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than these listed values.

(a) Quarterly composites of each location's weekly air particulate samples are analyzed for gamma emitters.

NA None assigned

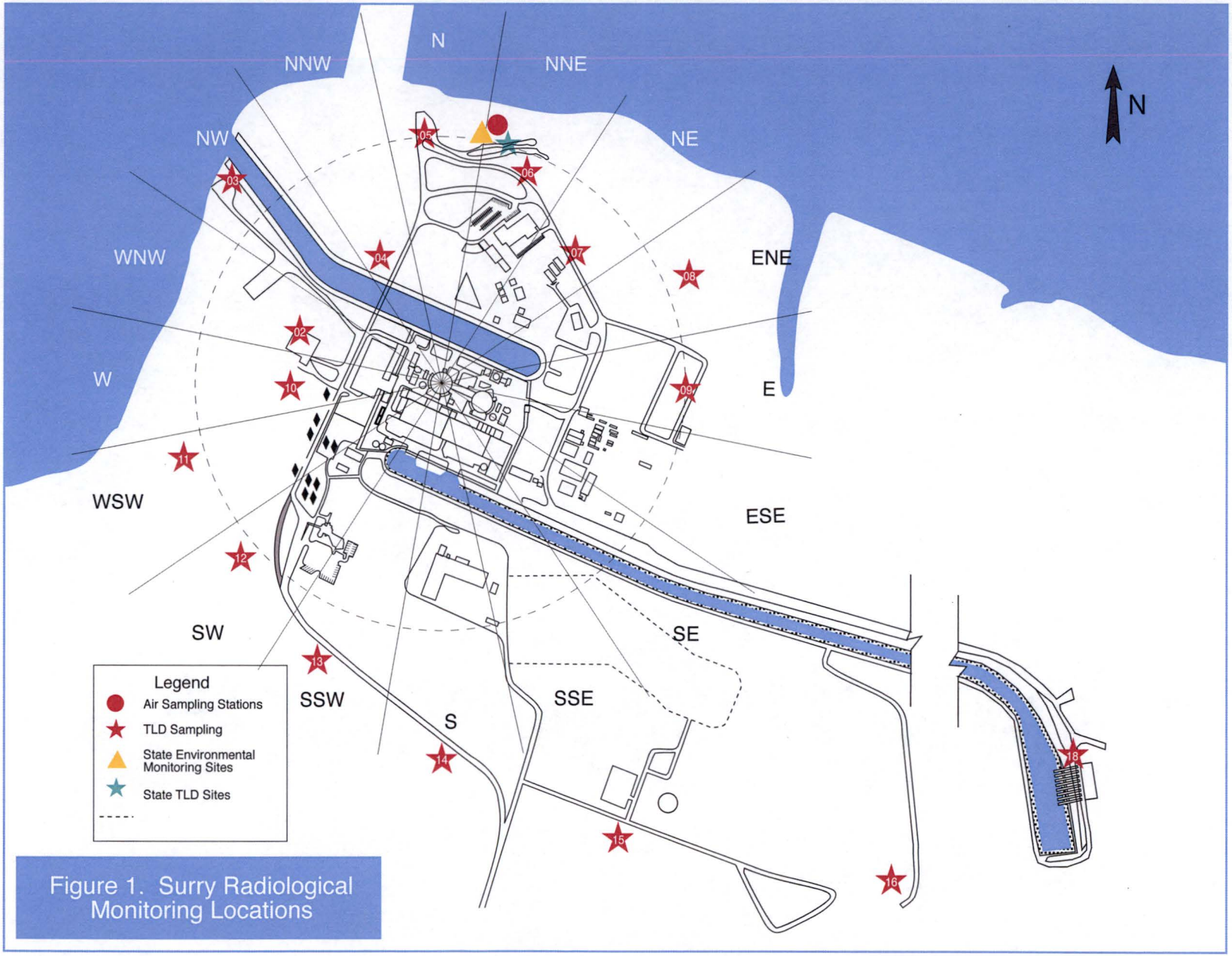
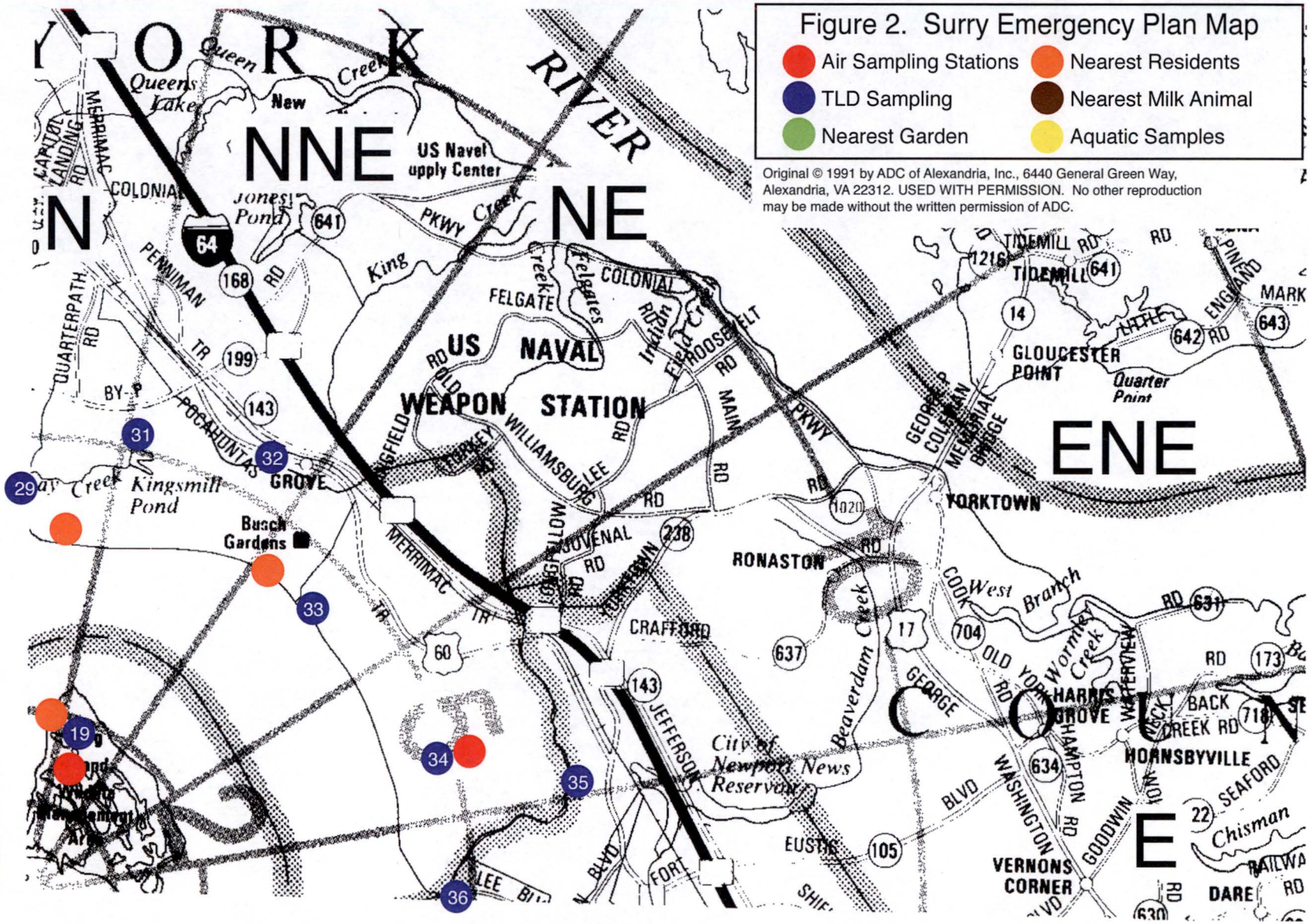


Figure 1. Surry Radiological Monitoring Locations

Graphics No. SV645F



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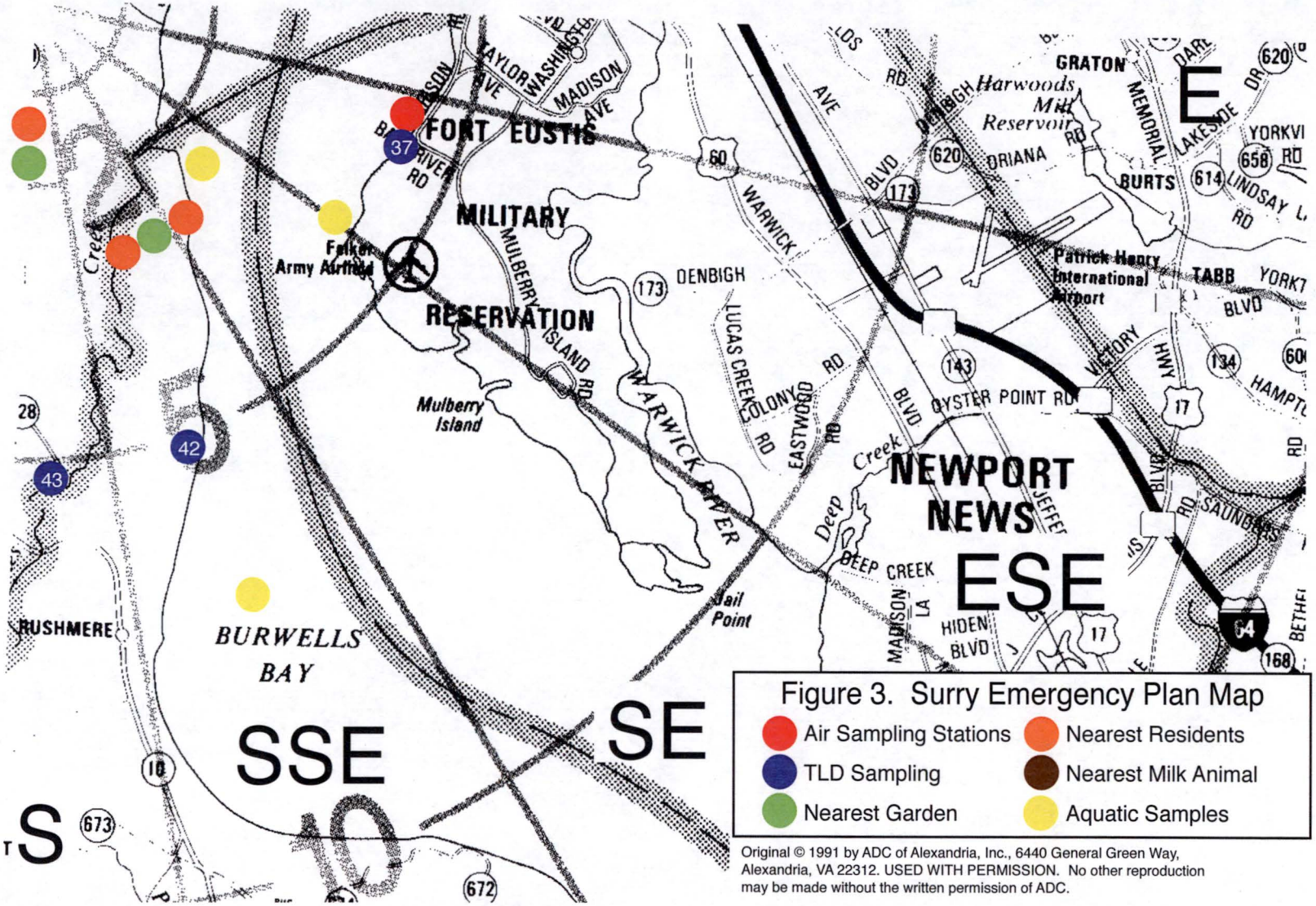

Figure 3. Surry Emergency Plan Map

Graphics No. CB3309A

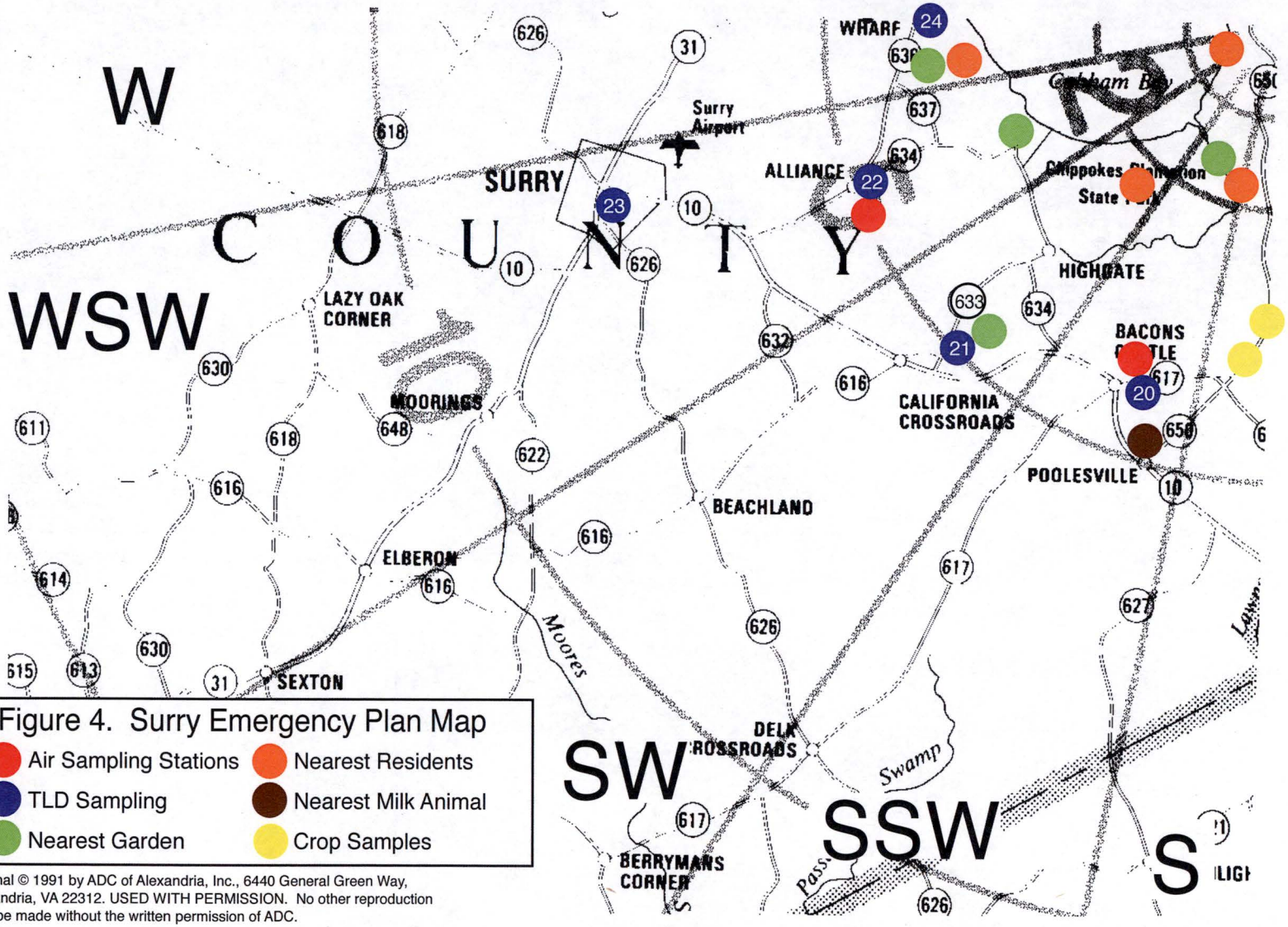

Figure 4. Surry Emergency Plan Map

- Air Sampling Stations
- TLD Sampling
- Nearest Garden
- Nearest Residents
- Nearest Milk Animal
- Crop Samples

Graphics No. CB3310A

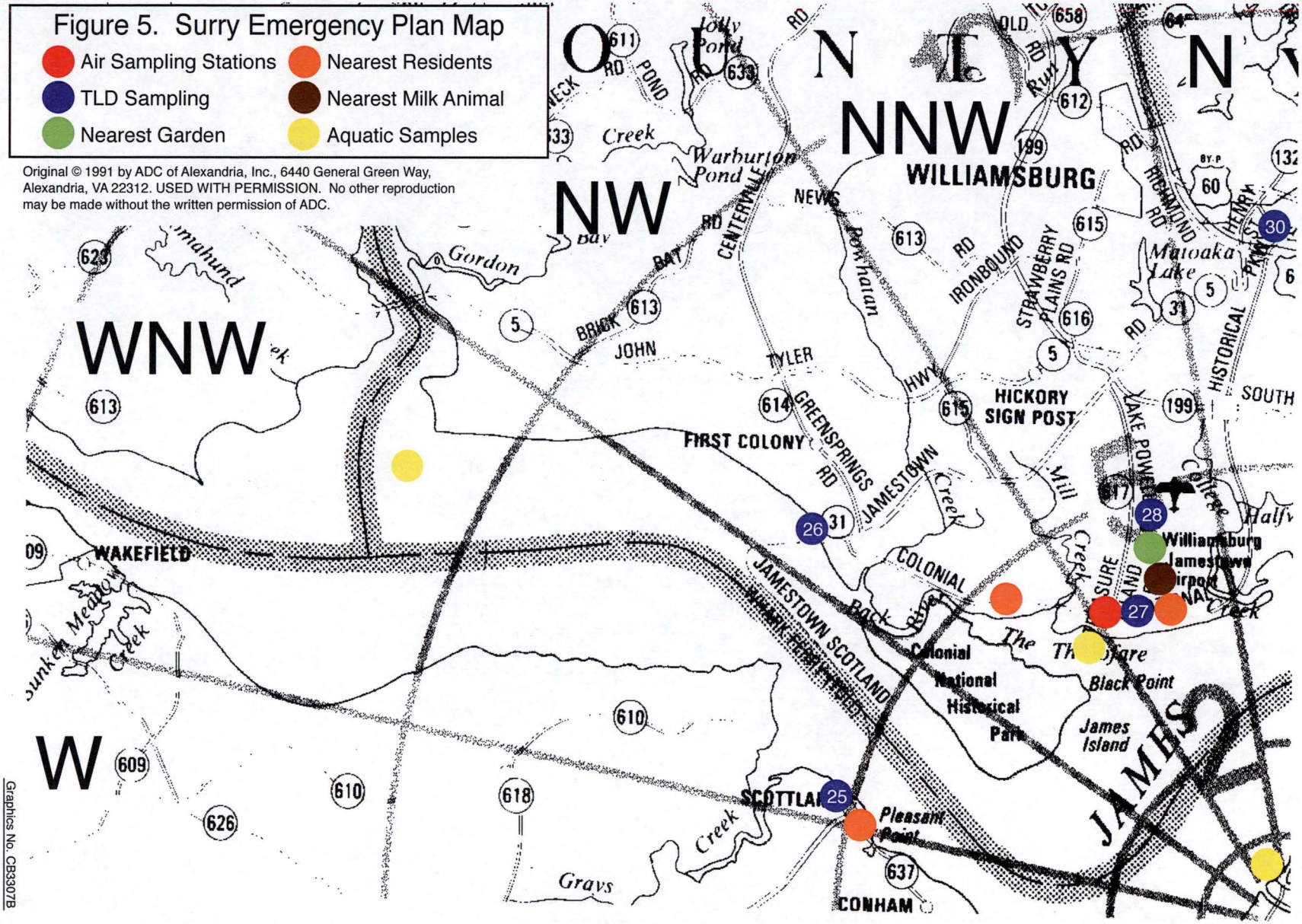
Figure 5. Surry Emergency Plan Map
Air Sampling Stations
Nearest Residents
TLD Sampling
Nearest Milk Animal
Nearest Garden
Aquatic Samples
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NNW
NW
WNW
W
WILLIAMSBURG
HICKORY SIGN POST
FIRST COLONY
WAKEFIELD
SCOTTLAND
CONHAM
JAMESTOWN SCOTLAND
Colonial National Historical Park
James Island
Black Point
Pleasant Point
Williamsburg Jamestown Airport
Warburton Pond
Gordon Creek
Jolly Pond
Mill Creek
Back River
Grays Creek
Sunken Meadow Creek
Lake Powell
Matoaka Lake
Graphics No. CB3307B

3. ANALYTICAL RESULTS

3.1 Summary of Results

In accordance with the Surry Offsite Dose Calculation Manual (ODCM), a summary table of the analytical results has been prepared and is presented in Table 3-1. This data is presented in accordance with the format of the USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Revision 1, November 1979. A more detailed analysis of the data is given in Section 4.

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Surry Power Station, Surry County, Virginia - 2017
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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Direct Radiation *TLD (mR/ Std Month)*	**Gamma**	164	2	**5.6 (150/152) (4.0 - 8.0)**	**STA-9**	**0.3 mi E**	**7.8 (4/4) (7.3 - 8.0)**	**6.0 (12/12) (4.9 - 7.6)**	0
Air Particulate *(1E-3 pCi/m3)*	**Gross Beta**	416	10	**13.9 (362/364) (2.05 - 27.2)**	**BASF**	**5.1 mi ENE**	**15.5 (52/52) (4.5 - 27.2)**	**12.8 (52/52) (4.5 - 21.1)**	0
	Gamma	32							
	Be-7	32		**144.2 (28/28) (97.8 - 201)**	**BASF**	**5.1 mi ENE**	**163 (4/4) (122 - 201)**	**134 (4/4) (122 - 150)**	0
	K-40	32		**23.7 (1/28) (23.7 - 23.7)**	**SS**	**0.3 mi NNE**	**23.7 (1/28) (23.7 - 23.7)**	< LLD	0
	Cs-134	32	50	< LLD	N/A		< LLD	< LLD	0
	Cs-137	32	60	< LLD	N/A		< LLD	< LLD	0
Air Iodine *(1E-3 pCi/m3)*	**I-131**	416	70	< LLD	N/A		< LLD	< LLD	0
Milk *(pCi/Liter)*	**Strontium**	4							
	Sr-89	4		< LLD	N/A		< LLD	< LLD	0
	Sr-90	4		**1.27 (3/4) (0.97 - 1.73)**	**CP**	**3.7 mi NNW**	**1.27 (3/4) (0.97 - 1.73)**	< LLD	0
	Gamma	36							
	K-40	36		**1361 (24/24) (1110 - 1620)**	**LR**	**30.6 mi NNW**	**1610 (12/12) (1280 - 1870)**	**1610 (12/12) (1280 - 1870)**	0
	Th-228	36		< LLD	N/A		< LLD	< LLD	0
	I-131	36	1	< LLD	N/A		< LLD	< LLD	0
	Cs-134	36	15	< LLD	N/A		< LLD	< LLD	0
	Cs-137	36	18	< LLD	N/A		< LLD	< LLD	0
	Ba-140	36	60	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Surry Power Station, Surry County, Virginia - 2017
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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Milk *(pCi/Liter)*	**Gamma**	36							
	La-140	36	15	< LLD	N/A		< LLD	< LLD	0
Food Products *(pCi/kg wet)*	**Gamma**	3							
	K-40	3		**10453 (3/3) (4170 - 21700)**	**Slade**	**3.2 mi S**	**21700 (1/1) (21700-21700)**	N/A	0
	Be-7	3		< LLD	N/A		< LLD	N/A	0
	Th-228	3		< LLD	N/A		< LLD	N/A	0
	I-131	3	60	< LLD	N/A		< LLD	N/A	0
	Cs-134	3	60	< LLD	N/A		< LLD	N/A	0
	Cs-137	3	80	< LLD	N/A		< LLD	N/A	0
Well Water *(pCi/Liter)*	**H-3**	12	2000	< LLD	N/A		< LLD	N/A	0
	Gamma	12							
	Mn-54	12	15	< LLD	N/A		< LLD	N/A	0
	Co-58	12	15	< LLD	N/A		< LLD	N/A	0
	Fe-59	12	30	< LLD	N/A		< LLD	N/A	0
	Co-60	12	15	< LLD	N/A		< LLD	N/A	0
	Zn-65	12	30	< LLD	N/A		< LLD	N/A	0
	K-40	12		**84.2 (1/8) (28.5 - 84.2)**	**HIR**	**2.0 mi NNE**	**84.2 (1/4) (28.5 - 84.2)**	N/A	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Well Water *(pCi/Liter)*	Nb-95	12	15	< LLD	N/A		< LLD	N/A	0
	Zr-95	12	30	< LLD	N/A		< LLD	N/A	0
	I-131	12	1	< LLD	N/A		< LLD	N/A	0
	Cs-134	12	15	< LLD	N/A		< LLD	N/A	0
	Cs-137	12	18	< LLD	N/A		< LLD	N/A	0
	Ba-140	12	60	< LLD	N/A		< LLD	N/A	0
	La-140	12	15	< LLD	N/A		< LLD	N/A	0
	Th-228	12		**19.8 (1/12) (19.8 - 19.8)**	**CS**	**0.3 mi E**	**19.8 (1/12) (19.8 - 19.8)**	N/A	0
River Water *(pCi/Liter)*	**H-3**	8	2000	< LLD	N/A		< LLD	< LLD	0
	Gamma	24							
	K-40	24		**96.6 (7/12) (69.1 - 143)**	**SW**	**4.9 mi WNW**	**104.5 (3/12) (81.0 - 142)**	**104.5 (3/12) (81.0 - 142)**	0
	Ac-228	24		**17.4 (1/12) (17.4 - 17.4)**	**SD**	**0.4 mi NW**	**17.4 (1/12) (17.4 - 17.4)**	< LLD	0
	Ra-226	24		< LLD	N/A		< LLD	< LLD	0
	Th-228	24		< LLD	N/A		< LLD	< LLD	0
	Mn-54	24	15	< LLD	N/A		< LLD	< LLD	0
	Co-58	24	15	< LLD	N/A		< LLD	< LLD	0
	Fe-59	24	30	< LLD	N/A		< LLD	< LLD	0
	Co-60	24	15	< LLD	N/A		< LLD	< LLD	0
	Zn-65	24	30	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
River Water *(pCi/Liter)*	Nb-95	24	15	< LLD	N/A		< LLD	< LLD	0
	Zr-95	24	30	< LLD	N/A		< LLD	< LLD	0
	I-131	24	10	< LLD	N/A		< LLD	< LLD	0
	Cs-134	24	15	< LLD	N/A		< LLD	< LLD	0
	Cs-137	24	18	< LLD	N/A		< LLD	< LLD	0
	Ba-140	24	60	< LLD	N/A		< LLD	< LLD	0
	La-140	24	15	< LLD	N/A		< LLD	< LLD	0
Silt *(pCi/kg dry)*	**Gamma**	5							
	Be-7	5		**1430 (1/3) (1430 -1430)**	**SD**	**1.3 mi NNW**	**1430 (1/3) (1430 -1430)**	< LLD	0
	K-40	5		**16067 (3/3) (15400-16500)**	**CHIC**	**11.2 mi WNW**	**17100 (2/2) (16600-17600)**	**17100 (2/2) (16600-17600)**	0
	Cs-134	5	150	< LLD	N/A		< LLD	< LLD	0
	Cs-137	5	180	**135 (2/3) (108 - 162)**	**SI**	**1.8 mi ESE**	**162 (1/1) (162 - 162)**	**170 (2/2) (132 - 207)**	0
	Ra-226	5		**2547 (3/3) (1940 - 3130)**	**SI**	**1.8 mi ESE**	**2570 (1/1) (2570 - 2570)**	**3115 (2/2) (2950 - 3280)**	0
	Th-228	5		**1487 (3/3) (1210 - 1790)**	**SD**	**1.3 mi NNW**	**1625 (2/2) (1460 - 1790)**	**1435 (2/2) (1390 - 1480)**	0
	Th-232	5		**1297 (3/3) (1020 - 1710)**	**SD**	**1.3 mi NNW**	**1365 (2/2) (1020 - 1710)**	**1370 (2/2) (1310 - 1430)**	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Shoreline Sediment *(pCi/kg dry)*	K-40	4		**6190 (2/2) (5050 - 7330)**	**HIR**	**0.6 mi N**	**6190 (2/2) (5050 - 7330)**	**2645 (2/2) (1100 - 4190)**	0
	Cs-134	4	150	< LLD	N/A		< LLD	< LLD	0
	Cs-137	4	180	< LLD	N/A		< LLD	< LLD	0
	Ra-226	4		**1210 (1/2) (1210 - 1210)**	**CHIC**	**11.2 mi WNW**	**6150 (1/2) (6150 - 6150)**	**6150 (1/2) (6150 - 6150)**	0
	Th-228	4		**505 (2/2) (126 - 884)**	**CHIC**	**11.2 mi WNW**	**2225 (2/2) (1010 - 3440)**	**2225 (2/2) (1010 - 3440)**	0
	Th-232	4		**842 (1/2) (842 - 842)**	**CHIC**	**11.2 mi WNW**	**2161 (2/2) (861 - 3460)**	**2161 (2/2) (861 - 3460)**	0
Fish *(pCi/kg wet)*	**Gamma**	4							
	K-40	4		**2740 (4/4) (1980 - 2335)**	**SD**	**1.3 mi NNW**	**2740 (4/4) (1980 - 2335)**	N/A	0
	Mn-54	4	130	< LLD	N/A		< LLD	N/A	0
	Co-58	4	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	4	260	< LLD	N/A		< LLD	N/A	0
	Co-60	4	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	4	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	4	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	4	150	< LLD	N/A		< LLD	N/A	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Oysters *(pCi/kg wet)*	**Gamma**	6							
	K-40	6		< LLD	N/A		< LLD	N/A	0
	Mn-54	6	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	6	260	< LLD	N/A		< LLD	N/A	0
	Co-58	6	130	< LLD	N/A		< LLD	N/A	0
	Co-60	6	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	6	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	6	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	6	150	< LLD	N/A		< LLD	N/A	0
Clams *(pCi/kg wet)*	**Gamma**	6							
	K-40	6		**859 (2/4) (735 - 983)**	**JI**	**3.9 mi NW**	**859 (2/4) (735 - 983)**	< LLD	0
	Mn-54	6	130	< LLD	N/A		< LLD	< LLD	0
	Co-58	6	130	< LLD	N/A		< LLD	< LLD	0
	Fe-59	6	260	< LLD	N/A		< LLD	< LLD	0
	Co-60	6	130	< LLD	N/A		< LLD	< LLD	0
	Zn-65	6	260	< LLD	N/A		< LLD	< LLD	0
	Cs-134	6	130	< LLD	N/A		< LLD	< LLD	0
	Cs-137	6	150	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Crabs *(pCi/kg wet)*	**Gamma**	1							
	K-40	1		**1450 (1/1) (1450 - 1450)**	**SD**	**1.3 mi NNW**	**1450 (1/1) (1450 - 1450)**	N/A	0
	Mn-54	1	130	< LLD	N/A		< LLD	N/A	0
	Co-58	1	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	1	260	< LLD	N/A		< LLD	N/A	0
	Co-60	1	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	1	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	1	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	1	150	< LLD	N/A		< LLD	N/A	0

3.2 Analytical Results of 2017 REMP Samples

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The reported error is two times the standard deviation (2σ) of the net activity. Unless otherwise noted, the overall error (counting, sample size, chemistry, errors, etc.) is estimated to be 2 to 5 times that listed. Results are considered positive when the measured value exceeds 2σ uncertainty.

Teledyne Brown Engineering analytical methods meet the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program", (November 1979, Revision 1) and the Surry ODCM.

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Weekly Gross Beta Radioactivity
3. Air Particulates, Weekly I-131
4. Air Particulates, Quarterly Gamma Spectroscopy
5. Animal Milk
6. Food Products
7. Well Water
8. River Water
9. Silt
10. Shoreline Sediment
11. Fish
12. Oysters
13. Clams
14. Crabs

TABLE 3-2: GAMMA EXPOSURE RATE

Surry Power Station, Surry County, Virginia – 2017

$MDD_Q = 3 \times \sigma_Q = 3 \times 1.0 = 3$ (5) Note: IF $MDD_Q < 5$ mR, THEN MDD_Q rounded to 5 mR (ANSI N13.37)

$MDD_A = 3 \times \sigma_A = 3 \times 2.8 = 8.8$ (10) Note: IF $MDD_A < 10$ mR, THEN MDD_A rounded to 10 mR (ANSI N13.37)

Monitoring Location	Quarterly Baseline, B_Q Baseline, (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem per standard quarter)				Quarterly Facility Dose,[a] $F_Q = M_Q - B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose,[b] $F_A = M_A - B_A$ (mrem)
		1	2	3	4	1	2	3	4			
2	19.8	19.7	18.2	v	20.9	ND	ND	N/A	ND	79.4	78.5	ND
3	19.1	19.7	18.8	20.6	20.3	ND	ND	ND	ND	76.2	79.5	ND
4	17.7	18.2	17.3	19.4	18.8	ND	ND	ND	ND	71.0	73.7	ND
5	18.9	19.1	17.3	20.6	20.3	ND	ND	ND	ND	75.6	77.4	ND
6	18.4	17.9	16.7	19.4	20.3	ND	ND	ND	ND	73.6	74.3	ND
7	18.6	18.5	17.9	19.7	20.0	ND	ND	ND	ND	74.2	76.1	ND
8	16.9	17.3	16.4	19.1	17.9	ND	ND	ND	ND	67.8	70.7	ND
9	23.1	23.7	22.1	24.3	24.0	ND	ND	ND	ND	92.5	94.0	ND
10	18.2	18.2	16.4	18.8	18.8	ND	ND	ND	ND	72.6	72.2	ND
11	16.0	16.1	15.5	17.3	17.0	ND	ND	ND	ND	63.8	65.8	ND
12	16.6	16.4	15.2	17.6	17.9	ND	ND	ND	ND	66.2	67.0	ND
13	18.5	19.4	17.6	20.0	20.0	ND	ND	ND	ND	73.8	77.0	ND
14	17.8	18.2	17.0	19.1	19.1	ND	ND	ND	ND	71.1	73.4	ND
15	18.4	18.8	17.9	20.0	20.0	ND	ND	ND	ND	73.5	76.7	ND
16	16.9	17.0	16.4	18.2	17.6	ND	ND	ND	ND	67.3	69.2	ND
18	14.3	15.2	14.9	15.8	15.8	ND	ND	ND	ND	57.1	61.6	ND
19	15.4	15.8	14.9	16.7	16.7	ND	ND	ND	ND	61.6	64.0	ND
20	14.3	14.6	13.3	14.9	15.5	ND	ND	ND	ND	57.1	58.2	ND
21	15.0	16.1	14.6	16.1	16.4	ND	ND	ND	ND	59.8	63.1	ND
22	13.0	13.7	12.7	14.3	14.0	ND	ND	ND	ND	52.2	54.6	ND
23	17.8	18.8	17.9	19.4	19.7	ND	ND	ND	ND	71.4	75.8	ND
24	14.7	14.9	14.3	15.8	15.8	ND	ND	ND	ND	58.9	60.7	ND
25	18.1	17.3	16.7	18.5	19.4	ND	ND	ND	ND	72.4	71.9	ND
26	15.6	16.1	14.9	16.4	16.7	ND	ND	ND	ND	62.3	64.0	ND
27	14.6	15.2	14.3	15.5	15.5	ND	ND	ND	ND	58.3	60.4	ND
28	14.1	14.6	13.7	14.9	15.2	ND	ND	ND	ND	56.5	58.2	ND
29	13.1	13.3	12.4	14.0	14.3	ND	ND	ND	ND	52.6	54.0	ND
30	14.4	14.3	13.7	14.9	15.5	ND	ND	ND	ND	57.6	58.2	ND
31	12.2	12.1	12.1	m	13.3	ND	ND	N/A	ND	49.0	50.2	ND
32	15.2	15.2	14.0	15.5	16.1	ND	ND	ND	ND	60.7	60.7	ND
33	14.0	14.6	14.0	15.8	16.4	ND	ND	ND	ND	56.2	60.7	ND
34	15.9	16.4	15.5	17.6	17.3	ND	ND	ND	ND	63.5	66.7	ND
35	18.3	19.7	17.6	20.3	20.6	ND	ND	ND	ND	73.4	78.3	ND
36	18.5	18.8	17.9	19.7	20.3	ND	ND	ND	ND	73.8	76.7	ND
37	15.3	15.8	14.6	16.4	16.4	ND	ND	ND	ND	61.3	63.1	ND
38	21.0	21.2	18.8	20.6	21.8	ND	ND	ND	ND	83.9	82.5	ND
39	14.8	15.5	14.9	16.1	15.8	ND	ND	ND	ND	59.1	62.2	ND
40	16.1	16.4	15.5	17.0	17.0	ND	ND	ND	ND	64.4	65.8	ND
41	21.7	21.5	21.2	23.1	22.8	ND	ND	ND	ND	86.9	88.6	ND
42	16.2	17.3	16.7	17.3	17.3	ND	ND	ND	ND	64.8	68.6	ND
43	14.3	14.6	13.3	15.5	14.9	ND	ND	ND	ND	57.1	58.2	ND

[a] ND = Not detected, where $M_Q < (B_Q + MDD_Q)$

[b] ND = Not detected, where $M_A < (B_A + MDD_A)$

d = Damaged TLDs; m = Missing TLDs; v = Vendor reports TLD not received

N/A = Missing or Damaged TLD Reading Not Available for Calculation

Note: Table formatted in accordance with ANSI/HPS N13.37-2014, Environmental Dosimetry - Criteria for system Design and Implementation.

TABLE 3-3: GROSS BETA CONCENTRATION IN FILTERED AIR

Surry Nuclear Power Station, Surry County, Virginia - 2017

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 03	13.4 ± 2.46	9.8 ± 2.23	10.3 ± 2.30	8.21 ± 2.11	9.91 ± 2.26	7.82 ± 2.07	9.45 ± 2.18	13.5 ± 2.4
January 10	20.5 ± 3.03	13.5 ± 2.64	13.5 ± 2.70	13.1 ± 2.62	11.9 ± 2.62	11.5 ± 2.54	13.3 ± 2.68	14.0 ± 2.7
January 17	15.2 ± 2.71	13.8 ± 2.63	16.3 ± 2.83	11.5 ± 2.48	11.9 ± 2.57	11.4 ± 2.49	9.80 ± 2.41	11.1 ± 2.44
January 24	9.41 ± 2.47	6.66 ± 2.29	9.60 ± 2.52	9.68 ± 2.46	9.18 ± 2.44	9.23 ± 2.44	6.54 ± 2.27	8.80 ± 2.42
January 31	10.9 ± 2.55	11.5 ± 2.57	11.2 ± 2.51	9.54 ± 2.36	12.1 ± 2.52	12.1 ± 2.51	11.3 ± 2.48	13.1 ± 2.59
February 07	16.7 ± 3.04	16.1 ± 3.02	20.0 ± 3.27	19.6 ± 3.18	19.9 ± 3.20	18.4 ± 3.08	19.2 ± 3.15	18.1 ± 3.06
February 14	19.0 ± 3.03	19.6 ± 3.08	19.1 ± 3.10	17.5 ± 2.95	22.4 ± 3.21	18.0 ± 3.68	17.2 ± 2.99	16.8 ± 2.95
February 21	12.1 ± 2.59	12.2 ± 2.58	12.8 ± 2.67	11.4 ± 2.51	13.3 ± 2.65	13.8 ± 2.66	10.3 ± 2.49	10.4 ± 2.52
February 28	10.8 ± 2.40	11.8 ± 2.46	11.4 ± 2.49	13.0 ± 2.54	12.2 ± 2.50	14.6 ± 2.62	10.9 ± 2.43	12.3 ± 2.51
March 07	11.2 ± 2.46	11.5 ± 2.47	11.4 ± 2.53	11.0 ± 2.44	12.8 ± 2.57	13.1 ± 2.56	13.3 ± 2.60	11.3 ± 2.47
March 13	11.6 ± 2.85	12.9 ± 2.93	14.9 ± 3.11	10.2 ± 2.75	12.8 ± 2.93	14.0 ± 2.99	10.3 ± 2.80	11.4 ± 2.85
March 20	10.5 ± 2.50	12.8 ± 2.64	13.6 ± 2.75	9.63 ± 2.44	14.8 ± 2.77	16.3 ± 2.84	12.2 ± 2.64	13.2 ± 2.70
March 27	20.9 ± 3.00	22.0 ± 3.05	21.5 ± 3.08	19.0 ± 2.88	21.1 ± 3.01	25.0 ± 3.20	19.1 ± 2.92	18.6 ± 2.87
Qtr. Avg. ± 2 s.d.	**14.0 ± 8.0**	**13.4 ± 8.0**	**14.3 ± 7.7**	**12.6 ± 7.6**	**14.2 ± 8.5**	**14.3 ± 8.9**	**12.5 ± 7.7**	**13.3 ± 5.9**
April 04	7.22 ± 2.09	7.74 ± 2.11	7.55 ± 2.12	6.94 ± 2.04	7.90 ± 2.10	7.54 ± 2.05	5.67 ± 1.95	6.53 ± 2.01
April 11	12.1 ± 2.45	10.6 ± 2.37	2.05 ± 1.76	11.0 ± 2.40	11.5 ± 2.42	12.9 ± 2.51	11.0 ± 2.39	12.4 ± 2.50
April 18	13.8 ± 2.75	17.0 ± 2.93	14.8 ± 2.85	13.8 ± 2.76	14.7 ± 2.83	15.7 ± 2.84	25.1 ± 3.34	13.5 ± 2.75
April 25	7.70 ± 2.17	8.39 ± 2.22	9.80 ± 2.35	8.48 ± 2.23	8.17 ± 2.21	8.78 ± 2.22	5.58 ± 2.02	10.0 ± 2.34
May 02	11.3 ± 2.67	10.7 ± 2.63	11.8 ± 2.75	10.0 ± 2.58	9.74 ± 2.57	12.6 ± 2.68	9.03 ± 2.51	10.0 ± 2.55
May 09	9.42 ± 2.32	9.34 ± 2.30	7.68 ± 2.23	8.09 ± 2.23	7.89 ± 2.22	9.84 ± 2.36	8.07 ± 2.29	9.46 ± 2.33
May 16	9.67 ± 2.44	9.28 ± 2.40	9.61 ± 2.45	9.89 ± 2.44	10.2 ± 2.46	10.6 ± 2.50	8.65 ± 2.39	7.66 ± 2.28
May 23	16.2 ± 2.72	15.8 ± 2.68	16.4 ± 2.76	12.7 ± 2.51	15.1 ± 2.65	16.0 ± 2.68	12.1 ± 2.50	13.9 ± 2.57
May 30	10.2 ± 2.61	12.4 ± 2.74	11.3 ± 2.71	9.39 ± 2.55	11.4 ± 2.68	12.4 ± 2.71	10.0 ± 2.62	11.6 ± 2.68
June 06	18.2 ± 3.03	17.8 ± 2.99	17.6 ± 3.01	15.4 ± 2.85	17.6 ± 2.97	20.9 ± 3.12	14.6 ± 2.82	16.2 ± 2.87
June 12	10.3 ± 2.84	9.16 ± 2.75	10.2 ± 2.86	9.88 ± 2.80	9.26 ± 2.78	10.6 ± 2.85	8.52 ± 2.77	8.48 ± 2.74
June 20	15.5 ± 2.53	17.9 ± 2.65	12.4 ± 2.38	14.4 ± 2.45	17.8 ± 2.64	19.3 ± 2.70	14.9 ± 2.50	13.6 ± 2.40
June 26	13.3 ± 2.99	11.8 ± 2.89	13.0 ± 3.03	10.9 ± 2.82	13.0 ± 2.97	16.3 ± 3.15	13.1 ± 3.00	10.4 ± 2.81
Qtr. Avg. ± 2 s.d.	**11.9 ± 6.7**	**12.1 ± 7.4**	**11.1 ± 8.2**	**10.8 ± 5.1**	**11.9 ± 7.0**	**13.3 ± 8.1**	**11.3 ± 10.2**	**11.1 ± 5.6**

TABLE 3-3: GROSS BETA CONCENTRATION IN FILTERED AIR

Surry Nuclear Power Station, Surry County, Virginia - 2017

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS SS	HIR	BC	ALL	CP	BASF	FE	NN
July 03	14.3 ± 2.67	11.5 ± 2.49	11.7 ± 2.56	10.2 ± 2.39	13.4 ± 2.62	13.1 ± 2.56	10.9 ± 2.45	9.94 ± 2.37
July 11	14.8 ± 2.44	14.4 ± 2.40	12.0 ± 2.30	13.6 ± 2.36	12.3 ± 2.28	14.7 ± 2.41	12.5 ± 2.31	12.6 ± 2.31
July 18	12.1 ± 2.83	13.7 ± 2.92	13.1 ± 2.94	11.7 ± 2.77	16.1 ± 3.05	19.2 ± 3.20	14.7 ± 3.01	10.1 ± 2.75
July 24	19.0 ± 3.26	19.5 ± 3.26	19.4 ± 3.33	19.3 ± 3.25	20.5 ± 3.32	24.1 ± 3.48	18.1 ± 3.19	16.5 ± 3.09
August 01	10.0 ± 2.19	8.40 ± 2.07	10.2 ± 2.24	8.98 ± 2.10	12.8 ± 2.34	11.1 ± 2.21	8.03 ± 2.03	7.12 ± 1.97
August 08	10.6 ± 2.58	12.6 ± 2.69	11.7 ± 2.70	9.28 ± 2.49	12.5 ± 2.71	14.9 ± 2.84	10.5 ± 2.59	11.8 ± 2.70
August 15	14.9 ± 2.57	12.6 ± 2.42	14.0 ± 2.56	10.6 ± 2.29	13.4 ± 2.48	14.1 ± 2.51	9.97 ± 2.25	11.7 ± 2.36
August 22	17.1 ± 2.89	17.3 ± 2.90	15.5 ± 2.93	17.7 ± 2.97	17.0 ± 2.94	20.6 ± 3.12	18.6 ± 3.05	17.3 ± 2.95
August 29	14.9 ± 3.00	14.3 ± 2.95	13.8 ± 2.92	12.6 ± 2.78	16.5 ± 2.99	18.9 ± 3.10	16.9 ± 3.04	13.7 ± 2.84
September 05	13.2 ± 2.68	10.8 ± 2.52	12.5 ± 2.69	10.5 ± 2.50	15.0 ± 2.82	15.0 ± 2.75	15.2 ± 2.79	14.3 ± 2.73
September 11	11.9 ± 2.78	10.7 ± 2.69	10.4 ± 2.74	9.23 ± 2.60	11.5 ± 2.74	14.5 ± 2.96	12.8 ± 2.89	12.5 ± 2.86
September 18	15.7 ± 2.76	13.4 ± 2.62	14.4 ± 2.75	12.6 ± 2.57	15.1 ± 2.72	17.1 ± 2.81	16.1 ± 2.78	12.8 ± 2.58
September 25	18.4 ± 2.98	16.0 ± 2.85	16.8 ± 2.94	13.9 ± 2.72	19.4 ± 3.02	20.2 ± 3.05	18.4 ± 2.99	15.6 ± 2.81
Qtr. Avg. ± 2 s.d.	**14.4 ± 5.6**	**13.5 ± 5.9**	**13.5 ± 5.2**	**12.3 ± 6.4**	**15.0 ± 5.6**	**16.7 ± 7.3**	**14.1 ± 7.1**	**12.8 ± 5.6**
October 03	10.8 ± 2.25	3.68 ± 1.75	9.83 ± 2.22	9.88 ± 2.18	10.3 ± 2.20	11.9 ± 2.27	12.1 ± 2.31	9.25 ± 2.10
October 10	8.68 ± 2.37	-1.37 ± 1.59 **E**	11.3 ± 2.59	7.59 ± 2.29	12.6 ± 2.61	4.50 ± 2.09	11.2 ± 2.56	10.4 ± 2.49
October 17	7.26 ± 2.31	2.45 ± 1.89 **A**	4.36 ± 2.16	5.04 ± 2.14	5.54 ± 2.19	6.91 ± 2.28	5.87 ± 2.24	4.50 ± 2.13
October 24	25.1 ± 3.42	19.2 ± 3.21	19.4 ± 3.27	18.5 ± 3.16	21.8 ± 3.30	27.2 ± 3.55	22.2 ± 3.35	18.0 ± 3.12
October 31	11.3 ± 2.47	12.6 ± 2.55	10.9 ± 2.44	11.5 ± 2.43	13.6 ± 2.56	13.5 ± 2.54	12.5 ± 2.49	11.6 ± 2.43
November 07	16.6 ± 2.83	16.7 ± 2.84	17.2 ± 2.91	19.1 ± 2.95	19.9 ± 2.98	17.9 ± 2.85	17.3 ± 2.85	16.3 ± 2.76
November 14	12.9 ± 2.39	12.3 ± 2.35	12.3 ± 2.38	12.6 ± 2.37	12.6 ± 2.37	14.0 ± 2.45	16.7 ± 2.64	11.6 ± 2.30
November 21	15.6 ± 2.82	14.5 ± 2.74	15.5 ± 2.87	18.5 ± 2.96	15.9 ± 2.84	18.0 ± 2.92	17.2 ± 2.93	11.9 ± 2.60
November 28	23.4 ± 3.14	19.1 ± 2.92	20.1 ± 3.02	25.1 ± 3.23	21.3 ± 3.02	25.6 ± 3.22	22.1 ± 3.10	21.1 ± 3.03
December 05	21.6 ± 3.13	24.0 ± 3.23	23.2 ± 3.26	24.5 ± 3.27	25.0 ± 3.30	23.0 ± 3.14	20.8 ± 3.10	16.5 ± 2.87
December 12	19.2 ± 2.87	19.1 ± 2.86	16.8 ± 2.86	14.6 ± 2.68	16.8 ± 2.81	22.7 ± 3.12	16.9 ± 2.87	14.8 ± 2.70
December 19	15.6 ± 2.81	17.4 ± 2.88	16.6 ± 2.84	18.1 ± 2.86	16.7 ± 2.78	20.4 ± 2.95	17.1 ± 2.82	17.2 ± 2.82
December 26	16.3 ± 2.76	22.7 ± 3.11	19.1 ± 3.03	20.9 ± 3.06	17.5 ± 2.88	22.4 ± 3.13	20.5 ± 3.07	18.1 ± 2.92
Qtr. Avg. ± 2 s.d.	**16.0 ± 11.4**	**14.0 ± 15.9**	**15.1 ± 10.3**	**15.8 ± 12.5**	**16.1 ± 10.5**	**17.5 ± 14.0**	**16.3 ± 9.6**	**13.9 ± 9.1**
Ann. Avg. ± 2 s.d.	**14.0 ± 8.4**	**13.3 ± 9.9**	**13.5 ± 8.4**	**12.9 ± 8.9**	**14.3 ± 8.5**	**15.5 ± 10.3**	**13.5 ± 9.3**	**12.8 ± 6.9**

A= <MDC; **E** = Air sample pump running, but no flow or vac.

TABLE 3-4: IODINE-131 CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2017

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 03	3.41 ± 15.4	3.38 ± 15.3	3.45 ± 15.6	3.33 ± 15.1	-6.18 ± 15.7	-5.93 ± 15.0	-5.94 ± 15.1	-5.87 ± 14.9
January 10	-8.34 ± 27.2	-8.34 ± 27.2	-8.58 ± 28.0	-8.33 ± 27.2	-7.71 ± 19.4	-7.47 ± 18.8	-7.57 ± 19.0	-7.46 ± 18.7
January 17	5.73 ± 16.3	5.73 ± 16.3	5.89 ± 16.8	5.68 ± 16.2	4.01 ± 13.3	3.90 ± 12.9	3.94 ± 13.1	3.81 ± 12.6
January 24	6.35 ± 18.8	6.35 ± 18.7	6.47 ± 19.1	6.25 ± 18.5	4.35 ± 18.8	4.32 ± 18.7	4.33 ± 18.7	4.30 ± 18.6
January 31	17.1 ± 18.8	16.9 ± 18.7	16.6 ± 18.3	16.0 ± 17.7	2.89 ± 13.0	2.86 ± 12.9	2.90 ± 13.1	2.88 ± 13.0
February 07	1.12 ± 16.8	1.13 ± 16.9	1.15 ± 17.2	1.12 ± 16.7	12.9 ± 15.5	12.6 ± 15.1	12.7 ± 15.3	12.4 ± 15.0
February 14	-3.85 ± 24.3	-3.89 ± 24.5	-3.97 ± 25.1	-3.85 ± 24.3	5.56 ± 18.9	7.42 ± 25.3	5.62 ± 19.2	5.57 ± 19.0
February 21	3.58 ± 24.4	3.56 ± 24.3	3.65 ± 24.9	3.49 ± 23.8	0.48 ± 15.8	0.47 ± 15.6	0.48 ± 15.9	0.49 ± 16.1
February 28	-1.23 ± 17.8	-1.23 ± 17.7	-1.26 ± 18.2	-1.22 ± 17.6	9.04 ± 16.4	8.91 ± 16.2	9.06 ± 16.5	8.96 ± 16.3
March 07	1.68 ± 23.0	1.67 ± 22.9	1.72 ± 23.6	1.67 ± 22.8	16.5 ± 19.8	16.2 ± 19.4	16.4 ± 19.7	16.3 ± 19.6
March 13	1.61 ± 15.6	1.61 ± 15.6	1.66 ± 16.0	1.59 ± 15.4	1.64 ± 19.8	1.63 ± 19.6	1.66 ± 19.9	1.64 ± 19.7
March 20	-5.16 ± 13.9	-5.16 ± 13.9	-5.33 ± 14.3	-5.14 ± 13.8	0.66 ± 18.5	0.65 ± 18.3	0.66 ± 18.6	0.66 ± 18.5
March 27	-0.39 ± 14.2	-0.38 ± 14.1	-0.40 ± 14.6	-0.38 ± 14.1	5.96 ± 10.4	5.91 ± 10.3	5.97 ± 10.4	5.88 ± 10.2
April 04	-5.65 ± 18.4	-5.63 ± 18.3	-5.68 ± 18.5	-5.51 ± 17.9	19.2 ± 16.0 **A**	7.27 ± 6.07 **A**	19.0 ± 15.8 **A**	18.9 ± 15.8 **A**
April 11	2.11 ± 4.58	5.02 ± 10.9	5.12 ± 11.1	5.03 ± 10.9	2.57 ± 9.67	2.56 ± 9.63	2.56 ± 9.63	2.58 ± 9.73
April 18	2.17 ± 10.3	2.17 ± 10.3	2.20 ± 10.4	2.16 ± 10.3	1.67 ± 10.6	1.63 ± 10.4	1.65 ± 10.5	1.65 ± 10.5
April 25	-5.11 ± 13.8	-5.11 ± 13.8	-5.20 ± 14.0	-5.11 ± 13.8	5.96 ± 14.4	5.85 ± 14.1	5.95 ± 14.4	5.95 ± 14.4
May 02	0.02 ± 18.3	0.02 ± 18.2	0.02 ± 18.7	0.02 ± 18.1	-4.55 ± 20.8	-4.40 ± 20.1	-4.47 ± 20.4	-4.42 ± 20.2
May 09	5.37 ± 14.9	5.32 ± 14.8	5.42 ± 15.1	5.32 ± 14.8	5.65 ± 19.2	5.65 ± 19.2	5.80 ± 19.7	5.63 ± 19.1
May 16	3.79 ± 14.8	3.76 ± 14.7	3.82 ± 15.0	3.75 ± 14.7	-3.48 ± 13.1	-3.51 ± 13.2	-3.53 ± 13.2	-3.43 ± 12.9
May 23	3.28 ± 9.08	3.25 ± 8.99	3.33 ± 9.21	3.26 ± 9.01	2.86 ± 9.95	2.81 ± 9.78	2.89 ± 10.1	2.82 ± 9.81
May 30	0.46 ± 15.4	0.46 ± 15.4	0.47 ± 15.6	0.46 ± 15.3	-0.79 ± 16.0	-0.30 ± 6.09	-0.80 ± 16.1	-0.78 ± 15.7
June 06	3.04 ± 8.88	3.00 ± 8.77	3.05 ± 8.90	2.99 ± 8.73	-0.68 ± 11.2	-0.67 ± 11.0	-0.29 ± 4.72	-0.66 ± 11.0
June 12	-6.09 ± 12.1	-6.03 ± 12.0	-6.15 ± 12.2	-6.03 ± 12.0	1.92 ± 7.44	1.89 ± 7.34	1.94 ± 7.52	1.90 ± 7.39
June 20	-0.46 ± 13.2	-0.46 ± 13.1	-0.47 ± 13.4	-0.46 ± 13.0	-12.8 ± 14.0	-5.32 ± 5.82	-0.13 ± 14.1	-12.7 ± 13.9
June 26	4.77 ± 21.6	4.75 ± 21.5	4.90 ± 22.2	4.72 ± 21.4	-8.10 ± 15.4	-8.02 ± 15.2	-8.14 ± 15.5	-8.05 ± 15.3

A: <MDC

TABLE 3-4: IODINE-131 CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2017

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
July 03	-5.15 ± 15.7	-5.10 ± 15.6	-5.26 ± 16.0	-5.04 ± 15.4	-9.20 ± 21.6	-8.93 ± 21.0	-9.04 ± 21.3	-8.95 ± 21.0
July 11	8.92 ± 18.7	8.86 ± 18.6	9.00 ± 18.9	8.83 ± 18.5	15.6 ± 25.0	15.4 ± 24.7	15.7 ± 25.1	15.6 ± 24.9
July 18	0.44 ± 13.1	0.44 ± 13.1	0.45 ± 13.3	0.43 ± 12.8	-9.61 ± 14.7	-9.53 ± 14.6	-9.69 ± 14.8	-9.66 ± 14.8
July 24	1.74 ± 20.7	1.71 ± 20.4	1.77 ± 21.1	1.71 ± 20.3	-3.36 ± 16.7	-3.32 ± 16.5	-3.36 ± 16.7	-3.34 ± 16.6
August 01	-5.21 ± 20.2	-5.17 ± 20.0	-5.31 ± 20.6	-5.14 ± 19.9	3.81 ± 16.7	3.72 ± 16.3	3.74 ± 16.4	3.74 ± 16.4
August 08	12.5 ± 13.3	12.5 ± 13.2	12.8 ± 13.6	12.4 ± 13.1	-3.75 ± 16.9	-3.73 ± 16.8	-3.72 ± 16.8	-3.77 ± 17.0
August 15	-8.20 ± 15.9	-8.15 ± 15.8	-8.40 ± 16.3	-8.14 ± 15.8	7.10 ± 17.5	7.05 ± 17.3	7.07 ± 17.4	7.02 ± 17.3
August 22	-2.51 ± 14.1	-2.50 ± 14.1	-2.69 ± 15.1	-2.60 ± 14.6	-6.69 ± 13.4	-6.67 ± 13.4	-6.74 ± 13.5	-6.62 ± 13.3
August 29	-14.7 ± 23.1	-14.5 ± 22.8	-14.6 ± 23.0	-14.1 ± 22.2	-4.62 ± 17.4	-2.49 ± 9.39	-4.67 ± 17.6	-4.57 ± 17.3
September 05	-6.28 ± 22.2	-6.25 ± 22.1	-6.47 ± 22.9	-6.23 ± 22.0	2.05 ± 21.3	1.97 ± 20.4	2.00 ± 20.8	1.98 ± 20.6
September 11	8.21 ± 19.3	8.14 ± 19.1	8.41 ± 19.7	3.41 ± 7.98	-5.21 ± 14.9	-5.27 ± 15.1	-5.33 ± 15.2	-5.29 ± 15.1
September 18	5.04 ± 16.8	4.99 ± 16.6	5.17 ± 17.2	4.99 ± 16.6	-0.34 ± 13.3	-0.34 ± 13.2	-0.34 ± 13.4	-0.34 ± 13.3
September 25	0.56 ± 16.4	0.55 ± 16.4	0.57 ± 16.8	0.55 ± 16.2	3.13 ± 13.2	3.11 ± 13.1	3.15 ± 13.3	3.10 ± 13.1
October 03	6.45 ± 13.9	6.38 ± 13.7 **E**	6.59 ± 14.2	6.39 ± 13.7	-10.3 ± 11.7	-10.0 ± 11.3	-10.2 ± 11.6	-9.96 ± 11.3
October 10	-12.2 ± 23.3	-12.2 ± 23.2	-12.5 ± 23.9	-12.1 ± 23.1	-23.1 ± 20.7	-22.9 ± 20.5	-23.3 ± 20.9	-22.9 ± 20.5
October 17	-1.11 ± 16.1	-1.05 ± 15.3	-1.14 ± 16.5	-1.09 ± 15.9	6.75 ± 9.94	6.72 ± 9.89	6.83 ± 10.1	6.76 ± 9.95
October 24	3.09 ± 19.0	3.15 ± 19.4	3.28 ± 20.2	3.20 ± 19.7	1.27 ± 13.6	1.26 ± 13.6	1.28 ± 13.7	1.27 ± 13.6
October 31	-0.18 ± 12.6	-0.19 ± 12.6	-0.19 ± 12.7	-0.18 ± 12.3	15.9 ± 17.0	15.7 ± 16.8	15.8 ± 16.9	15.7 ± 16.8
November 07	10.3 ± 20.3	10.4 ± 20.3	10.6 ± 20.7	10.2 ± 20.1	1.17 ± 15.2	1.15 ± 14.9	1.16 ± 15.1	1.14 ± 14.8
November 14	-2.29 ± 15.9	-2.28 ± 15.8	-2.32 ± 16.1	-2.28 ± 15.8	-3.88 ± 11.4	-3.86 ± 11.4	-3.93 ± 11.6	-3.84 ± 11.3
November 21	1.00 ± 14.6	0.99 ± 14.5	1.02 ± 15.0	0.99 ± 14.5	2.84 ± 11.2	2.80 ± 11.0	2.86 ± 11.3	2.80 ± 11.1
November 28	-12.2 ± 16.2	-12.2 ± 16.2	-12.5 ± 16.6	-12.2 ± 16.2	8.23 ± 11.1	8.16 ± 11.0	8.36 ± 11.3	8.27 ± 11.2
December 05	4.73 ± 16.8	4.68 ± 16.6	4.82 ± 17.1	4.70 ± 16.7	5.22 ± 12.4	5.04 ± 12.0	5.20 ± 12.4	5.16 ± 12.3
December 12	14.8 ± 17.2	14.7 ± 17.2	15.8 ± 18.4	15.4 ± 17.9	1.43 ± 10.5	1.43 ± 10.4	1.46 ± 10.7	1.42 ± 10.4
December 19	4.62 ± 14.8	4.54 ± 14.5	4.57 ± 14.6	4.42 ± 14.2	3.04 ± 10.2	3.00 ± 10.0	3.06 ± 10.2	2.55 ± 8.53
December 26	-3.08 ± 8.60	-7.32 ± 20.5	-7.78 ± 21.8	-7.56 ± 21.1	20.2 ± 20.0 **A**	20.2 ± 19.9 **A**	20.5 ± 20.3 **A**	20.2 ± 20.0 **A**

A: <MDC; **E:** Air sample pump running, but no flow or vac.

TABLE 3-5: GAMMA EMITTER CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2017

1.0E-3 pCi/m3 ± 2 Sigma

SAMPLING LOCATIONS	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	AVERAGE ± 2 SIGMA
SS	Cs-134	-0.32 ± 0.85	-0.24 ± 0.65	-0.62 ± 1.58	-0.35 ± 0.65	
	Cs-137	-0.15 ± 0.71	0.16 ± 0.52	-0.49 ± 1.34	0.06 ± 0.56	
	Be-7	**200** ± 29.3	**142** ± 23.2	**128** ± 40.8	**115** ± 19.9	146 ± 75.0
	K-40			**23.7** ± 21.6	±	23.7 21.6
HIR	Cs-134	0.74 ± 1.01	-0.14 ± 0.73	-0.38 ± 0.69	-0.87 ± 0.88	
	Cs-137	-0.22 ± 0.89	-0.42 ± 0.70	0.04 ± 0.63	-0.45 ± 0.62	
	Be-7	**171** ± 27.1	**148** ± 30.0	**127** ± 23.7	**137** ± 25.7	146 ± 37.8
BC	Cs-134	-0.74 ± 0.73	0.44 ± 1.47	-0.34 ± 1.07	-0.24 ± 1.54	
	Cs-137	0.09 ± 0.51	-0.49 ± 1.06	0.35 ± 0.85	0.22 ± 1.09	
	Be-7	**168** ± 24.4	**157** ± 36.4	**97.8** ± 29.2	**132** ± 31.4	139 ± 62.3
ALL	Cs-134	-0.55 ± 0.81	-0.17 ± 0.97	-0.005 ± 1.27	-0.41 ± 0.83	
	Cs-137	1.05 ± 0.63 **A**	0.19 ± 0.84	-0.31 ± 1.06	-0.31 ± 0.66	
	Be-7	**181** ± 30.8	**125** ± 27.1	**102** ± 39.9	**136** ± 24.6	136 ± 66.4
CP	Cs-134	0.41 ± 0.88	0.44 ± 1.11	0.11 ± 0.93	0.01 ± 1.27	
	Cs-137	0.28 ± 0.72	-0.19 ± 0.96	-0.76 ± 0.81	-0.03 ± 1.12	
	Be-7	**150** ± 23.8	**143** ± 35.7	**135** ± 27.4	**102** ± 34.7	133 ± 42.5
BASF	Cs-134	-0.65 ± 1.38	-0.36 ± 0.87	-0.41 ± 0.73	-0.17 ± 0.77	
	Cs-137	-0.40 ± 1.27	-0.78 ± 0.85	0.03 ± 0.52	0.69 ± 0.76	
	Be-7	**175** ± 41.8	**201** ± 28.7	**154** ± 24.5	**122** ± 21.8	163 ± 66.8
FE	Cs-134	-0.57 ± 0.88	0.76 ± 0.64	0.59 ± 0.83	0.00 ± 0.87	
	Cs-137	0.37 ± 0.68	-0.18 ± 0.53	0.11 ± 0.66	0.78 ± 0.88	
	Be-7	**159** ± 27.1	**138** ± 23.3	**140** ± 27.0	**153** ± 24.1	148 ± 20.3
NN-C	Cs-134	-0.27 ± 1.39	-0.39 ± 0.80	0.25 ± 0.85	-0.05 ± 0.63	
	Cs-137	1.09 ± 1.11	-0.65 ± 0.82	-0.33 ± 0.70	-0.20 ± 0.61	
	Be-7	**139** ± 34.0	**150** ± 25.9	**122** ± 24.2	**124** ± 20.3	134 ± 26.5

A: <MDC

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT-C
JANUARY			
Cs-134	-8.28 ± 6.80	-4.44 ± 3.74	-2.01 ± 4.70
Cs-137	2.08 ± 5.98	1.10 ± 3.88	4.04 ± 5.09
Ba-140	14.1 ± 21.4	-3.48 ± 12.9	0.49 ± 19.9
La-140	1.90 ± 5.11	-0.86 ± 4.15	-0.49 ± 4.22
I-131	-0.13 ± 0.33	0.10 ± 0.44	0.06 ± 0.36
K-40	**1,310** ± 223	**1,170** ± 143	**1,560** ± 184
FEBRUARY			
Cs-134	-7.61 ± 5.63	3.68 ± 6.52	-1.76 ± 6.57
Cs-137	2.03 ± 5.25	1.41 ± 6.48	3.15 ± 5.54
Ba-140	-2.61 ± 17.2	-2.96 ± 22.2	-1.39 ± 18.4
La-140	2.24 ± 5.98	5.16 ± 7.35	-3.57 ± 4.69
I-131	0.19 ± 0.28	0.43 ± 0.33 **A**	-0.05 ± 0.23
K-40	**1400** ± 208	**1280** ± 219	**1820** ± 209
MARCH			
Cs-134	4.10 ± 4.75	2.69 ± 5.02	1.99 ± 5.55
Cs-137	-2.01 ± 5.83	0.19 ± 5.48	-2.63 ± 5.05
Ba-140	20.1 ± 21.7	-2.66 ± 18.8	-4.37 ± 16.7
La-140	3.85 ± 5.92	-0.30 ± 5.52	3.36 ± 6.42
I-131	-0.10 ± 0.21	0.10 ± 0.32	0.25 ± 0.22 **A**
K-40	**1450** ± 210	**1280** ± 190	**1520** ± 196
Sr-89		1.85 ± 1.89	
Sr-90		**1.12** ± 0.33	
APRIL			
Cs-134	2.59 ± 4.73	1.83 ± 5.14	4.70 ± 5.32
Cs-137	-0.74 ± 3.95	0.81 ± 4.15	3.42 ± 5.06
Ba-140	-0.95 ± 15.8	2.58 ± 26.2	-9.35 ± 21.9
La-140	1.18 ± 5.07	3.50 ± 6.47	4.64 ± 7.56
I-131	0.04 ± 0.09	-0.36 ± 0.32	-0.01 ± 0.19
K-40	**1290** ± 154	**1390** ± 212	**1280** ± 194

A: <MDC

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT-C
MAY			
Cs-134	-1.66 ± 4.52	1.73 ± 4.84	2.13 ± 4.49
Cs-137	-0.33 ± 4.07	3.69 ± 4.34	-0.96 ± 4.61
Ba-140	13.3 ± 17.2	2.89 ± 17.2	-5.74 ± 20.8
La-140	-1.50 ± 6.40	2.27 ± 5.81	0.03 ± 5.31
I-131	-0.34 ± 0.46	-0.45 ± 0.33	-0.08 ± 0.24
K-40	**1360** ± 164	**1450** ± 167	**1610** ± 195
JUNE			
Cs-134	0.00 ± 4.93	-3.70 ± 4.53	-6.82 ± 5.30
Cs-137	-0.85 ± 5.53	-1.31 ± 4.57	-0.33 ± 5.67
Ba-140	11.4 ± 22.1	-2.18 ± 17.5	-0.71 ± 22.2
La-140	0.72 ± 6.71	-1.26 ± 5.05	-0.95 ± 6.24
I-131	0.47 ± 0.51	-0.04 ± 0.38	-0.08 ± 0.39
K-40	**1510** ± 194	**1510** ± 166	**1680** ± 189
Sr-89		-5.36 ± 2.91	
Sr-90		**1.73** ± 0.64	
JULY			
Cs-134	-2.71 ± 5.03	-0.99 ± 5.23	-1.15 ± 5.23
Cs-137	-0.90 ± 5.20	1.82 ± 5.75	2.14 ± 5.31
Ba-140	-9.28 ± 18.9	-1.66 ± 26.5	0.89 ± 21.5
La-140	-0.89 ± 6.92	3.17 ± 7.26	4.45 ± 7.59
I-131	-0.09 ± 0.43	0.43 ± 0.53	-1.01 ± 0.53
K-40	**1440** ± 191	**1360** ± 171	**1690** ± 207
AUGUST			
Cs-134	-2.09 ± 5.67	-0.721 ± 5.91	-1.02 ± 6.31
Cs-137	4.24 ± 4.87	-1.11 ± 5.49	1.52 ± 5.60
Ba-140	25.0 ± 25.9	5.95 ± 24.5	-1.81 ± 29.6
La-140	-6.10 ± 9.75	3.88 ± 8.01	-1.42 ± 5.90
I-131	0.58 ± 0.48 **A**	0.00 ± 0.55	-0.14 ± 0.34
K-40	**1490** ± 242	**1410** ± 185	**1500** ± 175

A: <MDC

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT-C
SEPTEMBER			
Cs-134	-1.16 ± 4.98	-1.84 ± 4.89	-2.14 ± 6.17
Cs-137	0.76 ± 5.31	2.30 ± 5.02	-1.41 ± 5.78
Ba-140	-1.48 ± 25.9	-3.29 ± 25.1	-12.9 ± 29.8
La-140	-2.92 ± 8.95	-8.56 ± 6.97	-6.23 ± 8.53
I-131	-0.13 ± 0.40	-0.11 ± 0.50	0.28 ± 0.31
K-40	**1260** ± 212	**1620** ± 212	**1870** ± 204
Sr-89		1.39 ± 2.53	
Sr-90		0.57 ± 0.46 **A**	
OCTOBER			
Cs-134	-1.53 ± 6.08	-1.54 ± 5.22	4.44 ± 5.66
Cs-137	1.27 ± 5.50	2.16 ± 4.87	-1.01 ± 5.17
Ba-140	26.1 ± 20.3 **A**	-14.2 ± 21.0	3.22 ± 21.1
La-140	-2.11 ± 7.38	1.93 ± 5.72	-2.43 ± 5.16
I-131	0.07 ± 0.37	-0.05 ± 0.38	-0.09 ± 0.45
K-40	**1470** ± 188	**1350** ± 179	**1580** ± 180
NOVEMBER			
Cs-134	1.05 ± 6.91	5.53 ± 7.04	5.89 ± 6.43
Cs-137	3.08 ± 5.53	0.93 ± 6.04	2.93 ± 4.40
Ba-140	13.8 ± 25.5	5.43 ± 31.2	27.2 ± 27.2 **A**
La-140	-0.05 ± 6.85	-3.84 ± 6.64	-3.49 ± 8.71
I-131	0.02 ± 0.34	-0.15 ± 0.24	0.23 ± 0.64
K-40	**1300** ± 207	**1320** ± 164	**1730** ± 208
DECEMBER			
Cs-134	-1.18 ± 5.45	0.99 ± 4.34	1.64 ± 5.92
Cs-137	-1.96 ± 4.70	2.24 ± 3.64	9.62 ± 6.12 **A**
Ba-140	-0.21 ± 17.0	8.89 ± 13.8	27.9 ± 21.9 **A**
La-140	2.00 ± 5.21	-0.67 ± 4.22	0.05 ± 4.62
I-131	0.08 ± 0.35	-0.59 ± 0.46	0.03 ± 0.33
K-40	**1110** ± 190	**1140** ± 157	**1480** ± 185
Sr-89		0.77 ± 1.89	
Sr-90		**0.97** ± 0.63	

A: <MDC

TABLE 3-7: GAMMA EMITTER CONCENTRATION IN FOOD PRODUCTS

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			Cs-134	**Cs-137**	**I-131**	**K-40**
BROCK FARM	11/16/2017	Corn	-14.2 ± 14.4	1.62 ± 12.9	-16.2 ± 34.7	**4170** ± 339
			Cs-134	**Cs-137**	**I-131**	**K-40**
	11/16/2017	Peanuts	-19.6 ± 19.6	-3.20 ± 17.8	-3.58 ± 32.4	**5490** ± 578
			Cs-134	**Cs-137**	**I-131**	**K-40**
SLADE FARM	12/6/2017	Soybeans	3.82 ± 24.1	1.88 ± 23.5	14.8 ± 21.6	**21700** ± 1340

TABLE 3-8: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN WELL WATER

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SS	3/7/2017	1.31 ± 3.47	-1.54 ± 3.28	-6.81 ± 6.29	-1.30 ± 3.00	-11.9 ± 9.09
	6/20/2017	0.98 ± 3.28	-2.59 ± 3.42	-0.90 ± 6.87	-0.97 ± 3.87	8.08 ± 9.05
	9/25/2017	1.28 ± 4.52	-0.42 ± 3.72	-3.88 ± 8.85	0.82 ± 4.93	-3.48 ± 10.0
	12/5/2017	-1.30 ± 2.48	-0.91 ± 3.17	0.74 ± 7.26	-0.43 ± 2.86	-5.40 ± 6.51
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/7/2017	4.52 ± 3.61 **A**	-1.01 ± 5.83	2.17 ± 5.54	0.55 ± 3.59	-1.47 ± 3.96
	6/20/2017	1.79 ± 3.90	-0.69 ± 6.84	0.06 ± 0.44	-1.15 ± 3.61	4.87 ± 4.56 **A**
	9/25/2017	1.60 ± 5.20	-7.56 ± 7.98	0.07 ± 0.31	4.62 ± 4.27 **A**	0.03 ± 4.43
	12/5/2017	4.13 ± 3.06 **A**	0.62 ± 5.55	0.20 ± 0.42	0.91 ± 3.25	-0.97 ± 3.53
		Ba-140	**La-140**	**H-3**	**Ra-226**	
	3/7/2017	-2.94 ± 15.6	-2.75 ± 4.62	39.4 ± 541	86.2 ± 134	
	6/20/2017	-11.6 ± 16.6	-0.22 ± 6.26	70.6 ± 437	1.43 ± 91.5	
	9/25/2017	-4.84 ± 18.1	0.98 ± 6.22	-0.76 ± 535	-22.3 ± 110	
	12/5/2017	-2.76 ± 10.1	0.39 ± 4.61	155 ± 675	23.9 ± 90.6	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
HIR	3/7/2017	1.80 ± 3.09	-3.17 ± 2.95	1.88 ± 6.71	-0.17 ± 2.78	-1.29 ± 7.30
	6/20/2017	-1.34 ± 4.21	-2.80 ± 4.08	-1.32 ± 7.72	0.18 ± 3.98	2.12 ± 7.71
	9/25/2017	-1.05 ± 3.60	-0.64 ± 3.39	3.04 ± 7.34	-0.06 ± 2.82	-3.38 ± 9.00
	12/5/2017	-0.50 ± 4.12	-0.54 ± 3.30	-2.08 ± 8.44	3.01 ± 4.42	-0.92 ± 9.54
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/7/2017	2.77 ± 3.82	3.91 ± 5.82	3.65 ± 5.58	0.91 ± 3.58	0.56 ± 3.59
	6/20/2017	1.62 ± 4.53	2.04 ± 7.04	-0.26 ± 0.41	4.84 ± 4.56 **A**	2.88 ± 4.40
	9/25/2017	2.59 ± 4.16	-0.09 ± 7.33	0.18 ± 0.27	-1.29 ± 4.11	-1.47 ± 4.46
	12/5/2017	-2.47 ± 4.43	-2.91 ± 6.14	0.22 ± 0.42	4.02 ± 4.60	-4.28 ± 4.55
		Ba-140	**La-140**	**H-3**	**K-40**	
	3/7/2017	7.16 ± 14.8	-1.05 ± 4.99	-133 ± 533	47.9 ± 55.0	
	6/20/2017	-2.69 ± 16.4	2.62 ± 6.58	-21.7 ± 428	-44.0 ± 58.5	
	9/25/2017	-4.85 ± 16.5	-3.29 ± 5.41	561 ± 610	**84.2** ± 68.1	
	12/5/2017	0.45 ± 15.5	-1.66 ± 5.05	82.4 ± 667	28.5 ± 69.8	

A: < MDC

TABLE 3-8: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN WELL WATER

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
TC	3/7/2017	2.69 ± 3.48	-0.77 ± 3.07	-2.00 ± 7.01	3.18 ± 3.65	-17.5 ± 10.1
	6/20/2017	2.39 ± 4.46	0.39 ± 3.92	-2.68 ± 8.00	-2.88 ± 4.62	1.59 ± 9.64
	9/25/2017	0.70 ± 3.87	-0.53 ± 3.67	-6.90 ± 6.76	-2.95 ± 5.17	3.64 ± 8.14
	12/5/2017	1.34 ± 4.14	0.09 ± 4.07	-4.07 ± 6.92	1.03 ± 4.59	-7.73 ± 10.5
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/7/2017	3.05 ± 3.79	-0.02 ± 6.10	0.02 ± 0.26	-1.88 ± 4.10	-0.83 ± 3.85
	6/20/2017	5.54 ± 4.10 **A**	-6.94 ± 7.56	0.40 ± 0.49	-2.34 ± 4.72	-1.36 ± 4.60
	9/25/2017	1.43 ± 4.12	-0.99 ± 6.77	-0.15 ± 0.33	-0.96 ± 3.99	-3.48 ± 3.93
	12/5/2017	2.21 ± 3.95	1.88 ± 6.94	-0.21 ± 0.40	-3.65 ± 4.40	-5.34 ± 4.46
		Ba-140	**La-140**	**H-3**	**K-40**	**Th-228**
	3/7/2017	-2.52 ± 16.6	-2.25 ± 3.70	13.1 ± 539	1.72 ± 65.4	
	6/20/2017	0.68 ± 17.7	5.37 ± 5.50	-59.7 ± 425	24.1 ± 63.2	
	9/25/2017	0.02 ± 16.8	-0.17 ± 6.16	-23.5 ± 541	33.9 ± 75.7	
	12/5/2017	-14.6 ± 18.8	-0.62 ± 5.99	-249 ± 655	-15.1 ± 64.3	**19.8** ± 13.3

A: < MDC

TABLE 3-9: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN RIVER WATER

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SD	1/3/2017	0.01 ± 2.54	0.28 ± 2.71	-0.68 ± 4.43	1.36 ± 2.89	-3.79 ± 5.61
	2/7/2017	1.39 ± 2.67	-0.76 ± 2.69	-0.08 ± 4.39	0.63 ± 2.38	-3.28 ± 5.44
	3/7/2017	-0.62 ± 3.37	-1.51 ± 3.62	2.46 ± 6.43	-0.25 ± 3.09	2.47 ± 7.67
	4/18/2017	-1.11 ± 2.23	-0.30 ± 2.28	-0.40 ± 5.09	3.42 ± 2.45 **A**	-5.76 ± 6.16
	5/2/2017	0.67 ± 2.75	-1.70 ± 2.42	-3.22 ± 5.42	-0.19 ± 2.60	-7.49 ± 6.08
	6/12/2017	1.22 ± 2.86	0.44 ± 2.72	-2.53 ± 6.32	3.28 ± 3.60	-0.67 ± 6.26
	7/3/2017	-0.06 ± 2.77	-1.41 ± 3.32	-2.53 ± 6.90	4.36 ± 4.07 **A**	-13.1 ± 9.44
	8/1/2017	1.10 ± 3.24	-3.03 ± 3.64	1.77 ± 7.99	3.59 ± 3.74	0.55 ± 7.99
	9/5/2017	-2.62 ± 3.27	-1.51 ± 3.16	3.33 ± 7.22	-1.03 ± 3.46	3.13 ± 5.93
	10/3/2017	-0.19 ± 2.97	1.12 ± 3.41	-0.14 ± 7.86	0.62 ± 3.00	-7.23 ± 8.58
	11/7/2017	-0.21 ± 3.36	-2.78 ± 3.38	3.38 ± 7.05	1.48 ± 3.91	-1.89 ± 7.61
	12/5/2017	-0.70 ± 2.31	0.51 ± 2.02	3.61 ± 4.76	0.82 ± 2.28	-5.15 ± 5.16
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/3/2017	-0.11 ± 2.63	-1.03 ± 5.07	-0.76 ± 3.46	0.56 ± 2.84	-1.16 ± 2.73
	2/7/2017	-1.09 ± 2.83	1.34 ± 4.34	-5.68 ± 4.16	0.29 ± 2.50	-0.58 ± 2.76
	3/7/2017	1.03 ± 2.88	5.27 ± 5.57	0.65 ± 4.20	0.52 ± 3.73	-0.001 ± 3.07
	4/18/2017	3.09 ± 2.42 **A**	-0.88 ± 4.47	-0.33 ± 3.00	2.60 ± 2.76	-0.95 ± 2.84
	5/2/2017	0.21 ± 2.82	-0.10 ± 4.70	-0.08 ± 4.26	-4.06 ± 3.00	-1.48 ± 2.73
	6/12/2017	1.30 ± 2.75	-2.95 ± 4.29	1.13 ± 3.35	3.03 ± 3.18	2.55 ± 3.09
	7/3/2017	-0.84 ± 3.48	1.69 ± 6.07	0.15 ± 4.32	2.24 ± 3.98	0.02 ± 3.03
	8/1/2017	-1.32 ± 3.72	-2.36 ± 6.34	-4.96 ± 6.19	0.61 ± 3.91	2.12 ± 3.78
	9/5/2017	1.77 ± 3.09	2.20 ± 5.19	-6.20 ± 6.67	-0.21 ± 3.36	0.13 ± 2.68
	10/3/2017	2.47 ± 3.83	3.32 ± 6.11	-5.75 ± 6.49	-0.08 ± 4.12	1.03 ± 3.33
	11/7/2017	-0.66 ± 3.85	-0.42 ± 6.13	-1.92 ± 6.14	0.22 ± 3.73	1.32 ± 3.91
	12/5/2017	0.16 ± 2.19	-2.89 ± 3.31	3.43 ± 3.53	0.80 ± 2.26	-1.36 ± 2.29
		Ba-140	**La-140**	**H-3**	**K-40**	
	1/3/2017	-5.33 ± 11.6	-0.22 ± 3.19		**69.1** ± 49.5	
	2/7/2017	-3.23 ± 10.8	-0.48 ± 3.83			
	3/7/2017	6.89 ± 13.7	2.63 ± 4.23		**72.2** ± 62.8	
	4/18/2017	10.30 ± 8.75 **A**	-0.73 ± 2.92			
	3/7/2017			-469 ± 521		
	5/2/2017	-1.27 ± 13.2	-2.75 ± 4.04			
	6/12/2017	-7.60 ± 10.7	0.63 ± 4.13	-135 ± 529		
	7/3/2017	2.95 ± 13.8	-2.11 ± 4.98			
	8/1/2017	-4.57 ± 18.6	-4.30 ± 5.77		**85.8** ± 74.4	
	9/5/2017	-5.16 ± 16.7	-1.27 ± 2.60	5.55 ± 665	**109** ± 68.3	
	10/3/2017	9.78 ± 17.8	1.16 ± 6.41		**97.7** ± 82.9	
	11/7/2017	14.4 ± 16.7	-6.41 ± 4.94		**99.2** ± 87.1	
	12/5/2017	0.10 ± 10.2	-2.16 ± 3.09	35.9 715	**143** ± 44.5	
		Ac-228				
	2/7/2017	**17.4** ± 14.8				

A: < MDC

TABLE 3-9: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN RIVER WATER

Surry Power Station, Surry County, Virginia - 2017

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPES				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SW-C	1/3/2017	3.47 ± 3.69	-0.85 ± 3.41	2.35 ± 7.91	2.80 ± 3.83	-7.63 ± 8.82
	2/7/2017	-0.48 ± 2.85	-3.02 ± 3.31	3.45 ± 5.97	-0.01 ± 2.40	-7.29 ± 6.23
	3/7/2017	-3.43 ± 4.35	0.63 ± 5.41	11.9 ± 10.7 **A**	-1.21 ± 4.01	-15.0 ± 12.0
	4/18/2017	-1.19 ± 2.81	-0.36 ± 2.76	1.01 ± 4.65	0.01 ± 2.54	-2.09 ± 6.81
	5/2/2017	-1.18 ± 3.15	1.66 ± 3.21	-0.61 ± 5.95	-0.84 ± 2.71	-4.82 ± 7.74
	6/12/2017	-2.01 ± 2.34	-1.15 ± 2.57	3.82 ± 6.41	1.67 ± 2.33	-6.75 ± 6.56
	7/3/2017	3.58 ± 3.99	-2.73 ± 4.45	-0.82 ± 7.81	1.32 ± 3.94	-8.60 ± 9.15
	8/1/2017	1.00 ± 3.21	-0.90 ± 3.44	2.38 ± 5.82	-1.16 ± 2.89	-5.65 ± 7.86
	9/5/2017	1.00 ± 2.17	-0.09 ± 2.41	-0.01 ± 5.01	0.70 ± 2.39	3.58 ± 5.23
	10/3/2017	-3.40 ± 3.26	-0.49 ± 3.02	2.86 ± 6.24	0.41 ± 3.29	-6.34 ± 5.99
	11/7/2017	-2.85 ± 3.76	-0.38 ± 3.34	6.70 ± 7.59	3.03 ± 4.42	-7.74 ± 9.21
	12/5/2017	-1.48 ± 2.54	-0.28 ± 2.54	-2.74 ± 5.32	3.99 ± 2.94 **A**	-3.44 ± 5.22
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/3/2017	-0.28 ± 4.14	-2.72 ± 6.28	2.45 ± 5.02	-12.6 ± 4.99	-1.13 ± 3.29
	2/7/2017	0.97 ± 2.97	-2.10 ± 5.39	-0.74 ± 4.95	-8.92 ± 3.47	-0.30 ± 3.21
	3/7/2017	0.28 ± 4.91	-2.51 ± 8.48	3.47 ± 5.43	-1.09 ± 4.37	-4.29 ± 4.55
	4/18/2017	2.01 ± 2.99	3.64 ± 4.90	1.07 ± 3.38	2.32 ± 3.03	-0.46 ± 3.25
	5/2/2017	-0.84 ± 3.04	0.44 ± 4.71	-1.32 ± 4.39	-0.23 ± 3.48	-4.21 ± 3.49
	6/12/2017	0.75 ± 2.27	2.46 ± 3.93	-1.14 ± 3.03	0.06 ± 2.83	-3.72 ± 2.96
	7/3/2017	1.07 ± 4.02	-1.33 ± 7.53	0.08 ± 5.20	-0.17 ± 4.59	0.54 ± 4.19
	8/1/2017	0.19 ± 3.05	-1.07 ± 5.58	-5.74 ± 6.13	3.59 ± 3.40 **A**	-3.10 ± 3.51
	9/5/2017	0.09 ± 2.42	-1.80 ± 3.77	2.48 ± 4.75	0.61 ± 2.36	-0.82 ± 2.46
	10/3/2017	-0.60 ± 2.97	-0.12 ± 5.95	0.23 ± 5.88	-0.76 ± 3.25	-2.25 ± 3.36
	11/7/2017	4.44 ± 4.19 **A**	-3.37 ± 6.47	3.36 ± 5.74	0.11 ± 4.01	0.12 ± 4.25
	12/5/2017	-0.18 ± 2.47	4.12 ± 4.83	-1.00 ± 4.14	0.95 ± 2.76	1.29 ± 2.78
		Ba-140	**La-140**	**H-3**	**K-40**	
	1/3/2017	2.10 ± 15.6	-0.29 ± 5.25			
	2/7/2017	0.69 ± 13.9	-0.11 ± 3.54			
	3/7/2017	5.12 ± 19.1	2.37 ± 7.08			
	4/18/2017	-4.48 ± 10.5	-1.95 ± 3.70			
	3/7/2017			-474 ± 525		
	5/2/2017	-8.37 ± 12.9	-3.89 ± 4.07			
	6/12/2017	-0.25 ± 9.79	-1.42 ± 2.68	-541 ± 481		
	7/3/2017	5.24 ± 17.0	2.64 ± 4.94			
	8/1/2017	-10.4 ± 16.6	0.87 ± 4.85		**81.0** ± 70.4	
	9/5/2017	-7.68 ± 12.6	-4.41 ± 4.61	382 ± 519		
	10/3/2017	3.29 ± 15.2	0.84 ± 4.82		**142** ± 59.7	
	11/7/2017	21.4 ± 18.0 **A**	-2.19 ± 5.48		**90.4** ± 72.2	
	12/5/2017	7.08 ± 11.1	-1.13 ± 3.46	283 720		

A: < MDC

TABLE 3-10: GAMMA EMITTER CONCENTRATIONS IN SILT

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
SD	3/21/2017	94.7 ± 56.0 **A**	61.7 ± 59.5 **A**	**15400** ± 1700	**1790** ± 142	**1710** ± 207
	9/7/2017	21.2 ± 36.9	**108** ± 43.5	**16500** ± 863	**1460** ± 120	**1020** ± 111
		Ra-226	**Be-7**	**Zn-65**		
	3/21/2017	**3130** ± 1810				
	9/7/2017	**1940** ± 956	**1430** ± 456	166 ± 88.7 **B**		
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
CHIC-C	3/20/2017	105 ± 56.0 **A**	**207** ± 74.7	**16600** ± 1990	**1390** ± 142	**1430** ± 231
	9/7/2017	60.1 ± 43.9 **A**	**132** ± 55.7	**17600** ± 1320	**1480** ± 97.1	**1310** ± 159
		Ra-226				
	3/20/2017	**3280** ± 1520				
	9/7/2017	**2950** ± 1230				
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
SI						
	9/7/2017	25.0 ± 25.8	**162** ± 35.2	**16300** ± 961	**1210** ± 64.3	**1160** ± 102
		Ra-226				
	9/7/2017	**2570** ± 797				

A: < MDC

B: Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 2 sigma.

TABLE 3-11: GAMMA EMITTER CONCENTRATIONS IN SHORELINE SEDIMENT

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
HIR	2/14/2017	-6.85 ± 37.4	35.1 ± 32.4	**7330** ± 1230	33.2 ± 598	**126** ± 89.2
	8/1/2017	26.6 ± 35.3	-7.42 ± 34.3	**5050** ± 816	**1210** ± 920	**884** ± 85.7
		Th-232				
	2/14/2017	173 ± 146				
	8/1/2017	**842** ± 132				
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
CHIC-C	2/14/2017	92.3 ± 36.5	19.2 ± 31.6	**4190** ± 677	917 ± 744	**1010** ± 120
	8/1/2017	211 ± 64.2 **A**	-25.0 ± 40.7	**1100** ± 542	**6150** ± 1830	**3440** ± 142
		Th-232	Nb-95			
	2/14/2017	**861** ± 159				
	8/1/2017	**3460** ± 225	90.9 ± 47.8 **A**			

A: Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 2 sigma.

TABLE 3-12: GAMMA EMITTER CONCENTRATION IN FISH

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATION	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	4/5/2017	Catfish	**1980** ± 552	0.04 ± 27.4	-5.76 ± 26.6	10.7 ± 63.8
	4/5/2017	Game fish	**2480** ± 764	-13.4 ± 24.5	6.89 ± 30.4	19.1 ± 92.6
	10/10/2017	Catfish	**2740** ± 1160	-32.5 ± 57.6	-19.5 ± 49.7	24.0 ± 115
	10/10/2017	Game fish	**2140** ± 789	21.4 ± 41.7	5.86 ± 44.3	-34.6 ± 85.0
			Co-60	**Zn-65**	**Cs-134**	**Cs-137**
	4/5/2017	Catfish	-3.56 ± 19.0	-72.0 ± 59.1	-8.08 ± 24.5	-19.9 ± 24.2
	4/5/2017	Game fish	10.4 ± 28.0	-18.9 ± 53.2	-10.1 ± 34.9	10.3 ± 29.9
	10/10/2017	Catfish	33.1 ± 46.7	-71.5 ± 121	-12.7 ± 55.8	-16.7 ± 56.9
	10/10/2017	Game fish	16.2 ± 41.8	20.7 ± 99.1	-65.1 ± 45.6	2.93 ± 43.8

TABLE 3-13: GAMMA EMITTER CONCENTRATIONS IN OYSTERS

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
POS	3/21/2017	-28.8 ± 26.9	-22.3 ± 23.2	-17.7 ± 48.1	1.09 ± 22.3
	9/7/2017	5.57 ± 27.0	-10.2 ± 24.4	41.2 ± 58.2	-1.57 ± 26.6
		Zn-65	**Cs-134**	**Cs-137**	
	3/21/2017	-47.2 ± 61.8	6.05 ± 27.8	-25.3 ± 28.5	
	9/7/2017	6.94 ± 65.1	10.4 ± 23.0	10.4 ± 29.8	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
MP	3/21/2017	-16.1 ± 30.8	25.4 ± 35.1	-26.6 ± 71.1	10.5 ± 35.1
	9/7/2017	17.5 ± 35.8	7.71 ± 33.5	20.4 ± 65.4	-36.7 ± 37.8
		Zn-65	**Cs-134**	**Cs-137**	
	3/21/2017	-78.6 ± 81.2	3.73 ± 35.8	0.01 ± 36.7	
	9/7/2017	-59.3 ± 75.6	-7.81 ± 37.0	3.73 ± 37.4	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
LC	3/21/2017	* ±	* ±	* ±	* ±
SHI	9/7/2017	3.88 ± 35.5	23.2 ± 38.9	-27.2 ± 77.2	0.73 ± 26.5
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/21/2017	±	±	±	±
	9/7/2017	-51.2 ± 86.1	34.8 ± 45.8	-15.6 ± 42.4	619 ± 618 **A**

*: LC samples not collected on 3/21/17 due to lease conflict.
A: <MDC

TABLE 3-14: GAMMA EMITTER CONCENTRATIONS IN CLAMS

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
JI	3/20/2017	-20.5 ± 31.8	0.75 ± 29.2	6.73 ± 57.0	-17.4 ± 28.3
	9/7/2017	-2.19 ± 47.0	13.7 ± 42.0	33.9 ± 91.7	1.05 ± 32.5
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/20/2017	-12.0 ± 62.1	10.4 ± 30.6	-16.6 ± 35.3	**735** ± 509
	9/7/2017	0.75 ± 87.2	20.6 ± 42.6	-18.3 ± 47.0	**983** ± 763
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SD	3/21/2017	-6.15 ± 42.6	0.11 ± 41.7	-10.7 ± 82.8	10.4 ± 36.9
	9/7/2017	1.93 ± 30.0	-15.0 ± 27.2	29.6 ± 43.1	-3.93 ± 35.1
		Zn-65	**Cs-134**	**Cs-137**	
	3/21/2017	-0.1 ± 80.8	48.6 ± 46.9 **A**	13.1 ± 43.5	
	9/7/2017	-63.0 ± 70.9	7.44 ± 30.7	-0.40 ± 29.9	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
CHIC-C	3/20/2017	-2.93 ± 33.5	1.80 ± 41.9	20.5 ± 73.3	-59.2 ± 50.3
	9/7/2017	25.3 ± 32.3	1.74 ± 31.2	-7.78 ± 74.6	-22.1 ± 43.7
		Zn-65	**Cs-134**	**Cs-137**	
	3/20/2017	-11.4 ± 86.2	-12.2 ± 45.6	19.6 ± 48.3	
	9/7/2017	-48.1 ± 64.5	6.62 ± 32.8	-0.14 ± 29.3	

A: <MDC

TABLE 3-15: GAMMA EMITTER CONCENTRATIONS IN CRABS

Surry Power Station, Surry County, Virginia - 2017

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	6/15/2017	**1450** ± 853	5.11 ± 36.0	-0.80 ± 26.8	17.3 ± 60.3
		Co-60	**Zn-65**	**Cs-134**	**Cs-137**
		13.7 ± 41.6	-98.1 ± 74.4	-17.8 ± 39.1	-22.3 ± 38.9

4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 2017 and tabulated in Section 3, are discussed below. The procedures and specifications followed in the laboratory for these analyses are as required in the Teledyne Brown Engineering quality assurance manuals and laboratory procedures. In addition to internal quality control measures performed by the laboratories, they also participate in an Interlaboratory Comparison Program. Participation in this program ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison Program are provided in Appendix B.

The predominant radioactivity detected throughout 2017 was from external sources, such as fallout from nuclear weapons tests (cesium-137) and naturally occurring radionuclides. Naturally occurring nuclides such as beryllium-7 and potassium-40 were detected in numerous samples.

The following is a discussion and summary of the results of the environmental measurements taken during the 2017 reporting period.

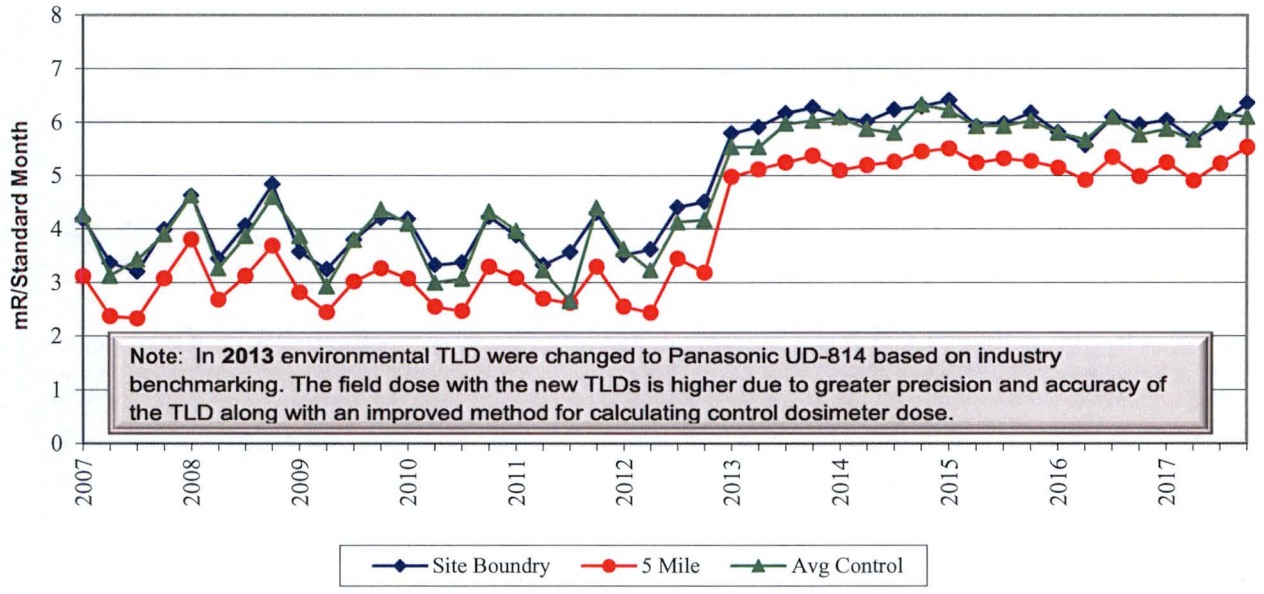
4.1 Gamma Exposure Rate

A thermoluminescent dosimeter (TLD) is an inorganic crystal used to detect ambient radiation. Three TLDs, made of CaF and LiF elements and specifically designed for environmental monitoring, are deployed at each sampling location. TLDs are placed in two concentric rings around the station. The inner ring is located in the vicinity of the site boundary, and the outer ring is located at approximately five miles from the station. TLDs are also placed in special interest areas, such as population centers and nearby residences. Additional TLDs serve as controls. Ambient radiation comes from naturally occurring radioisotopes in the air and soil, radiation from cosmic origin, fallout from nuclear weapons testing, station effluents and direct radiation from the station.

The results of the TLD analyses are presented in Table 3-2. There was no detectable external dose to members of the public from Surry Power Station in 2017. The results of the TLD analysis shown in Table 3.2 comply with Section 7 of ANSI/HPS N13.37-2014 in order to ensure accurate environmental results. The long-term integrity of each field monitoring location is accomplished by a thorough, documented evaluation of the location for changes that could impact data quality in accordance with Section 7.1 of the ANSI Standard. Since off-site processing of TLDs is used, extraneous dose received prior to and after removal from the field is quantified in compliance with Section 7.2 of the ANSI Standard. Data analysis for Table 3-2 was performed in accordance with Section 7.3 of the

ANSI Standard. This includes normalizing results to a standard 91 day quarterly monitoring period, determination of the baseline background dose for each monitoring location and determination of the smallest facility-related dose that can be detected above the baseline background.

Figure 4-1:
DIRECT RADIATION MEASUREMENT
TLD RESULTS



4.2 Airborne Gross Beta

Air is continuously sampled by passing through glass fiber particulate filters. The filters collect airborne particulate radionuclides. Once a week the samples are collected and analyzed for gross beta activity. Results of the weekly gross beta analyses are presented in Table 3-3. A review of the results from control and indicator locations continues to show no significant variation in measured activities (see Figure 4-2 and 4-3). The December 5, 2017 data point has a notable separation between the indicator and control trend data points. The subsequent data points returned to a typical variation. Data from Figures 4-2 and 4-3 indicate that any station contribution is not measurable.

Gross beta activity found during the pre-operational and early operating period of Surry Power Station was higher because of nuclear weapons testing. During that time, nearly 740 nuclear weapons were tested worldwide. In 1985 weapons testing ceased, and with the exception of the Chernobyl accident in 1986, airborne gross beta results have remained steady.

Figure 4-2:
2017 GROSS BETA IN AIR PARTICULATES

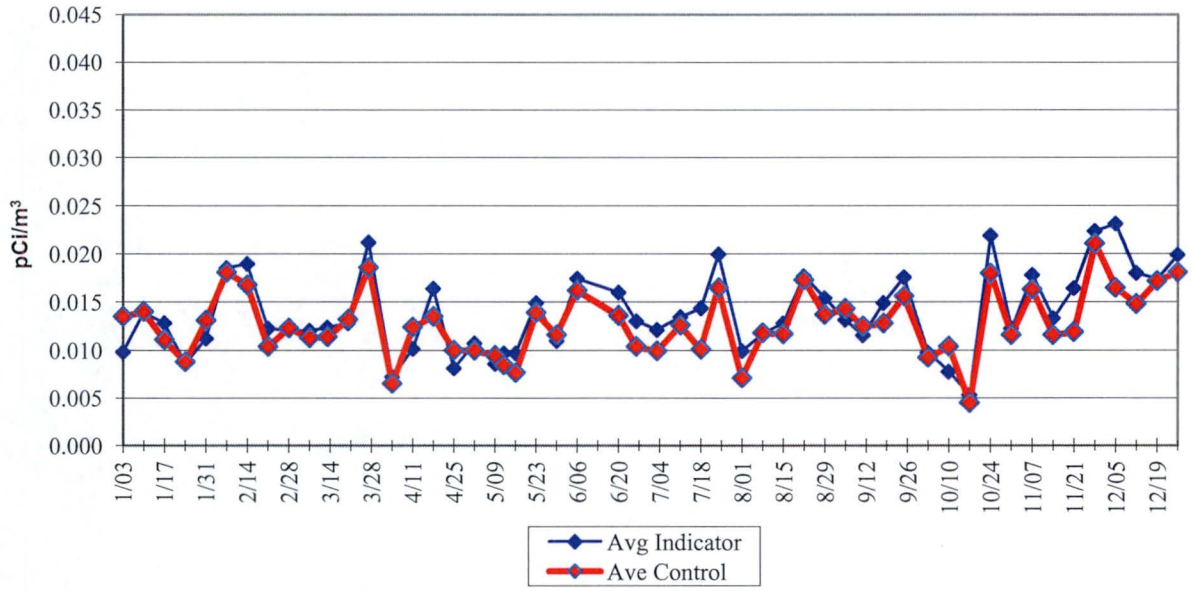
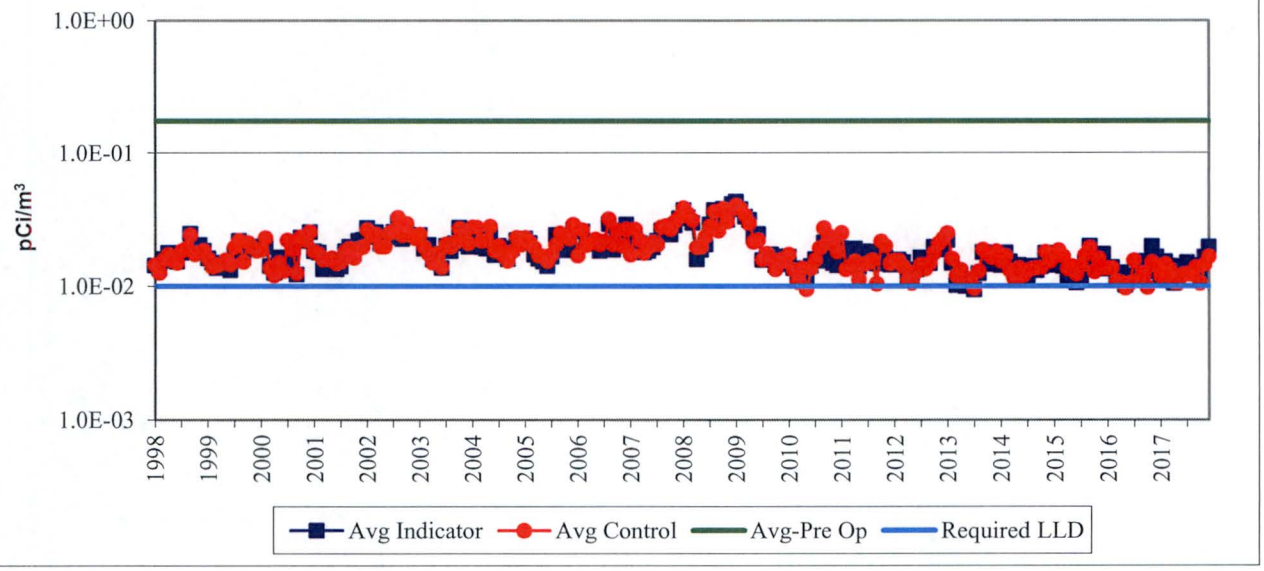


Figure 4-3:
GROSS BETA IN AIR PARTICULATES
HISTORICAL TREND



4.3 Airborne Radioiodine

Air is also continuously sampled for radioiodines by passing air through charcoal cartridges. Once a week, the charcoal cartridge samples are collected and analyzed. The results of the analyses are presented in Table 3-4. All results are below the lower limit of detection. No positive iodine-131 was detected. These results are similar to pre-operational data and the results of samples taken prior to and after the 1986 accident in the Soviet Union at Chernobyl and the Fukushima Daiichi nuclear incident in 2011.

4.4 Air Particulate Gamma

The air particulate filters from the weekly gross beta analyses are composited by location and analyzed quarterly by gamma spectroscopy. The results are listed in Table 3-5. The results indicate the presence of naturally occurring potassium-40 and beryllium-7, which are produced by cosmic processes. No man-made radionuclides were identified. These analyses confirm no effects from station effluents.

4.5 Animal Milk

Analysis of milk samples is generally the most sensitive indicator of fission product existence in the terrestrial environment. This, in combination with the fact that consumption of milk is significant, results in this pathway usually being the most critical from the plant release viewpoint. This pathway also shows measurable amounts of nuclear weapons testing fallout. Therefore, this media needs to be carefully evaluated when determining the effects from station effluents.

Results of gamma spectroscopy indicate no detectable station related radioactivity in the milk samples. The results of the analyses are presented in Table 3-6. In years past, cesium-137 had been detected sporadically. The occurrences were attributed to residual global fallout from past atmospheric weapons testing. No positive Cesium-137 activity was detected in 2017.

At the request of the Commonwealth of Virginia, a quarterly composite sample is prepared from the monthly milk samples from the Colonial Parkway collection station. The composite samples are analyzed for strontium-89 and strontium-90. No strontium-89 was detected in the four composites analyzed. Strontium-90 was detected in three of the four composite samples, with an average concentration of 1.27 pCi/L. Sr-90 is not a component of the station radiological effluents and is a product of nuclear weapons testing fallout which has been well documented.

4.6 Food Products

Three food product samples (corn, peanuts, and soybeans) were collected and analyzed by gamma spectroscopy. The results of the analyses are presented in Table 3-7. As expected, naturally occurring potassium-40 was detected in all samples. The potassium-40 concentration for 2017 indicates a slight increase when compared to the previous five year average; however, remains consistent with the 2016 concentration. No station related radioactivity was detected.

4.7 Well Water

Well water is not considered to be affected by station operations because there are no discharges made to this pathway. However, Surry Power Station monitors well water quarterly at three indicator locations and analyzes for gamma radiation and for tritium. The results of these analyses are presented in Table 3-8. With the exception of natural products, no other gamma emitters were detected. The naturally occurring radionuclides detected were potassium-40 and thorium-228. No station related radioactivity was detected. No gamma emitting isotopes were detected during the pre-operational period.

4.8 River Water

Samples of the James River water are collected monthly and the results are presented in Table 3-9. All samples are analyzed by gamma spectroscopy. The monthly samples are also composited and analyzed for tritium on a quarterly basis. Tritium was not detected and, with the exception of natural products, no other gamma emitters were detected. The naturally occurring radionuclides detected were potassium-40, and actinium-228. No station related radioactivity was detected.

4.9 Silt

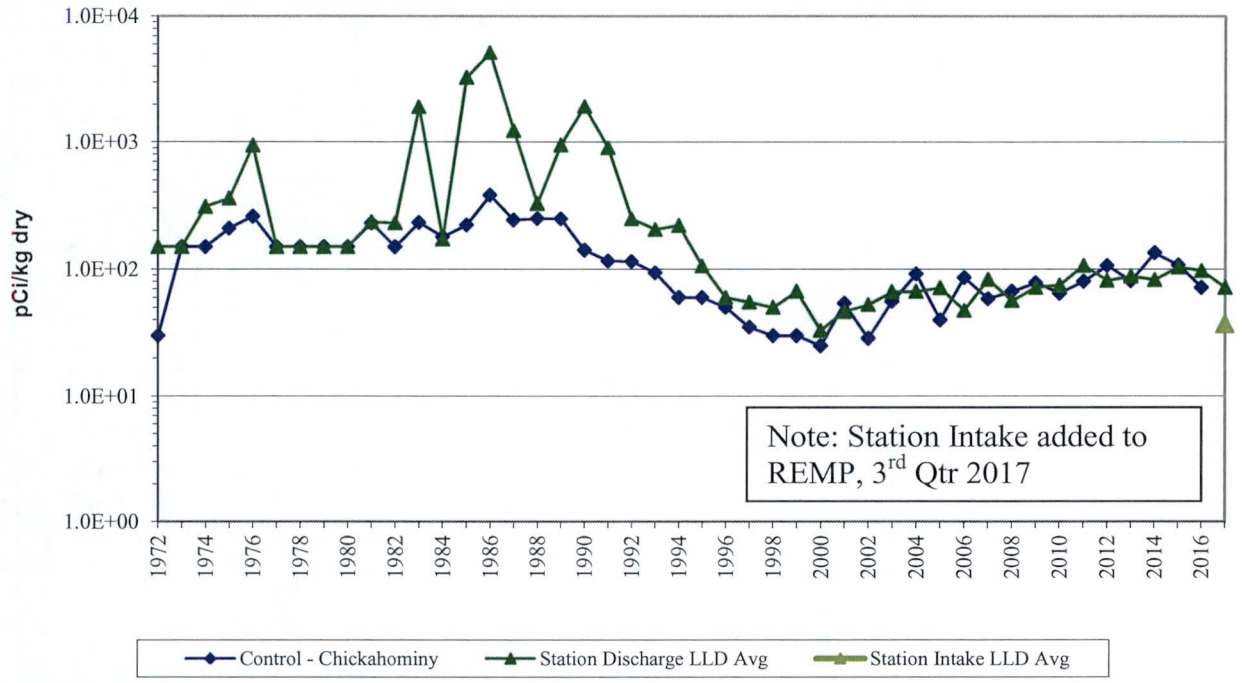
Silt is sampled to evaluate any buildup of radionuclides in the environment due to the operation of the station. Sampling of this pathway provides a good indication of the dispersion effects of effluents to the river. Buildup of radionuclides in silt could indirectly lead to increasing radioactivity levels in clams, oysters, crabs and fish.

Samples of silt are collected from three locations, one upstream, one downstream of the station and one in the dredge area of the station intake. The station intake was added in the third quarter of 2017 to provide data for future station intake dredging operations. The results of the gamma spectroscopy analyses are presented in Table 3-10. Naturally occurring beryllium-7, potassium-40, radium-226, thorium-228 and thorium-232 were detected. Historically, cobalt-60 has been detected in samples obtained from the indicator location (SD). Cobalt-60 has not been detected since 2003. Trend graphs of cobalt-60 and cesium-137 in silt appear in Figures 4-4 and 4-5.

The concentrations of cesium-137 detected indicate a continual decreasing trend as seen for over two decades. The detection of cesium-137 in both control and indicator samples and decreasing levels indicate that the presence of cesium-137 is the result of accumulation and runoff into the river of residual weapons testing fallout. Its global presence has been well documented. During the pre-operational period, cesium-137 was detected in silt samples with an average concentration as indicated in Figure 4-5.

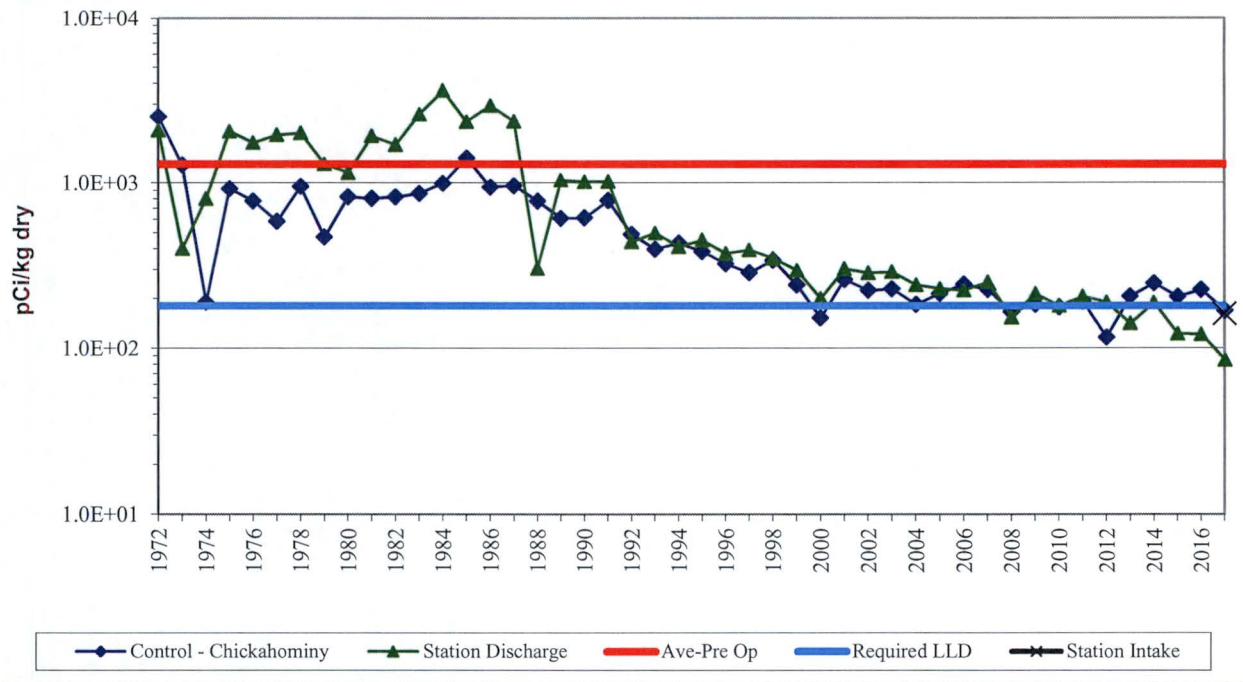
In 2017, at the control location, cesium-137 was detected with an average concentration of 170 pCi/kg. In the third quarter of 2017, an additional silt sampling location was added to the REMP. The new sample location is at the station intake in the dredge channel area. The channel is approximately 150' wide and 1750' in length. The highest indicator location is the Station Intake at 162 pCi/kg, which is equivalent to the control location average activity. This location was added to support future station intake channel dredging operations.

Figure 4-4:
COBALT-60 IN SILT



Chickahominy had detectable activity in 1982 and 1984 through 1994. Other years were <MDC, Minimum Detectable Concentration. Station Discharge was <MDC activity 1996 through 1998 and 2004 through 2017.

Figure 4-5:
CESIUM-137 IN SILT



4.10 Shoreline Sediment

Shoreline sediment, unlike river silt, may provide a direct dose to humans. Buildup of radionuclides along the shoreline may provide a source of direct exposure for those using the area for commercial and recreational uses. The results are presented in Table 3-11.

The naturally occurring radionuclides potassium-40, radium-226, thorium-228 and thorium-232 were detected at concentrations equivalent to normal background activities. The activities of these radionuclides indicate a steady trend. There were no radionuclides attributable to the operation of the station found in any shoreline sediment samples.

4.11 Fish

The radioactivity measured in fish sampled from the station discharge canal and analyzed by gamma spectroscopy is presented in Table 3-12. These results are the same as those seen over the last decade. No activity was observed in this media except for naturally occurring potassium-40.

4.12 Oysters

Oysters were collected from three different locations. The Lawne's Creek oyster sampling location was replaced with Swash Hole Island in the third quarter of 2017. The results of the oyster analyses are presented in Table 3-13.

There were no gamma emitting radionuclides detected in oysters sampled. No station related radioactivity has been detected in this media since 1991. The absence of station related radionuclides is attributable to the replacement of steam generators in 1982 and past improvements made to liquid effluent treatment systems.

4.13 Clams

Clams are analyzed from three different locations. The results of the gamma spectroscopy analyses are presented in Table 3-14. Other than naturally occurring potassium-40, no station related radioactivity was detected.

4.14 Crabs

An annual crab sample was collected from the station discharge canal and analyzed by gamma spectroscopy. The results of the analysis are presented in Table 3-15. Other than naturally occurring potassium-40, no other gamma emitting radionuclides related to station effluents were detected in the sample. This is consistent with pre-operational data and data collected over the past decade.

5. PROGRAM EXCEPTIONS

There were four exceptions from the REMP sampling schedule in 2017. The four exceptions are detailed below:

1. Oyster samples were not collected from the Lawne's Creek location during the first half of 2017 due to the area being under a private lease for shellfish harvesting. Dominion Energy Environmental Biology located a replacement location that is monitored and stocked by the Virginia Oyster Stock Assessment and Replenishment Archive (VOSARA). The replacement location name is Swash Hole Island. Oyster samples were collected from this location during the third quarter of 2017.

2. All three environmental TLDs were missing from location #31 (Kingsmill North) during collection of the third quarter TLDs.

3. All three TLDs from site boundary location #02 (WNW) were collected, packaged and shipped, but not received by the vendor lab. This omission was noted during review of the third quarter vendor supplied TLD results.

4. It was noted during the October 10, 2017 collection of environmental air samples, that the Hog Island Reserve (HIR) air sample had very little discoloration on the patch. This information was forwarded to the vendor and analyzed. Results from the vendor lab indicate the gross beta activity < MDC, when positive results are typically recorded. The vendor lab was subsequently contacted and the patch was removed from the quarterly composite group.

6. CONCLUSIONS

The results of the 2017 Radiological Environmental Monitoring Program for Surry Power Station have been presented in previous sections. This section presents conclusions for each pathway.

- **Direct Radiation Exposure Pathway** - There was no detectable external dose to members of the public from Surry Power Station in 2017.

- **Airborne Exposure Pathway** – Radioiodine analysis of charcoal cartridge samples indicated that no positive activity was detected. Quarterly gamma isotopic analyses of the composite particulate samples identified only naturally occurring beryllium-7 and potassium-40. Air particulate gross beta concentrations at all of the indicator locations for 2017 trend well with the control location. The December 5, 2017 data point indicates a separation between the indicator and control trend data points. The subsequent data points returned to a typical variation. The effluent data was reviewed for the period of interest and concluded the station contribution is not measurable.

- **Milk** - Milk samples are an important indicator measuring the effect of radioactive iodine and radionuclides in airborne releases. Cesium-137 and iodine-131 were not detected in any of the thirty-six samples. Naturally occurring potassium-40 was detected at a similar level when compared to the averages of the previous years.

  Strontium-90 was detected in three samples at an average concentration of 1.27 pCi/L. Strontium-90 is not a component of station effluents, but rather, a product of nuclear weapons testing fallout.

- **Food Products** - As expected, naturally occurring potassium-40 was detected in all three food product samples. In the past, cesium-137 had occasionally been detected in these samples and is attributable to global fallout from past nuclear weapons testing. In the 2017 food product analyses, no positive Cesium-137 activity was detected.

- **Well Water** - Well water sample analyses indicated there was no radioactivity attributable to the operation of the station. This trend is consistent throughout the monitoring period.

- **River Water** - River water samples were analyzed for gamma emitting radionuclides and tritium. The only gamma emitting radionuclide detected was naturally occurring potassium-40. No positive Tritium activity was detected.

- **Silt** – In 2017, at the control location, cesium-137 was detected with an average concentration of 170 pCi/kg. In the third quarter of 2017, an additional silt sampling location was added to the REMP. The new sample location is at the station intake in the dredge channel area. The channel is approximately 150' wide and 1750' in length. The highest indicator location is the Station Intake at 162 pCi/kg, which is equivalent to the control location average activity. This location was added to support future station intake channel dredging operations. The presence of cesium-137 is attributable to residual weapons testing fallout and its presence has been well documented. Cobalt-60 has not been detected since 2003.

- **Shoreline Sediment** - Naturally occurring radionuclides were detected at concentrations equivalent to normal background activities. There were no radionuclides attributable to the operation of Surry Power Station identified in any sample.

Aquatic Biota

- **Fish** - As expected, naturally occurring potassium-40 was detected. There were no other positive gamma emitting radionuclides detected in any of the fish samples.

- **Oysters and Clams** – Other than naturally occurring potassium-40, there were no other positive gamma emitting radionuclides detected in any of the oyster or clam samples.

- **Crabs** – Naturally occurring potassium-40 was detected. No other positive gamma emitting radionuclides were detected.

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6. Virginia Electric and Power Company, Surry Power Station Technical Specifications, Units 1 and 2.

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9. NCRP Report No. 160, "Ionizing Radiation Exposure of the Population of the United States," March 2009.

10. Position paper on "Implementation of ANSI/HPS N13.37-2014 Environmental Dosimetry Criteria at Surry Power Station", November 2016 by John M. Sukosky, CHP.

APPENDICES

APPENDIX A: LAND USE CENSUS

Year 2017

*LAND USE CENSUS**

Surry Power Station, Surry County, Virginia

January 1 to December 31, 2017 Page 1 of 1

Sector	Direction	Nearest Resident	Nearest Garden**	Nearest Cow	Nearest Goat
A	N	4.1 @ 10°	(a)	(a)	(a)
B	NNE	1.9 @ 32°	(a)	(a)	(a)
C	NE	4.7 @ 35°	(a)	(a)	(a)
D	ENE	(a)	(a)	(a)	(a)
E	E	(a)	(a)	(a)	(a)
F	ESE	(a)	(a)	(a)	(a)
G	SE	2.8 @ 142°	(a)	(a)	(a)
H	SSE	2.7 @ 158°	2.7 @ 158°	(a)	(a)
J	S	1.7 @ 181°	2.0 @ 183°	(a)	(a)
K	SSW	1.9 @ 192°	1.9 @ 192°	4.8 @ 200°	(a)
L	SW	2.3 @ 221°	4.7 @ 228°	(a)	(a)
M	WSW	0.4 @ 244°	3.6 @ 245°	(a)	(a)
N	W	3.1 @ 260°	3.4 @ 260°	(a)	(a)
P	WNW	4.9 @ 283°	(a)	(a)	(a)
Q	NW	4.6 @ 321°	(a)	(a)	(a)
R	NNW	3.8 @ 338°	4.4 @ 334°	3.7 @ 336°	(a)

* *Locations are listed by miles and degrees heading relative to true north from center of Unit #1 Containment.*

** *Area greater than 50 m^2 and contains broadleaf vegetation.*

(a) None

APPENDIX B: SUMMARY OF INTERLABORATORY COMPARISONS

Year 2017

INTRODUCTION

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

B. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (PT) program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
- Not Acceptable (flag = "N") – bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

The results are then reported to the provider for evaluation. The suite of QA/QC samples is designed to provide sample media and radionuclide combinations that are offered by the providers and included in the REMP and typically includes:

- milk for gamma nuclides and low-level iodine-131 analyses,
- milk for Sr-89 and Sr-90 analyses,
- water for gamma nuclides, low-level iodine-131, and gross beta analyses,
- water for tritium, Sr-89, and Sr-90 analyses,
- cartridge for I-131 analyses,
- air filter for gamma nuclide, gross beta, and Sr-90 analyses.

RESULTS

For the TBE laboratory, 168 out of 173 analyses performed met the specified acceptance criteria. Five analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program. TBE provided the following narrative.

1. ERA April 2017: Two nuclides in water were evaluated as Not Acceptable. (NCR 17-09)

    a. The Zn-65 result of 39.3 pCi/L, exceeded the lower acceptance limit of 47.2. The known value was unusually low for this study. The sample was run in duplicate on two different detectors. The results of each were 39.3 ± 18.2 pCi/L (46% error and lower efficiency) and 59.3 ± 8.23 pCi/L (13.9% error and higher efficiency). The result from the 2nd detector would have been well within the acceptable range (47.2 – 65.9) and 110.2% of the known value of 53.8 pCi/L.

    b. The Sr-89 result of 40.7 pCi/L exceeded the lower acceptance limit of 53.8. All associated QC and recoveries were reviewed and no apparent cause could be determined for the failure. The prior three cross-check results were from 99 – 115% of the known values and the one that followed this sample (November, 2017) was 114% of the known value.

2. DOE MAPEP August 2017: The air particulate U-238 result of 0.115 ± 0.025 Bq/sample was higher than the known value of 0.087 ± 0.002 with a ratio of 1.32, therefore the upper ratio of 1.30 (acceptable with warning) was exceeded. TBE's result with error easily overlaps with the acceptable range. MAPEP does not evaluate results with any associated error. Also, the spike level for this sample was very low (2.35 pCi) compared to TBE's normal LCS of 6 pCi. TBE considers this result as passing. (NCR 17-15)

3. Analytics September 2017: The soil Cr-51 result was evaluated as Not Acceptable (Ratio of TBE to known result at 0.65). The reported value was 0.230 ± 0.144 pCi/g and the known value was 0.355 ± 0.00592 pCi/g. The sample was counted overnight for 14 hours; however the Cr-51 was spiked at a very low level and had a counting error of 65%. Cr-51 has a 27-day half-life, making low-level quantification even more difficult. The error does not appear to have been taken into consideration for this result. If it had been evaluated with the error, the highest result would have been 105% of the reference value, which is acceptable. Also, the known value is significantly lower than TBE's typical MDC for this nuclide in a soil matrix and would typically not be reported to clients (unless specified). The results of all of the previous cross-checks have been in the acceptable (80 – 120%) range. TBE will evaluate further upon completion of the next ICP sample. (NCR 17-16)

4. ERA November 2017: The water Sr-90 sample was evaluated as Not Acceptable. TBE's result of 27.1 pCi/L exceeded the lower acceptance range (30.8 – 48.0 pCi/L). After reviewing the associated QC data for this sample, it was determined that although the spike recovery for Sr-90 was within our laboratory guidelines (70% -130%), both the spike result and our ERA result were biased low. The original cross-check sample was completely consumed and we were unable to reanalyze before submitting the result. We (TBE) have modified our preparation process to avoid this situation for future cross-check samples. We (TBE) also have enhanced LIMS programming to force a LCSD when a workgroup includes cross-check samples (as opposed to running a DUP). (NCR 17-19)

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2017	E11811	Milk	Sr-89	pCi/L	87	97.7	0.89	A
			Sr-90	pCi/L	12.4	16.2	0.77	W
	E11812	Milk	Ce-141	pCi/L	135	145	0.93	A
			Co-58	pCi/L	153	150	1.02	A
			Co-60	pCi/L	182	183	1.00	A
			Cr-51	pCi/L	258	290	0.89	A
			Cs-134	pCi/L	104	120	0.87	A
			Cs-137	pCi/L	142	140	1.02	A
			Fe-59	pCi/L	135	129	1.05	A
			I-131	pCi/L	92.6	97.9	0.95	A
			Mn-54	pCi/L	173	164	1.05	A
			Zn-65	pCi/L	208	199	1.04	A
	E11813	Charcoal	I-131	pCi	92	93.9	0.98	A
	E11814	AP	Ce-141	pCi	99.9	101	0.99	A
			Co-58	pCi	95.4	104	0.92	A
			Co-60	pCi	140	127	1.10	A
			Cr-51	pCi	211	201	1.05	A
			Cs-134	pCi	82.1	83.2	0.99	A
			Cs-137	pCi	92.8	97.0	0.96	A
			Fe-59	pCi	107	89.3	1.20	A
			Mn-54	pCi	106	114	0.93	A
			Zn-65	pCi	137	138	0.99	A
	E11816	Soil	Ce-141	pCi/g	0.258	0.250	1.03	A
			Co-58	pCi/g	0.241	0.258	0.93	A
			Co-60	pCi/g	0.312	0.315	0.99	A
			Cr-51	pCi/g	0.439	0.500	0.88	A
			Cs-134	pCi/g	0.176	0.207	0.85	A
			Cs-137	pCi/g	0.304	0.317	0.96	A
			Fe-59	pCi/g	0.210	0.222	0.95	A
			Mn-54	pCi/g	0.292	0.283	1.03	A
			Zn-65	pCi/g	0.353	0.344	1.03	A
	E11815	Water	Fe-55	pCi/L	1600	1890	0.85	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Analytics Environmental Radioactivity Cross Check Program

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Ratio of TBE to Analytics Result	Evaluation [(b)]
June 2017	E11844	Milk	Sr-89	pCi/L	81.3	92.6	0.88	A
			Sr-90	pCi/L	12.1	13.5	0.90	A
	E11846	Milk	Ce-141	pCi/L	142	151	0.94	A
			Co-58	pCi/L	147	155	0.95	A
			Co-60	pCi/L	185	191	0.97	A
			Cr-51	pCi/L	321	315	1.02	A
			Cs-134	pCi/L	168	188	0.89	A
			Cs-137	pCi/L	148	150	0.99	A
			Fe-59	pCi/L	116	115	1.01	A
			I-131	pCi/L	102	93.6	1.09	A
			Mn-54	pCi/L	168	172	0.98	A
			Zn-65	pCi/L	195	204	0.96	A
	E11847	Charcoal	I-131	pCi	87.9	84.8	1.04	A
	E11845	AP	Sr-89	pCi	70.8	79.1	0.90	A
			Sr-90	pCi	9.10	11.5	0.79	W
	E11848	AP	Ce-141	pCi	112	116	0.96	A
			Co-58	pCi	119	119	1.00	A
			Co-60	pCi	171	146	1.17	A
			Cr-51	pCi	270	241	1.12	A
			Cs-134	pCi	152	144	1.05	A
			Cs-137	pCi	114	115	0.99	A
			Fe-59	pCi	94.1	88.3	1.07	A
			Mn-54	pCi	139	132	1.06	A
			Zn-65	pCi	141	156	0.90	A
	E11849	Water	Fe-55	pCi/L	1840	1890	0.97	A
July 2017	E11901	AP	GR-A	pCi	50.1	44.2	1.13	A
			GR-B	pCi	218	233	0.93	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
September 2017	E11914	Milk	Sr-89	pCi/L	84.3	82.7	1.02	A
			Sr-90	pCi/L	12.6	12.1	1.04	A
	E11915	Milk	Ce-141	pCi/L	93.9	87.0	1.08	A
			Co-58	pCi/L	115	117	0.98	A
			Co-60	pCi/L	265	262	1.01	A
			Cr-51	pCi/L	273	217	1.26	W
			Cs-134	pCi/L	186	201	0.93	A
			Cs-137	pCi/L	175	172	1.02	A
			Fe-59	pCi/L	137	125	1.09	A
			I-131	pCi/L	78.0	71.0	1.10	A
			Mn-54	pCi/L	128	123	1.04	A
			Zn-65	pCi/L	206	184	1.12	A
	E11916	Charcoal	I-131	pCi	71.9	64.4	1.12	A
	E11917	AP	Ce-141	pCi	80.1	86.3	0.93	A
			Co-58	pCi	110	116	0.95	A
			Co-60	pCi	277	260	1.07	A
			Cr-51	pCi	275	215	1.28	W
			Cs-134	pCi	192	199	0.96	A
			Cs-137	pCi	165	170	0.97	A
			Fe-59	pCi	122	124	0.98	A
			Mn-54	pCi	120	122	0.99	A
			Zn-65	pCi	175	183	0.96	A
	E11918	Water	Fe-55	pCi/L	1630	1630	1.00	A
	E11919	Soil	Ce-141	pCi/g	0.136	0.142	0.96	A
			Co-58	pCi/g	0.179	0.191	0.94	A
			Co-60	pCi/g	0.405	0.429	0.94	A
			Cr-51	pCi/g	0.230	0.355	0.65	N [1]
			Cs-134	pCi/g	0.272	0.328	0.83	A
			Cs-137	pCi/g	0.336	0.356	0.94	A
			Fe-59	pCi/g	0.210	0.205	1.02	A
			Mn-54	pCi/g	0.210	0.201	1.05	A
			Zn-65	pCi/g	0.301	0.301	1.00	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) See NCR 17-16

Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Ratio of TBE to Analytics Result	Evaluation [(b)]
December 2017	E12054	Milk	Sr-89	pCi/L	92.1	92.3	1.00	A
			Sr-90	pCi/L	18.3	16.9	1.09	A
	E12055	Milk	Ce-141	pCi/L	97.8	98.3	0.99	A
			Co-58	pCi/L	92.3	89.9	1.03	A
			Co-60	pCi/L	176	173	1.02	A
			Cr-51	pCi/L	226	242	0.93	A
			Cs-134	pCi/L	118	125	0.95	A
			Cs-137	pCi/L	148	141	1.05	A
			Fe-59	pCi/L	123	113	1.08	A
			I-131	pCi/L	66.0	57.8	1.14	A
			Mn-54	pCi/L	173	161	1.08	A
			Zn-65	pCi/L	233	211	1.10	A
	E12056	Charcoal	I-131	pCi	48.1	47.5	1.01	A
	E12057A	AP	Ce-141	pCi	108	111	0.97	A
			Co-58	pCi	89.5	102	0.88	A
			Co-60	pCi	223	196	1.14	A
			Cr-51	pCi	311	274	1.13	A
			Cs-134	pCi	141	142	1.00	A
			Cs-137	pCi	162	160	1.01	A
			Fe-59	pCi	121	129	0.94	A
			Mn-54	pCi	177	182	0.97	A
			Zn-65	pCi	203	239	0.85	A
	E12058	Water	Fe-55	pCi/L	1970	1740	1.13	A
	E12059	AP	Sr-89	pCi	71.2	87.4	0.81	A
			Sr-90	pCi	12.9	16.0	0.81	A

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services
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Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2017	17-MaS36	Soil	Ni-63	Bq/kg	-5.512		*(1)*	A
			Sr-90	Bq/kg	571	624	437 - 811	A
	17-MaW36	Water	Am-241	Bq/L	0.693	0.846	0.592 - 1.100	A
			Ni-63	Bq/L	13.4	12.2	8.5 - 15.9	A
			Pu-238	Bq/L	0.7217	0.703	0.492 - 0.914	A
			Pu-239/240	Bq/L	0.9277	0.934	0.654 - 1.214	A
	17-RdF36	AP	U-234/233	Bq/sample	0.0911	0.104	0.073 - 0.135	A
			U-238	Bq/sample	0.0967	0.107	0.075 - 0.139	A
	17-RdV36	Vegetation	Cs-134	Bq/sample	6.44	6.95	4.87 - 9.04	A
			Cs-137	Bq/sample	4.61	4.60	3.22 - 5.98	A
			Co-57	Bq/sample	-0.0229		*(1)*	A
			Co-60	Bq/sample	8.52	8.75	6.13 - 11.38	A
			Mn-54	Bq/sample	3.30	3.28	2.30 - 4.26	A
			Sr-90	Bq/sample	1.30	1.75	1.23 - 2.28	W
			Zn-65	Bq/sample	5.45	5.39	3.77 - 7.01	A
August 2017	17-MaS37	Soil	Ni-63	Bq/kg	1130	1220	854 - 1586	A
			Sr-90	Bq/kg	296	289	202 - 376	A
	17-MaW37	Water	Am-241	Bq/L	0.838	0.892	0.624 - 1.160	A
			Ni-63	Bq/L	-0.096		*(1)*	A
			Pu-238	Bq/L	0.572	0.603	0.422 - 0.784	A
			Pu-239/240	Bq/L	0.863	0.781	0.547 - 1.015	A
	17-RdF37	AP	U-234/233	Bq/sample	0.103	0.084	0.059 - 0.109	W
			U-238	Bq/sample	0.115	0.087	0.061 - 0.113	N [2]
	17-RdV37	Vegetation	Cs-134	Bq/sample	2.34	2.32	1.62 - 3.02	A
			Cs-137	Bq/sample	0.05		*(1)*	A
			Co-57	Bq/sample	3.32	2.8	2.0 - 3.6	A
			Co-60	Bq/sample	2.09	2.07	1.45 - 2.69	A
			Mn-54	Bq/sample	2.90	2.62	1.83 - 3.41	A
			Sr-90	Bq/sample	1.17	1.23	0.86 - 1.60	A
			Zn-65	Bq/sample	6.07	5.37	3.76 - 6.98	A

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) DOE/MAPEP evaluation:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

(1) False positive test

(2) See NCR 17-15

ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identrification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2017	MRAD-26	AP	GR-A	pCi/sample	76.3	85.5	28.6 - 133	A
April 2017	RAD-109	Water	Ba-133	pCi/L	49.2	49.7	40.8 - 55.1	A
			Cs-134	pCi/L	83.2	90.1	74.0 - 99.1	A
			Cs-137	pCi/L	202	206	185 - 228	A
			Co-60	pCi/L	51.2	54.7	49.2 - 62.7	A
			Zn-65	pCi/L	39.3	53.8	47.2 - 65.9	N [1]
			GR-A	pCi/L	53.6	75.0	39.5 - 92.3	A
			GR-B	pCi/L	42.7	38.5	25.5 - 46.0	A
			U-Nat	pCi/L	50.1	55.6	45.2 - 61.7	A
			H-3	pCi/L	7080	6850	5920 - 7540	A
			Sr-89	pCi/L	40.7	66.2	53.8 - 74.3	N [1]
			Sr-90	pCi/L	26.9	26.7	19.3 - 31.1	A
			I-131	pCi/L	26.7	29.9	24.9 - 34.9	A
September 2017	MRAD-27	AP	GR-A	pCi/sample	40.9	50.1	16.8 - 77.8	A
		AP	GR-B	pCi/sample	58.0	61.8	39.1 - 90.1	A
October 2017	RAD-111	Water	Ba-133	pCi/L	71.3	73.7	61.7 - 81.1	A
			Cs-134	pCi/L	43.0	53.0	42.8 - 58.3	A
			Cs-137	pCi/L	48.2	52.9	47.6 - 61.1	A
			Co-60	pCi/L	69.0	69.5	62.6 - 78.9	A
			Zn-65	pCi/L	335	348	313 - 406	A
			GR-A	pCi/L	32.5	35.6	18.3 - 45.8	A
			GR-B	pCi/L	24.3	25.6	16.0 - 33.6	A
			U-Nat	pCi/L	36.6	37.0	30.0 - 40.9	A
			H-3	pCi/L	6270	6250	5390 - 6880	A
			I-131	pCi/L	26.4	24.2	20.1 - 28.7	A
November 2017	111317O	Water	Sr-89	pCi/L	57.1	50.0	39.4 - 57.5	A
			Sr-90	pCi/L	27.1	41.8	30.8 - 48.0	N [2]

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

(1) See NCR 17-09
(2) See NCR 17-19