VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261
30 April, 2024

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Serial No.	24-165
S&L/SCN	R0
Docket Nos.	50-280
	50-281
	72-2
	72-55
License Nos.	DPR-32
	DPR-37
	SNM-2501

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
2023 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Surry Units 1 and 2 Technical Specification 6.6.B.2 requires the submittal of an Annual Radiological Environmental Operating Report (AREOR) for Surry Power Station. Surry Independent Spent Fuel Storage Installation (ISFSI) Technical Specification Appendix C, Item 1.3.1 requires that the Surry ISFSI be included in the environmental monitoring for Surry Power Station. Accordingly, enclosed is the Surry Power Station AREOR for the period of January 1, 2023 through December 31, 2023, which includes environmental monitoring for the Surry ISFSI and both units.

If you have any further questions, please contact William Terry at 757-365-2010.

Sincerely,

Cathy Grady
Director Safety & Licensing
Surry Power Station

Attachment

Commitments made in this letter: None

Serial No. 24-165
Docket Nos.: 50-280
50-281
72-2
72-55

cc: U. S. Nuclear Regulatory Commission Region II
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Serial No. 24-165
Docket Nos.: 50-280
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ATTACHMENT 1

2023 Annual Radiological Environmental Operating Report

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

2023 Annual Radiological Environmental Operating Report

Surry Power Station

Dominion Energy®

Dominion Energy

Surry Power Station

Radiological Environmental Monitoring Program

January 1, 2023 to December 31, 2023

Annual Radiological Environmental Operating Report

Surry Power Station

January 1, 2023 to December 31, 2023

Prepared by: _____

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PREFACE

This report is submitted as required by Technical Specification 6.6.B.2, Annual Radiological Environment 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 Surry Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels from January 1 through December 31, 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. Several 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.

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 airborne results were comparable to previous years. No station related radioactivity was detected atural radioactivity levels are consistent with historical values. Aquaticexposure 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, actinium-228, 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 and silt pathways. Naturally occurring beryllium-7, potassium-40, radium-226, actinium-228, thorium-228, and thorium-232 were detected at average environmental levels. Shoreline sediment, which may provide a direct exposure pathway, contained no station related radionuclides. Naturally occurring potassium-40, 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 milk samples. Iodine-131 has not been detected in milk prior to or since the 1986 Chernobyl accident. Strontium-90 was detected in milk samples and remains comparable to historical levels. Strontium-90 is attributable to atmospheric nuclear weapons testing. No other man-made radionuclides were detected in milk samples. Only naturally occurring potassium-40 was detected in the milk pathway. No man-made radionuclides were detected in food product samples. Only naturally occurring potassium-40 was detected.Environmental radiation dose is measured in the direct exposure pathway using TLDs. The TLD results are reported in accordance with ANSI/HPS N13.37-2014 methodology. Historically, these results have remained relatively constant. No annual facility dose is attributable to station operations.

During, and 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 was 0.093 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 demonstrate the adequacy of radioactive effluent controls at Surry Power Station.

2. PROGRAM DESCRIPTION

2.1 Introduction

This report documents the Surry Power Station perational 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 was 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 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 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 sampling program for Surry Power Station. All samples listed in Table 2-1 are taken at indicator locations except those labeled "control location." 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, except for TLDs, are shipped to Teledyne Brown Engineering, located in Knoxville, TN, for analysis. The TLDs are shipped to Mirion Technologies, located in Oak Ridge, TN, for processing.

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

Table 2-1
SURRY -
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 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 miles
	Route 633	(21)	4.9	SW	227°	Quarterly	Apx. 5 miles
	Alliance	(22)	5.1	WSW	247°	Quarterly	Apx. 5 miles
	Surry	(23)	7.7	WSW	256°	Quarterly	Population Center
	Route 636 and 637	(24)	4.0	W	270°	Quarterly	Apx. 5 miles
	Scotland Wharf	(25)	5.0	WNW	284°	Quarterly	Apx. 5 miles
	Jamestown	(26)	6.3	NW	308°	Quarterly	Apx. 5 miles
	Colonial Parkway	(27)	3.8	NNW	333°	Quarterly	Apx. 5 miles
	Route 617 and 618	(28)	4.9	NNW	340°	Quarterly	Apx. 5 miles
	Kingsmill	(29)	4.6	N	2°	Quarterly	Apx. 5 miles
	Williamsburg	(30)	7.8	N	0°	Quarterly	Population Center
	Kingsmill North	(31)	5.5	NNE	12°	Quarterly	Apx. 5 miles
	Budweiser	(32)	5.8	NNE	27°	Quarterly	Population Center
	Water Plant	(33)	5.0	NE	46°	Quarterly	Apx. 5 miles

Table 2-1
SURRY -
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 miles
	Lee Hall	(35)	7.1	ENE	75°	Quarterly	Population Center
	Goose Island	(36)	5.1	E	90°	Quarterly	Apx. 5 miles
	Fort Eustis	(37)	4.9	ESE	104°	Quarterly	Apx. 5 miles
	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 miles
	Route 628	(43)	5.1	S	177°	Quarterly	Apx. 5 miles
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)	0.5	NW	315°	Semi-Annually	
	Surry Station Intake	(SI)	1.8	ESE	112°	Semi-Annually	

Table 2-1
SURRY -
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	
	Beachy Farm	(BF)	12.0	SW	220°	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	128°	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 (Corn, Peanuts, Soybeans)	Brock's Farm	(BROCK)	3.8	S	183°	Annually	
	Slade's Farm	(SLADE)	3.2	S	179°	Annually	

Table 2-2
SURRY -
SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Thermoluminescent Dosimetry (TLD)	Quarterly	Gamma Dose	6	mR/Std. Quarter
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 -
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	Sr-89	NA	pCi/L
	Composite of CP monthly sample	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 -

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.

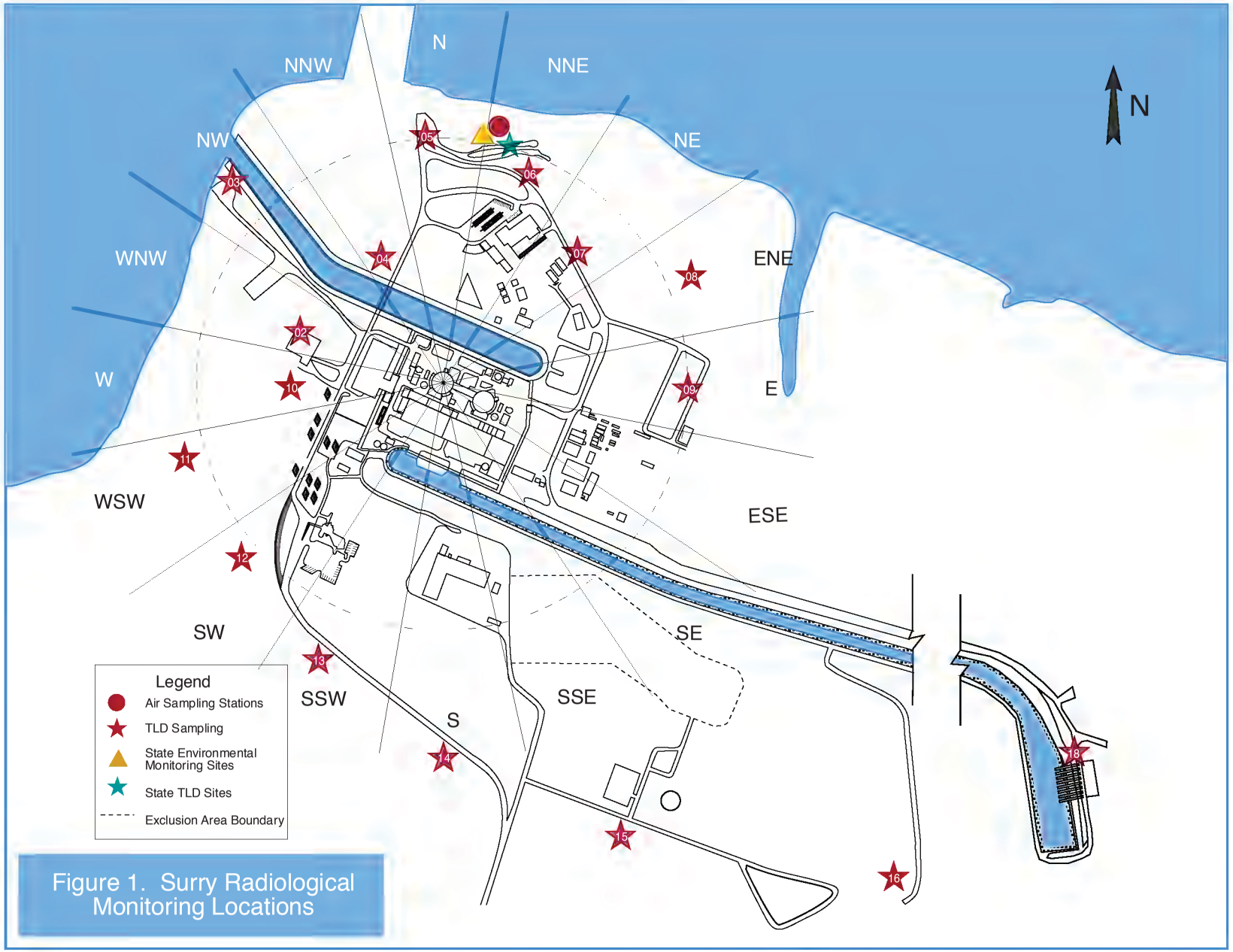

Figure 1. Surry Radiological Monitoring Locations

Graphics No. SV645F

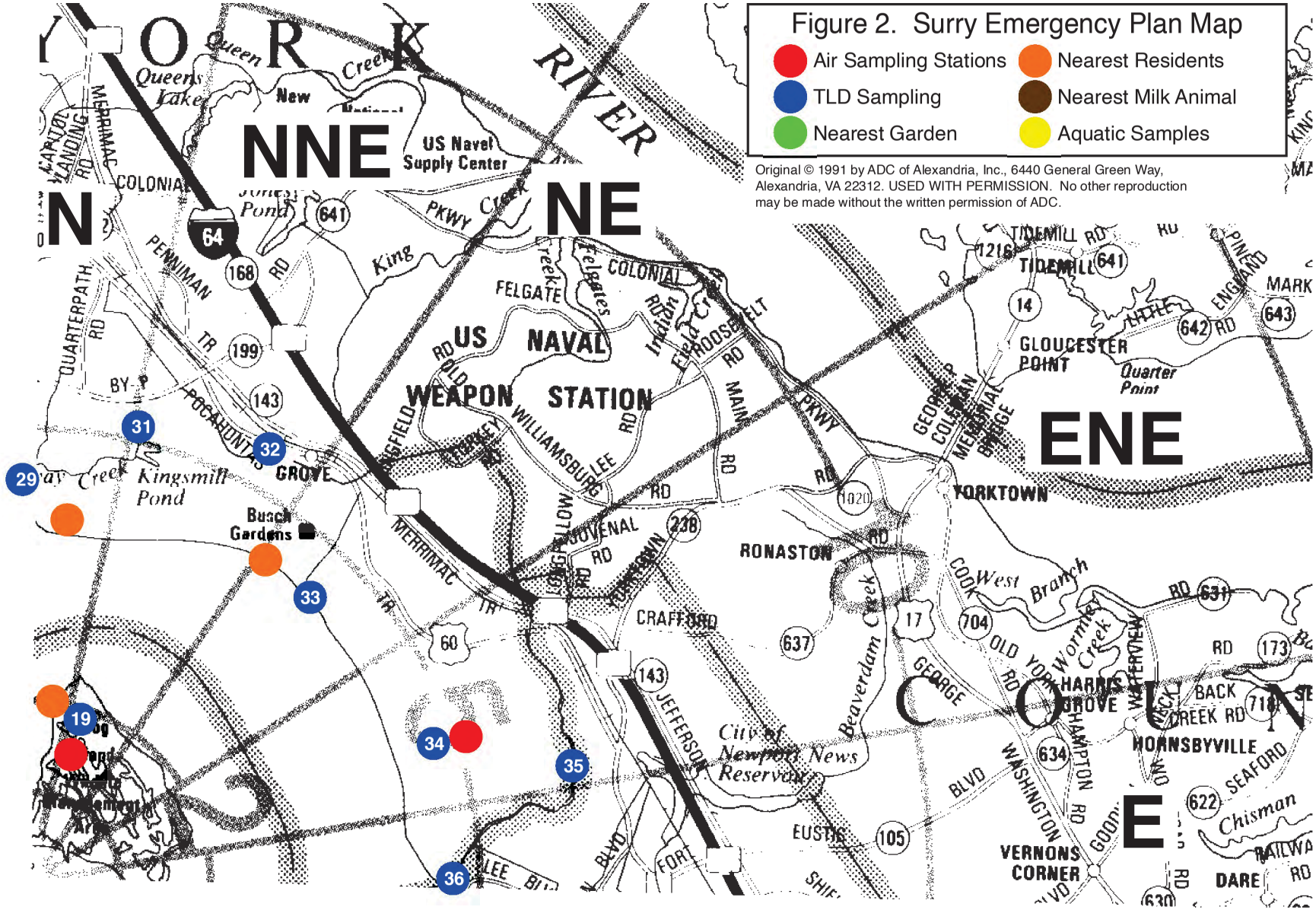
Figure 2. Surry Emergency Plan Map
Air Sampling Stations
Nearest Residents
TLD Sampling
Nearest Milk Animal
Nearest Garden
Aquatic Samples
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NE
ENE
E
US Naval Supply Center
US NAVAL WEAPON STATION
GLOUCESTER POINT
YORKTOWN
RONASTON
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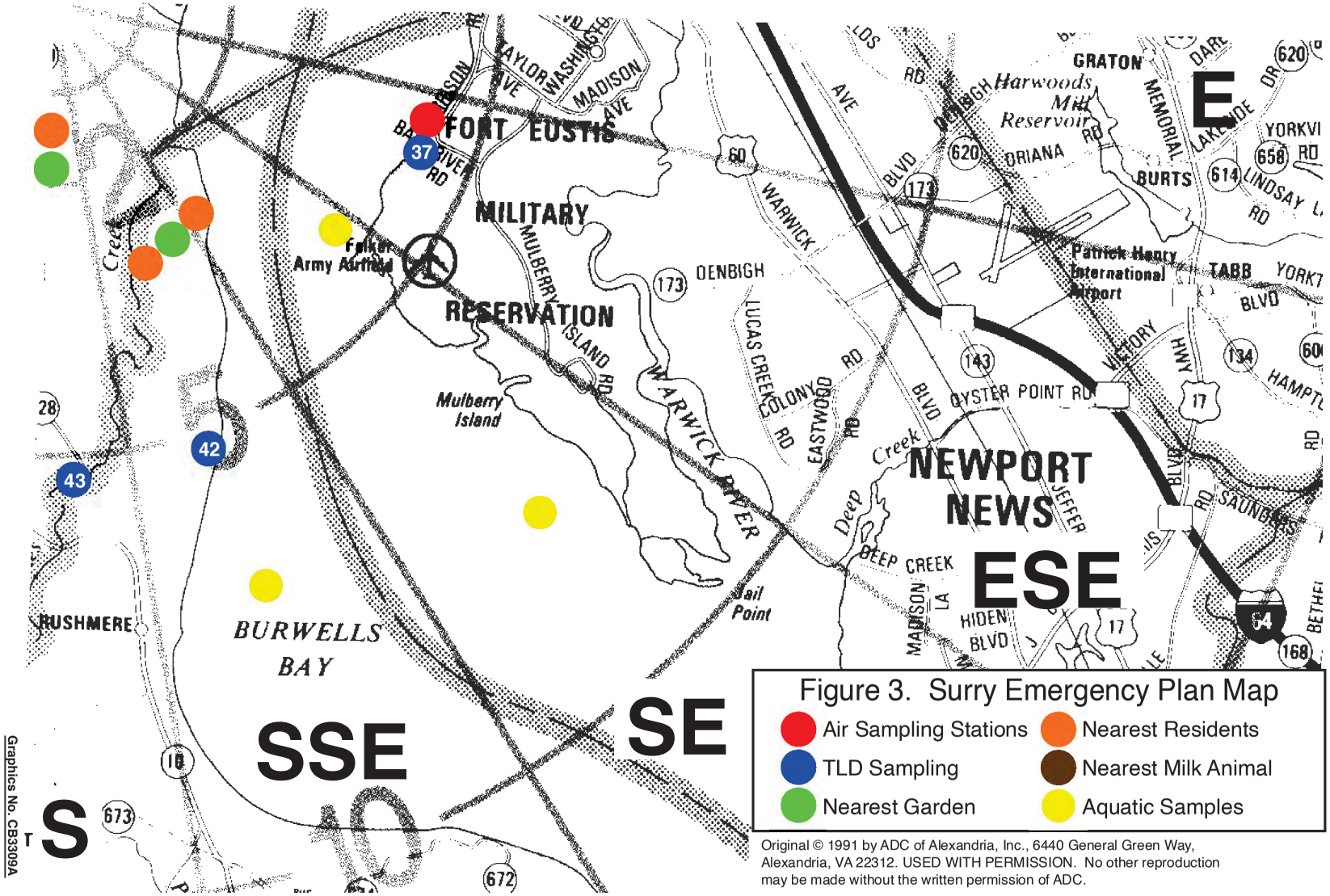
HORNSBYVILLE
VERNONS CORNER
City of Newport News Reservation
Queens Lake
Kingsmill Pond
Busch Gardens
Graphics No. CB3308A



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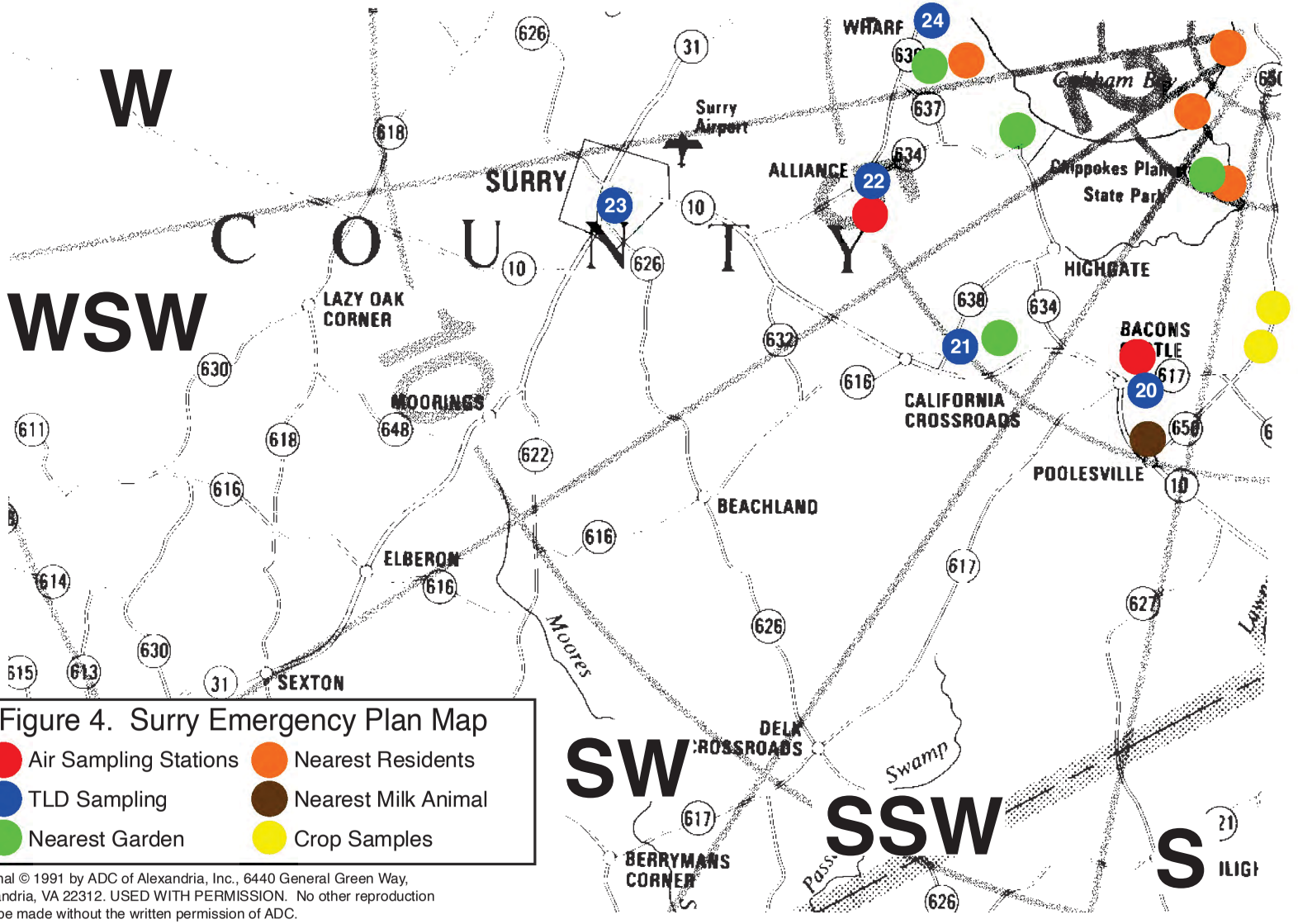
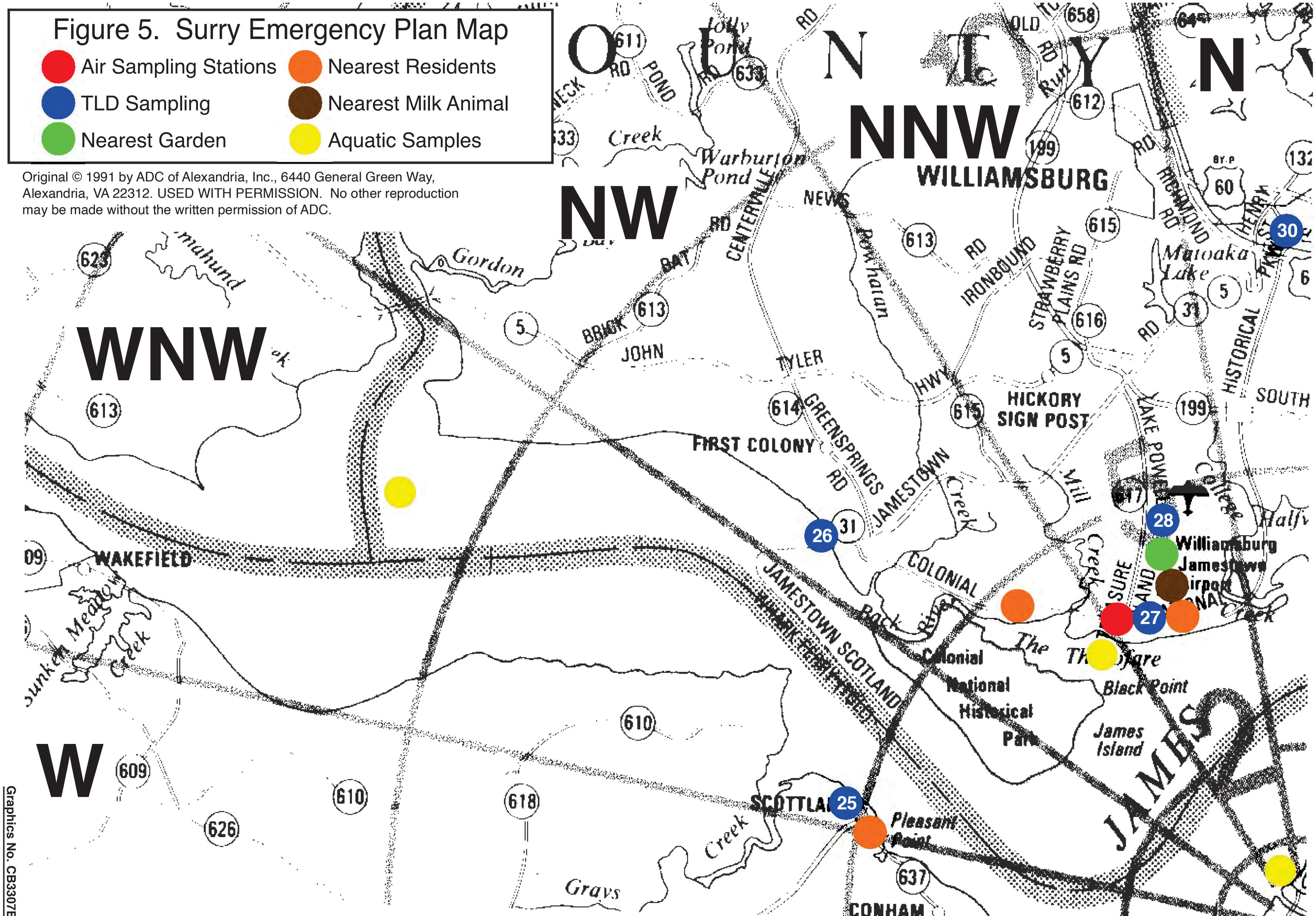


Figure 4. Surry Emergency Plan Map

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

Figure 5. Surry Emergency Plan Map



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 provided in Section 4.

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

Docket No. 50-280-281

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations	Location with Highest Mean			Control Locations	Number of Nonroutine Reported Measurements
				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Direct Radiation *TLD (mR/Std. Month)*	**Gamma Dose**	164	2						0
Air Particulate *($1e^{-3}$ pCi/m^3)*	**Gross Beta**	416	10	**15.9 (364/364) (6.56-28.7)**	**BC**	**4.5 mi. SSW**	**17.7 (52/52) (7.59-28.7)**	**15.2 (52/52) (5.38-21.3)**	0
	GAMMA	32							
	Cs-134	32	50	<LLD	N/A		<LLD	<LLD	0
	Cs-137	32	60	<LLD	N/A		<LLD	<LLD	0
	Be-7	32		**113 (28/28) (79.6-133)**	**BC**	**4.5 mi. SSW**	**126 (4/4) (123-133)**	**113 (4/4) (97.1-123)**	0
Air Iodine *($1e^{-3}$ pCi/m^3)*	**I-131**	416	70	<LLD	N/A		<LLD	<LLD	0
Milk *(pCi/Liter)*	**SR-89**	4	5	<LLD	N/A		<LLD	NA	0
	SR-90	4	1	**1.72 (3/4) (1.52-1.87)**	**CP**	**3.7 mi. NNW**	**1.72 (3/4) (1.52-1.87)**	NA	0
	GAMMA	27							
	Cs-134	27	15	<LLD	N/A		<LLD	<LLD	0
	Cs-137	27	18	<LLD	N/A		<LLD	<LLD	0
	Ba-140	27	60	<LLD	N/A		<LLD	<LLD	0
	La-140	27	15	<LLD	N/A		<LLD	<LLD	0
	I-131	27	1	<LLD	N/A		<LLD	<LLD	0
	K-40	27		**1199 (16/16) (779-1429)**	**CP**	**3.7 mi. NNW**	**1274 (12/12) (1161-1429)**	**1135 (11/11) (923-1344)**	0
Food Products	**GAMMA**	3							
(pCi/kg wet)	Cs-134	3	60	<LLD	N/A		<LLD	N/A	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

Docket No. 50-280-281

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations	Location with Highest Mean			Control Locations	Number of Nonroutine Reported Measurements
				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Food Products (cont'd) *(pCi/kg wet)*	Cs-137	3	80	<LLD	N/A		<LLD	N/A	0
	I-131	3	60	<LLD	N/A		<LLD	N/A	0
	K-40	3		**7859 (3/3) (2464-15270)**	**SLADE**	**3.2 mi. S**	**15270 (1/1) (15270-15270)**	NA	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
	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

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

Docket No. 50-280-281

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations Mean (Range)	Location with Highest Mean Number	Distance Direction	Mean (Range)	Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
River Water	**H-3**	8	2000	**6850 (1/4) (6850-6850)**	**SD**	**0.4 mi. NW**	**6850 (1/4) (6850-6850)**	<LLD	0
(pCi/Liter)	**GAMMA**	24							
	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
	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
	K-40	24		**106 (5/12) (98.0-118)**	**SD**	**0.4 mi. NW**	**106 (5/12) (98.0-118)**	**74.3 (2/12) (69.3-79.2)**	0
Sediment Silt	**GAMMA**	6							
(pCi/kg dry)	CS-134	6	150	<LLD	N/A		<LLD	<LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

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Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations Mean (Range)	Location with Highest Mean Number	Distance Direction	Mean (Range)	Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
Sediment Silt (cont'd) *(pCi/kg dry)*	Cs-137	6	180	<LLD	N/A		<LLD	<LLD	0
	K-40	6		**13205 (4/4) (10740-14380)**	**SI**	**1.8 mi. ESE**	**14210 (2/2) (14040-14380)**	**13880 (2/2) (11830-15930)**	0
	Ra-226	6		**1866 (1/4) (1866-1866)**	**CHIC**	**11.2 mi. WNW**	**4139 (2/2) (3967-4311)**	**4139 (2/2) (3967-4311)**	0
	Ac-228	6		**919 (3/4) (663-1162)**	**SD**	**0.5 mi. NW**	**1047 (2/2) (932-1162)**	**671 (1/2) (671-671)**	0
	Th-228	6		**1120 (4/4) (889-1592)**	**SI**	**1.8 mi. ESE**	**1240 (2/2) (889-1592)**	**1017 (2/2) (823-1211)**	0
	Th-232	6		**867 (4/4) (762-1054)**	**CHIC**	**11.2 mi. WNW**	**947 (2/2) (723-1171)**	**947 (2/2) (723-1171)**	0
	BE-7	6		**1972 (1/4) (1972-1972)**	**SI**	**1.8 mi. ESE**	**1972 (1/2) (1972-1972)**	<LLD	0
Shoreline Sediment *(pCi/kg dry)*	**GAMMA**	4							
	CS-134	4	150	<LLD	N/A		<LLD	<LLD	0
	CS-137	4	180	<LLD	N/A		<LLD	<LLD	0
	K-40	4		**5268 (2/2) (4638-5897)**	**HIR**	**0.6 mi. N**	**5268 (2/2) (4638-5897)**	**1685 (2/2) (1503-1866)**	0
	Th-228	4		**166 (1/2) (166-166)**	**CHIC**	**11.2 mi. WNW**	**281 (2/2) (229-334)**	**281 (2/2) (229-334)**	0
	Th-232	4		<LLD	**CHIC**	**11.2 mi. WNW**	**336 (1/2) (336-336)**	**336 (1/2) (336-336)**	0
Fish *(pCi/kg wet)*	**GAMMA**	4							
	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

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

Docket No. 50-280-281

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations	Location with Highest Mean			Control Locations	Number of Nonroutine
				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	Reported Measurements
Fish (cont'd)	Cs-134	4	130	<LLD	N/A		<LLD	N/A	0
(pCi/kg wet)									
	Cs-137	4	150	<LLD	N/A		<LLD	N/A	0
	K-40	4		**1627 (4/4) (1145-1989)**	**SD**	**1.3 mi. NNW**	**1627 (4/4) (1145-1989)**	NA	0
Oysters	**GAMMA**	6							
(pCi/kg wet)	Mn-54	6	130	<LLD	N/A		<LLD	N/A	0
	Co-58	6	130	<LLD	N/A		<LLD	N/A	0
	Fe-59	6	260	<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	**GAMMA**	6							
(pCi/kg wet)	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

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

SURRY NUCLEAR POWER STATION

Docket No. 50-280-281

Medium or Pathway Sampled (Units)	Analysis Type	Total Number	LLD	Indicator Locations Mean (Range)	Location with Highest Mean Number	Distance Direction	Mean (Range)	Control Locations Mean (Range)	Number of Nonroutine Reported Measurements
Clams (cont'd)	Cs-134	6	130	<LLD	N/A		<LLD	<LLD	0
(pCi/kg wet)									
	Cs-137	6	150	<LLD	N/A		<LLD	<LLD	0
Crabs	**GAMMA**	1							
(pCi/kg wet)	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
	K-40	1		**1394 (1/1) (1394-1394)**	**SD**	**1.3 mi. NNW**	**1394 (1/1) (1394-1394)**	N/A	0

3.2 Analytical Results of 2023 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, unless otherwise noted. MDC is noted in the footnote in several tables. The term <MDC means the value is less than its Minimum Detectable Concentration and is therefore, not considered a positive value or result. Positive values or results are indicated by **bold** text.

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
(mR/Std. Month) ± 2 Sigma

$MDD_Q = 3 \times s_Q = 3 \times 1.0 = 5$ Note: IF $MDD_Q < 5$ mR, THEN MDD_Q rounded to 5 mR (ANSI N13.37)
$MDD_A = 3 \times s_A = 3 \times 2.3 = 10$ 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	21.2	21.1	21.0	23.0	ND	ND	ND	ND	79.2	86.4	ND
3	19.2	20.4	20.2	20.1	21.8	ND	ND	ND	ND	76.9	82.5	ND
4	17.9	19.7	20.5	20.1	20.5	ND	ND	ND	ND	71.7	80.7	ND
5	19.0	20.0	19.5	19.6	21.0	ND	ND	ND	ND	76.0	80.2	ND
6	18.4	19.3	19.2	19.8	20.2	ND	ND	ND	ND	73.8	78.4	ND
7	18.7	20.0	20.2	20.0	21.0	ND	ND	ND	ND	74.6	81.1	ND
8	17.0	18.1	19.5	18.0	19.8	ND	ND	ND	ND	68.4	75.3	ND
9	23.2	24.7	24.4	23.0	25.9	ND	ND	ND	ND	92.8	98.1	ND
10	18.1	17.7	18.2	19.2	21.7	ND	ND	ND	ND	72.5	76.8	ND
11	16.1	17.7	17.2	17.1	18.1	ND	ND	ND	ND	64.2	70.1	ND
12	16.6	15.8	16.9	17.6	19.3	ND	ND	ND	ND	66.4	69.5	ND
13	18.6	20.0	20.5	19.4	20.4	ND	ND	ND	ND	74.5	80.3	ND
14	17.9	18.9	20.5	19.5	19.9	ND	ND	ND	ND	71.6	78.8	ND
15	18.5	19.7	20.2	19.1	21.2	ND	ND	ND	ND	74.1	80.1	ND
16	17.0	16.5	18.2	18.0	18.7	ND	ND	ND	ND	67.7	71.4	ND
18	14.5	15.8	15.9	15.9	16.3	ND	ND	ND	ND	58.0	63.9	ND
19	15.5	15.8	15.9	16.6	17.2	ND	ND	ND	ND	62.1	65.5	ND
20	14.3	13.8	14.3	14.5	15.4	ND	ND	ND	ND	57.4	58.0	ND
21	15.1	15.4	16.9	16.4	16.7	ND	ND	ND	ND	60.5	65.4	ND
22	13.2	13.4	12.9	14.2	14.0	ND	ND	ND	ND	52.7	54.5	ND
23	18.1	19.3	18.9	18.6	18.1	ND	ND	ND	ND	72.3	74.9	ND
24	14.8	15.0	15.6	15.0	16.7	ND	ND	ND	ND	59.2	62.3	ND
25	18.1	19.7	19.2	18.6	19.9	ND	ND	ND	ND	72.3	77.3	ND
26	15.7	14.1	15.8	16.7	17.0	ND	ND	ND	ND	62.9	63.6	ND
27	14.7	15.2	14.4	14.5	16.7	ND	ND	ND	ND	58.7	60.8	ND
28	14.2	14.1	14.7	15.2	15.9	ND	ND	ND	ND	56.8	59.9	ND
29	13.2	13.4	13.0	14.0	14.6	ND	ND	ND	ND	52.9	55.0	ND
30	14.4	15.2	14.7	14.9	15.7	ND	ND	ND	ND	57.7	60.5	ND
31	12.3	13.0	12.3	12.9	13.6	ND	ND	ND	ND	49.2	51.8	ND
32	15.2	14.8	15.1	15.1	15.5	ND	ND	ND	ND	60.7	60.5	ND
33	14.2	15.6	15.8	15.9	17.2	ND	ND	ND	ND	57.1	64.4	ND
34	16.0	15.9	16.5	16.0	18.5	ND	ND	ND	ND	64.1	67.0	ND
35	18.6	21.0	18.9	19.8	21.1	ND	ND	ND	ND	74.4	80.8	ND
36	18.6	19.7	19.3	19.4	21.3	ND	ND	ND	ND	74.4	79.8	ND
37	15.4	16.3	15.1	16.6	17.0	ND	ND	ND	ND	61.7	65.0	ND
38	20.9	19.2	18.6	18.8	19.6	ND	ND	ND	ND	83.6	76.1	ND
39	14.9	15.9	15.8	16.1	16.5	ND	ND	ND	ND	59.7	64.3	ND
40	16.2	17.7	17.2	16.9	16.9	ND	ND	ND	ND	64.7	68.8	ND
41	21.8	23.2	23.5	22.1	24.4	ND	ND	ND	ND	87.3	93.2	ND
42	16.4	17.7	17.2	17.3	17.9	ND	ND	ND	ND	65.5	70.1	ND
43	14.3	15.4	14.9	14.9	16.3	ND	ND	ND	ND	57.3	61.6	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
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
($1.0E^{-3}$ pCi/m^3 ± 2 Sigma)

SAMPLING LOCATIONS

COLLECTION DATE	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 10	**20.1** ± 2.75	**15.5** ± 2.46	**20.8** ± 2.84	**18.2** ± 2.72	**16.1** ± 2.50	**19.2** ± 2.69	**20.6** ± 2.79	**18.8** ± 2.63
January 17	**14.7** ± 2.64	**16.1** ± 2.72	**21.2** ± 3.00	**17.7** ± 2.87	**18.2** ± 2.85	**16.6** ± 2.79	**19.1** ± 2.98	**18.4** ± 2.90
January 24	**11.3** ± 2.62	**11.3** ± 2.63	**12.6** ± 2.75	**11.0** ± 2.63	**11.2** ± 2.54	**13.0** ± 2.65	**12.1** ± 2.62	**11.6** ± 2.51
Feburary 1	**13.3** ± 2.38	**10.7** ± 2.23	**15.2** ± 2.53	**14.3** ± 2.51	**11.3** ± 2.31	**12.3** ± 2.40	**13.7** ± 2.54	**15.3** ± 2.58
Feburary 8	**17.5** ± 2.97	**14.0** ± 2.77	**20.5** ± 3.16	**17.8** ± 3.05	**15.1** ± 2.84	**17.1** ± 2.94	**13.7** ± 2.85	**19.4** ± 3.07
Feburary 14	**15.1** ± 3.01	**14.2** ± 2.92	**19.6** ± 3.28	**16.3** ± 3.12	**17.6** ± 3.13	**18.0** ± 3.16	**19.2** ± 3.28	**19.4** ± 3.23
Feburary 21	**14.5** ± 2.81	**13.2** ± 2.70	**16.2** ± 2.92	**15.1** ± 2.88	**13.4** ± 2.71	**13.6** ± 2.74	**15.8** ± 2.91	**15.4** ± 2.83
Feburary 28	**15.6** ± 2.77	**11.2** ± 2.48	**16.6** ± 2.83	**14.5** ± 2.80	**13.6** ± 2.65	**14.9** ± 2.74	**14.3** ± 2.73	**16.3** ± 2.75
March 7	**13.2** ± 2.67	**10.6** ± 2.48	**13.1** ± 2.68	**11.2** ± 2.56	**12.5** ± 2.60	**13.7** ± 2.70	**14.6** ± 2.80	**11.9** ± 2.60
March 13	**9.21** ± 2.77	**7.31** ± 2.62	**10.6** ± 2.82	**9.36** ± 2.75	**8.61** ± 2.64	**11.4** ± 2.82	**9.58** ± 2.76	**7.05** ± 2.53
March 20	**16.2** ± 2.90	**12.9** ± 2.69	**16.7** ± 3.05	**13.0** ± 2.86	**14.8** ± 2.86	**17.1** ± 2.98	**16.9** ± 3.02	**16.9** ± 2.94
March 28	**15.8** ± 2.57	**14.5** ± 2.47	**17.9** ± 2.65	**17.1** ± 2.64	**14.4** ± 2.47	**15.2** ± 2.53	**16.3** ± 2.64	**16.9** ± 2.63
Qtr. Avg. ± 2 s.d.	**14.7 ± 5.64**	**12.6 ± 4.99**	**16.8 ± 6.90**	**14.6 ± 5.93**	**13.9 ± 5.52**	**15.2 ± 4.88**	**15.5 ± 6.34**	**15.6 ± 7.48**
April 4	**14.1** ± 2.46	**14.6** ± 2.46	**16.8** ± 2.58	**11.5** ± 2.32	**12.6** ± 2.35	**16.1** ± 2.56	**14.0** ± 2.49	**17.1** ± 2.62
April 11	**19.3** ± 3.06	**17.0** ± 2.91	**24.8** ± 3.32	**19.5** ± 3.10	**17.7** ± 2.93	**17.3** ± 2.93	**16.9** ± 2.95	**17.2** ± 2.91
April 18	**19.2** ± 3.01	**13.3** ± 2.66	**16.6** ± 2.87	**14.3** ± 2.76	**14.5** ± 2.71	**18.5** ± 2.91	**20.0** ± 3.01	**19.1** ± 2.90
April 25	**23.4** ± 3.18	**14.9** ± 2.73	**21.6** ± 3.11	**19.6** ± 3.05	**17.0** ± 2.86	**20.0** ± 3.03	**23.1** ± 3.25	**21.3** ± 3.08
May 2	**12.0** ± 2.60	**11.8** ± 2.56	**15.5** ± 2.80	**9.12** ± 2.45	**12.1** ± 2.60	**12.0** ± 2.59	**11.5** ± 2.60	**11.6** ± 2.55
May 9	**11.8** ± 2.55	**9.97** ± 2.42	**10.4** ± 2.48	**9.37** ± 2.45	**9.05** ± 2.40	**9.49** ± 2.42	**10.1** ± 2.49	**8.03** ± 2.31
May 16	**14.9** ± 2.82	**12.8** ± 2.70	**20.1** ± 3.11	**15.2** ± 2.89	**19.1** ± 3.05	**16.3** ± 2.91	**15.4** ± 2.91	**12.3** ± 2.68
May 23	**11.3** ± 2.63	**11.3** ± 2.63	**12.3** ± 2.71	**9.00** ± 2.55	**10.5** ± 2.61	**10.6** ± 2.61	**10.2** ± 2.62	**11.2** ± 2.62
May 30	**7.63** ± 2.31	**7.18** ± 2.28	**9.94** ± 2.48	**8.09** ± 2.39	**8.50** ± 2.39	**8.85** ± 2.41	**7.62** ± 2.36	**8.02** ± 2.34
June 6	**7.27** ± 2.31	**7.74** ± 2.34	**7.59** ± 2.28	**7.34** ± 2.30	**7.28** ± 2.26	**6.56** ± 2.20	**6.92** ± 2.26	**5.38** ± 2.10
June 13	**16.4** ± 2.90	**17.0** ± 2.92	**16.7** ± 2.95	**13.9** ± 2.84	**17.6** ± 2.99	**18.1** ± 3.01	**15.7** ± 2.93	**16.4** ± 2.91
June 20	**17.4** ± 2.85	**15.1** ± 2.73	**18.6** ± 2.99	**17.0** ± 2.94	**17.3** ± 2.90	**19.5** ± 3.02	**16.2** ± 2.89	**20.5** ± 3.05
June 27	**11.5** ± 2.36	**13.0** ± 2.43	**13.0** ± 2.47	**10.8** ± 2.36	**13.2** ± 2.45	**12.9** ± 2.47	**11.3** ± 2.38	**12.5** ± 2.42
Qtr. Avg. ± 2 s.d.	**14.3 ± 9.46**	**12.7 ± 6.24**	**15.7 ± 9.91**	**12.7 ± 8.47**	**13.6 ± 7.93**	**14.3 ± 8.97**	**13.8 ± 9.49**	**13.9 ± 10.2**

TABLE 3-3
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
($1.0E^{-3}$ pCi/m^3 ± 2 Sigma)

SAMPLING LOCATIONS

COLLECTION DATE	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
July 3	**15.6** ± 3.32	**17.4** ± 3.37	**14.7** ± 3.16	**15.9** ± 3.26	**16.0** ± 3.19	**19.0** ± 3.38	**14.9** ± 3.18	**16.6** ± 3.24
July 11	**15.6** ± 2.49	**17.2** ± 2.54	**19.2** ± 2.69	**17.1** ± 2.63	**16.4** ± 2.56	**16.4** ± 2.58	**17.4** ± 2.67	**17.9** ± 2.66
July 17	**16.8** ± 3.41	**16.9** ± 3.36	**16.8** ± 3.40	**13.4** ± 3.22	**16.9** ± 3.31	**15.3** ± 3.23	**14.7** ± 3.24	**15.5** ± 3.20
July 25	**18.2** ± 2.62	**16.2** ± 2.49	**18.7** ± 2.66	**16.7** ± 2.59	**18.8** ± 2.64	**19.8** ± 2.69	**17.9** ± 2.65	**17.7** ± 2.58
August 1	**14.8** ± 2.50	**15.0** ± 2.48	**16.0** ± 2.58	**16.8** ± 2.65	**14.2** ± 2.46	**14.2** ± 2.46	**15.7** ± 2.59	**14.4** ± 2.46
August 8	**10.8** ± 2.54	**13.0** ± 2.62	**14.8** ± 2.78	**10.3** ± 2.56	**15.1** ± 2.76	**12.9** ± 2.66	**13.0** ± 2.71	**12.8** ± 2.65
August 15	**18.4** ± 2.99	**21.3** ± 3.11	**21.1** ± 3.11	**18.9** ± 3.05	**16.9** ± 2.89	**22.4** ± 3.19	**20.9** ± 3.16	**19.1** ± 3.01
August 22	**16.5** ± 2.92	**16.9** ± 2.95	**16.9** ± 2.91	**14.0** ± 2.78	**15.7** ± 2.82	**17.0** ± 2.90	**15.5** ± 2.86	**13.1** ± 2.68
August 29	**16.1** ± 2.89	**15.3** ± 2.84	**16.2** ± 2.95	**16.1** ± 2.96	**14.9** ± 2.84	**15.8** ± 2.88	**14.7** ± 2.87	**12.2** ± 2.68
September 5	**16.1** ± 2.85	**19.4** ± 3.01	**18.1** ± 2.91	**13.8** ± 2.71	**13.1** ± 2.65	**18.6** ± 2.95	**16.4** ± 2.89	**15.5** ± 2.80
September 12	**25.1** ± 3.30	**23.0** ± 3.19	**24.8** ± 3.41	**21.2** ± 3.26	**24.3** ± 3.34	**21.7** ± 3.24	**19.7** ± 3.18	**19.8** ± 3.13
September 19	**21.5** ± 3.15	**20.4** ± 3.07	**19.9** ± 3.01	**19.2** ± 3.00	**17.8** ± 2.87	**17.8** ± 2.89	**18.6** ± 2.97	**16.5** ± 2.81
September 25	**16.4** ± 3.22	**14.9** ± 3.09	**20.4** ± 3.49	**19.5** ± 3.48	**17.9** ± 3.28	**16.9** ± 3.22	**16.2** ± 3.21	**14.7** ± 3.04
Qtr. Avg. ± 2 s.d.	**17.1** ± 6.80	**17.5** ± 5.69	**18.3** ± 5.69	**16.4** ± 5.96	**16.8** ± 5.52	**17.5** ± 5.54	**16.6** ± 4.46	**15.8** ± 4.78
October 3	**10.1** ± 2.26	**8.51** ± 2.15	**10.3** ± 2.31	**7.52** ± 2.22	**8.04** ± 2.20	**10.3** ± 2.34	**7.44** ± 2.21	**8.81** ± 2.24
October 10	**15.4** ± 2.85	**11.7** ± 2.61	**16.1** ± 2.97	**15.9** ± 2.90	**18.0** ± 2.96	**18.4** ± 2.99	**15.9** ± 2.88	**11.6** ± 2.61
October 17	**19.7** ± 3.16	**14.9** ± 2.89	**25.1** ± 3.33	**18.1** ± 3.05	**19.6** ± 3.11	**26.3** ± 3.44	**22.3** ± 3.33	**18.7** ± 3.11
October 24	**11.6** ± 2.52	**9.36** ± 2.35	**12.7** ± 2.65	**8.80** ± 2.43	**9.58** ± 2.41	**13.5** ± 2.64	**11.0** ± 2.52	**9.49** ± 2.36
October 31	**17.5** ± 2.93	**13.5** ± 2.66	**18.9** ± 2.93	**15.6** ± 2.78	**19.3** ± 2.94	**17.3** ± 2.84	**17.9** ± 2.91	**16.6** ± 2.78
November 7	**28.2** ± 3.43	**18.5** ± 2.93	**28.7** ± 3.47	**25.7** ± 3.36	**23.3** ± 3.16	**27.3** ± 3.37	**25.3** ± 3.32	**20.2** ± 3.03
November 13	**22.6** ± 3.54	**17.8** ± 3.26	**25.4** ± 3.72	**22.6** ± 3.62	**24.4** ± 3.67	**27.6** ± 4.09	**22.2** ± 3.63	**21.1** ± 3.50
November 21	**19.4** ± 2.70	**14.4** ± 2.44	**19.5** ± 2.74	**18.1** ± 2.69	**21.2** ± 2.79	**18.5** ± 2.69	**21.7** ± 2.78	**16.6** ± 2.56
November 28	**15.0** ± 2.63	**12.2** ± 2.43	**20.1** ± 2.92	**12.3** ± 2.53	**15.7** ± 2.80	**15.1** ± 2.71	**16.4** ± 2.73	**14.2** ± 2.64
December 5	**25.2** ± 3.24	**17.1** ± 2.78	**23.5** ± 3.21	**22.1** ± 3.17	**24.1** ± 3.17	**27.6** ± 3.38	**22.3** ± 3.03	**20.0** ± 2.94
December 12	**21.2** ± 3.01	**12.2** ± 2.48	**22.6** ± 3.10	**14.5** ± 2.68	**19.2** ± 2.89	**17.1** ± 2.84	**20.7** ± 2.95	**14.5** ± 2.66
December 19	**18.0** ± 2.95	**14.1** ± 2.70	**19.6** ± 3.05	**18.1** ± 3.00	**19.2** ± 2.99	**20.8** ± 3.14	**17.5** ± 2.88	**15.3** ± 2.79
December 26	**17.3** ± 3.02	**11.5** ± 2.65	**21.9** ± 3.18	**16.8** ± 2.95	**19.1** ± 3.01	**19.2** ± 3.07	**21.9** ± 3.11	**17.3** ± 2.93
January 2	**9.65** ± 2.44	**6.91** ± 2.22	**14.1** ± 2.71	**8.43** ± 2.39	**9.63** ± 2.40	**15.0** ± 2.78	**9.36** ± 2.36	**12.0** ± 2.56
Qtr. Avg. ± 2 s.d.	**17.9 ± 10.8**	**13.0 ± 6.86**	**19.9 ± 10.4**	**16.0 ± 10.9**	**17.9 ± 10.7**	**19.6 ± 11.3**	**18.0 ± 10.9**	**15.5 ± 7.86**
Ann. Avg. ± 2 s.d.	**16.1 ± 8.85**	**14.0 ± 7.12**	**17.7 ± 8.90**	**15.0 ± 8.48**	**15.6 ± 8.46**	**16.7 ± 9.02**	**16.0 ± 8.66**	**15.2 ± 7.74**

TABLE 3-4
AIRBORNE IODINE
($1.0E^{-3}$ pCi/m^3 ± 2 Sigma)

COLLECTION DATE	Sampling Stations SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 10	-11.6 ± 18.0	-11.4 ± 17.7	-11.8 ± 18.4	-12.0 ± 18.7	-1.54 ± 15.4	-1.56 ± 15.6	-1.58 ± 15.8	-1.52 ± 15.2
January 17	-6.20 ± 10.0	-6.20 ± 10.0	-6.29 ± 10.1	-6.42 ± 10.3	0.17 ± 4.89	0.39 ± 10.9	0.40 ± 11.2	0.39 ± 11.0
January 24	-0.84 ± 13.8	-0.85 ± 13.9	-0.86 ± 14.1	-0.85 ± 14.0	1.39 ± 12.7	1.38 ± 12.6	1.40 ± 12.8	0.64 ± 5.82
Feburary 1	10.3 ± 12.5	10.2 ± 12.4	10.6 ± 12.8	10.7 ± 13.0	0.15 ± 17.3	0.15 ± 17.6	0.16 ± 18.2	0.15 ± 17.7
Feburary 8	2.45 ± 12.0	2.42 ± 11.9	2.48 ± 12.2	2.53 ± 12.4	7.71 ± 11.8	7.71 ± 11.8	8.04 ± 12.3	7.78 ± 11.9
Feburary 14	2.82 ± 12.8	1.41 ± 6.44	2.84 ± 12.9	2.88 ± 13.1	2.21 ± 18.7	2.22 ± 18.7	2.28 ± 19.2	2.23 ± 18.8
Feburary 21	2.71 ± 10.9	2.66 ± 10.7	2.74 ± 11.0	2.76 ± 11.1	3.12 ± 5.19	6.94 ± 11.5	7.11 ± 11.8	6.96 ± 11.6
Feburary 28	5.63 ± 13.2	5.52 ± 12.9	5.66 ± 13.3	5.94 ± 13.9	-3.65 ± 9.93	-3.69 ± 10.0	-3.74 ± 10.2	-3.57 ± 9.73
March 7	-11.7 ± 10.7	-5.86 ± 5.38	-11.8 ± 10.8	-11.9 ± 10.9	2.82 ± 16.3	2.87 ± 16.6	2.94 ± 17.0	2.87 ± 16.6
March 13	-0.30 ± 8.47	-0.71 ± 19.9	-0.70 ± 19.7	-0.71 ± 19.9	-0.69 ± 19.3	-4.93 ± 15.2	-5.05 ± 15.5	-4.91 ± 15.1
March 20	-9.24 ± 12.5	-9.11 ± 12.3	-9.85 ± 13.3	-9.85 ± 13.4	5.07 ± 11.3	5.09 ± 11.4	5.18 ± 11.6	5.01 ± 11.2
March 28	3.03 ± 11.0	2.99 ± 10.8	3.02 ± 10.9	3.06 ± 11.1	-15.7 ± 22.9	-15.9 ± 23.2	-16.4 ± 23.9	-16.0 ± 23.4
April 4	-5.39 ± 14.3	-5.32 ± 14.1	-5.36 ± 14.2	-5.44 ± 14.4	-4.91 ± 6.60	-10.5 ± 14.2	-10.8 ± 14.6	-10.6 ± 14.3
April 11	0.86 ± 10.2	0.41 ± 4.83	0.86 ± 10.2	0.87 ± 10.4	3.46 ± 5.01	6.87 ± 9.95	7.01 ± 10.2	6.83 ± 9.90
April 18	8.39 ± 24.6	8.28 ± 24.3	8.39 ± 24.6	8.49 ± 24.9	0.98 ± 21.6	0.97 ± 21.5	0.98 ± 21.8	0.95 ± 21.1
April 25	-0.36 ± 15.4	-0.36 ± 15.1	-0.36 ± 15.4	-0.37 ± 15.7	0.80 ± 13.5	0.80 ± 13.5	0.82 ± 13.9	0.79 ± 13.3
May 2	2.99 ± 19.2	2.94 ± 18.9	2.99 ± 19.2	3.03 ± 19.4	-5.01 ± 20.5	-5.00 ± 20.5	-5.10 ± 20.9	-4.93 ± 20.2
May 9	2.27 ± 10.8	1.14 ± 5.42	2.28 ± 10.8	2.32 ± 11.0	6.13 ± 12.0	6.11 ± 11.9	6.21 ± 12.1	6.02 ± 11.8
May 16	14.7 ± 25.2	14.7 ± 25.1	14.9 ± 25.5	15.2 ± 25.8	-16.9 ± 22.8	-16.8 ± 22.7	-17.2 ± 23.3	-16.6 ± 22.5
May 23	-1.45 ± 15.7	-1.45 ± 15.7	-1.47 ± 15.9	-1.49 ± 16.1	-7.71 ± 12.1	-7.66 ± 12.1	-7.79 ± 12.3	-7.57 ± 11.9
May 30	-3.28 ± 22.1	-3.28 ± 22.1	-3.32 ± 22.4	-3.37 ± 22.7	16.3 ± 23.2	16.2 ± 23.1	16.5 ± 23.5	16.0 ± 22.8
June 6	6.49 ± 22.4	6.49 ± 22.4	6.29 ± 21.7	6.40 ± 22.0	12.4 ± 21.2	12.3 ± 21.1	12.5 ± 21.4	12.1 ± 20.8
June 13	1.70 ± 13.7	1.69 ± 13.6	1.72 ± 13.9	1.75 ± 14.1	-0.82 ± 13.2	-0.81 ± 13.1	-0.83 ± 13.3	-0.80 ± 12.9
June 20	0.62 ± 12.4	0.62 ± 12.4	0.65 ± 13.0	0.66 ± 13.2	-4.45 ± 18.3	-4.45 ± 18.4	-4.55 ± 18.8	-4.40 ± 18.2
June 27	-6.30 ± 22.0	-6.22 ± 21.7	-6.50 ± 22.7	-6.60 ± 23.1	1.47 ± 24.5	1.50 ± 25.0	1.51 ± 25.1	1.47 ± 24.6

TABLE 3-4
AIRBORNE IODINE
($1.0E^{-3}$ pCi/m^3 ± 2 Sigma)

COLLECTION DATE	Sampling Stations SS	HIR	BC	ALL	CP	BASF	FE	NN-C
July 3	-1.56 ± 22.3	-1.52 ± 21.8	-1.50 ± 21.5	-1.51 ± 21.7	9.17 ± 23.8	9.25 ± 24.0	9.33 ± 24.2	9.15 ± 23.8
July 11	15.3 ± 16.6	15.0 ± 16.3	15.5 ± 16.8	15.8 ± 17.1	10.6 ± 15.2	10.7 ± 15.4	11.0 ± 15.8	10.7 ± 15.4
July 17	-1.51 ± 8.08	-1.48 ± 7.90	-1.50 ± 8.01	-1.51 ± 8.08	17.3 ± 18.6	17.3 ± 18.6	17.6 ± 19.0	17.0 ± 18.3
July 25	-1.48 ± 22.9	-0.61 ± 9.41	-1.48 ± 23.0	-1.51 ± 23.4	1.49 ± 19.4	1.49 ± 19.3	1.53 ± 19.9	1.47 ± 19.2
August 1	10.1 ± 22.8	9.99 ± 22.5	10.3 ± 23.2	10.5 ± 23.6	4.57 ± 20.5	4.58 ± 20.5	4.69 ± 21.0	4.52 ± 20.2
August 8	2.61 ± 14.7	1.07 ± 6.05	2.67 ± 15.1	2.72 ± 15.4	-12.5 ± 14.9	-12.6 ± 15.1	-12.9 ± 15.4	-12.5 ± 15.0
August 15	4.73 ± 17.3	4.65 ± 17.0	4.78 ± 17.5	4.88 ± 17.9	20.8 ± 17.9 **A**	21.0 ± 18.1 **A**	21.4 ± 18.4 **A**	20.8 ± 17.9 **A**
August 22	-8.75 ± 8.96	-8.78 ± 8.99	-8.68 ± 8.89	-8.81 ± 9.02	9.10 ± 12.4	9.12 ± 12.4	9.27 ± 12.6	4.28 ± 5.82
August 29	6.44 ± 13.7	2.69 ± 5.72	6.59 ± 14.0	6.65 ± 14.1	1.84 ± 11.0	1.83 ± 11.0	1.87 ± 11.2	0.76 ± 4.58
September 5	-15.5 ± 16.9	-15.3 ± 16.7	-15.0 ± 16.4	-15.2 ± 16.5	-4.06 ± 12.4	-4.08 ± 12.4	-4.20 ± 12.8	-4.11 ± 12.5
September 12	-13.9 ± 22.0	-5.84 ± 9.21	-14.5 ± 22.9	-14.7 ± 23.1	-5.70 ± 20.4	-5.76 ± 20.6	-5.88 ± 21.0	-5.75 ± 20.5
September 19	5.35 ± 14.8	5.28 ± 14.6	5.16 ± 14.2	5.23 ± 14.4	-1.93 ± 7.57	-1.96 ± 7.70	-2.00 ± 7.85	-1.96 ± 7.69
September 25	3.78 ± 12.9	3.70 ± 12.6	3.82 ± 13.0	3.87 ± 13.2	0.10 ± 11.4	0.10 ± 11.4	0.10 ± 11.5	0.05 ± 5.67
October 3	1.43 ± 14.2	1.42 ± 14.0	1.47 ± 14.5	1.54 ± 15.2	-12.7 ± 18.6	-12.7 ± 18.6	-13.0 ± 19.0	-12.6 ± 18.4
October 10	17.8 ± 18.7	17.5 ± 18.4	18.8 ± 19.8	18.4 ± 19.4	-3.99 ± 13.8	-4.00 ± 13.8	-4.04 ± 14.0	-3.95 ± 13.6
October 17	-1.17 ± 16.1	-1.16 ± 15.9	-1.15 ± 15.8	-1.17 ± 16.1	3.97 ± 13.5	4.01 ± 13.6	4.13 ± 14.0	4.04 ± 13.7
October 24	-1.25 ± 8.42	-1.23 ± 8.26	-1.31 ± 8.82	-1.32 ± 8.92	0.72 ± 10.5	0.72 ± 10.5	0.73 ± 10.6	0.71 ± 10.3
October 31	-4.96 ± 9.86	-4.85 ± 9.63	-4.83 ± 9.60	-4.89 ± 9.72	-1.07 ± 8.89	-1.07 ± 8.90	-1.09 ± 9.05	-0.80 ± 6.68
November 7	-3.99 ± 14.8	-3.90 ± 14.5	-4.00 ± 14.8	-4.03 ± 14.9	1.09 ± 11.6	1.00 ± 10.6	1.01 ± 10.8	0.99 ± 10.5
November 13	-21.5 ± 23.9	-21.3 ± 23.7	-21.9 ± 24.3	-22.2 ± 24.7	7.95 ± 15.0	8.98 ± 16.9	8.11 ± 15.3	7.86 ± 14.8
November 21	-2.08 ± 15.7	-2.06 ± 15.6	-2.11 ± 16.0	-2.13 ± 16.1	-15.7 ± 18.6	-16.4 ± 19.3	-15.4 ± 18.2	-15.6 ± 18.4
November 28	-0.43 ± 12.7	-0.32 ± 9.37	-0.43 ± 12.8	-0.44 ± 13.0	-1.71 ± 19.6	-1.65 ± 18.9	-1.61 ± 18.4	-1.65 ± 18.8
December 5	3.58 ± 12.3	3.48 ± 12.0	3.71 ± 12.8	3.76 ± 13.0	12.9 ± 20.1	13.2 ± 20.6	12.6 ± 19.6	12.7 ± 19.8
December 12	-5.17 ± 13.5	-5.06 ± 13.2	-5.31 ± 13.9	-5.36 ± 14.0	0.61 ± 8.44	0.63 ± 8.70	0.60 ± 8.30	0.61 ± 8.47
December 19	-0.69 ± 18.9	-0.67 ± 18.4	-0.71 ± 19.4	-0.71 ± 19.6	3.30 ± 29.2	3.40 ± 30.1	1.36 ± 12.1	3.28 ± 29.0
December 26	-0.40 ± 20.5	-0.39 ± 20.1	-0.39 ± 20.1	-0.40 ± 20.3	10.6 ± 13.2	10.9 ± 13.6	4.93 ± 6.13	10.6 ± 13.2
January 2	9.29 ± 13.4	9.07 ± 13.1	9.34 ± 13.5	9.41 ± 13.6	-14.8 ± 14.5	-15.3 ± 15.0	-11.1 ± 10.9	-14.8 ± 14.5

A= <MDC

TABLE 3-5
AIR PARTICULATES
GAMMA EMITTER CONCENTRATIONS
($1.0E^{-3}$ pCi/m^3 ± 2 Sigma)

SAMPLING LOCATIONS	Nuclide	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Avg. ± 2 s.d.
SS	CS-134	-1.02 ± 1.02	0.02 ± 0.45	0.05 ± 0.95	0.44 ± 0.59	
	CS-137	-0.33 ± 0.89	0.10 ± 0.45	-0.81 ± 0.79	0.39 ± 0.38 **A**	
	BE-7	**113** ± 28.3	**121** ± 20.3	**99.2** ± 22.1	**107** ± 16.1	110 ± 18.4
HIR	CS-134	0.07 ± 1.02	0.08 ± 0.74	-0.15 ± 0.84	0.16 ± 1.02	
	CS-137	0.08 ± 0.81	0.54 ± 0.57	-0.29 ± 0.55	0.40 ± 0.83	
	BE-7	**117** ± 22.5	**128** ± 22.1	**120** ± 22.0	**89.8** ± 18.9	114 ± 33.0
BC	CS-134	-0.08 ± 0.71	-0.32 ± 0.74	0.50 ± 0.92	0.40 ± 0.90	
	CS-137	-0.02 ± 0.61	0.53 ± 0.55	0.49 ± 0.67	-0.58 ± 0.70	
	BE-7	**124** ± 21.6	**133** ± 24.1	**123** ± 24.3	**126** ± 21.7	126 ± 9.77
ALL	CS-134	0.47 ± 0.84	-0.90 ± 1.00	0.29 ± 0.82	0.36 ± 1.31	
	CS-137	0.09 ± 0.53	0.46 ± 0.73	-0.22 ± 0.70	-0.01 ± 0.92	
	BE-7	**120** ± 21.2	**112** ± 25.0	**79.6** ± 16.1	**98.9** ± 24.6	103 ± 35.0
CP	CS-134	-0.82 ± 0.64	-0.04 ± 0.59	0.80 ± 0.93	-0.60 ± 0.73	
	CS-137	-0.12 ± 0.54	-0.06 ± 0.55	0.41 ± 0.97	-0.17 ± 0.80	
	BE-7	**121** ± 24.2	**118** ± 23.5	**111** ± 21.0	**123** ± 20.9	118 ± 10.9
BASF	CS-134	0.04 ± 0.57	-0.47 ± 0.95	-0.55 ± 0.83	-0.92 ± 0.74	
	CS-137	0.49 ± 0.58	0.76 ± 0.79	-0.06 ± 0.66	0.01 ± 0.75	
	BE-7	**123** ± 22.8	**124** ± 26.3	**121** ± 21.4	**95.8** ± 19.8	116 ± 26.9
FE	CS-134	0.25 ± 1.10	-0.04 ± 0.74	-0.39 ± 0.84	0.13 ± 0.93	
	CS-137	0.09 ± 0.87	-0.07 ± 0.50	0.31 ± 0.59	0.03 ± 0.64	
	BE-7	**115** ± 26.2	**126** ± 23.7	**95.4** ± 19.4	**86.4** ± 19.1	105 ± 35.5
NN-C	CS-134	-0.40 ± 0.62	0.46 ± 0.94	0.33 ± 0.97	-0.17 ± 1.12	
	CS-137	0.00 ± 0.63	-0.24 ± 0.83	-0.47 ± 0.80	0.61 ± 0.93	
	BE-7	**111** ± 24.0	**123** ± 24.5	**120** ± 23.9	**97.1** ± 19.3	113 ± 23.4

A= <MDC

TABLE 3-6
MILK
GAMMA EMMITER AND STRONTIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

NUCLIDE	EPPS	*COLONIAL PARKWAY	BEACHY FARM-C
JANUARY			
Cs-134	0.65 ± 4.52	-4.23 ± 5.34	5.27 ± 5.77
Cs-137	-2.69 ± 5.12	-2.17 ± 5.05	4.47 ± 4.61
Ba-140	-0.05 ± 15.8	-10.7 ± 15.5	-13.0 ± 16.8
La-140	1.55 ± 4.50	3.04 ± 3.88	-1.64 ± 5.15
I-131	0.04 ± 0.38	0.21 ± 0.51	0.56 ± 0.54 **A**
K-40	**837** ± 148	**1259** ± 187	**1344** ± 161
FEBRUARY			
Cs-134	-5.98 ± 6.14	6.48 ± 5.29 **A**	0.15 ± 5.05
Cs-137	0.43 ± 4.74	3.21 ± 3.99	0.77 ± 4.82
Ba-140	-6.23 ± 23.0	-4.51 ± 20.2	0.41 ± 19.4
La-140	-0.92 ± 6.26	-4.04 ± 7.29	1.22 ± 5.09
I-131	-0.21 ± 0.47	-0.08 ± 0.32	0.09 ± 0.39
K-40	**1087** ± 183	**1191** ± 183	**1234** ± 151
MARCH			
Cs-134	0.34 ± 5.52	0.11 ± 5.18	-3.66 ± 4.81
Cs-137	-0.74 ± 4.36	4.72 ± 5.89	0.63 ± 4.10
Ba-140	-6.41 ± 13.7	-8.12 ± 20.4	-1.22 ± 16.3
La-140	0.92 ± 3.44	2.51 ± 4.24	1.12 ± 5.16
I-131	0.04 ± 0.35	0.21 ± 0.32	-0.01 ± 0.37
K-40	**779** ± 144	**1331** ± 197	**1093** ± 138
Sr-89		4.06 ± 2.93 **A**	
Sr-90		**1.52** ± 0.44	
APRIL			
Cs-134	-0.73 ± 3.08	0.49 ± 4.05	-1.90 ± 3.55
Cs-137	-1.53 ± 3.02	1.63 ± 3.48	-1.77 ± 3.63
Ba-140	2.92 ± 11.4	-0.05 ± 12.1	-3.61 ± 11.6
La-140	0.55 ± 3.03	-4.55 ± 4.05	0.49 ± 4.17
I-131	0.00 ± 0.26	0.23 ± 0.31	-0.09 ± 0.42
K-40	**1184** ± 116	**1278** ± 143	**1038** ± 128
MAY			
Cs-134		1.35 ± 4.36	0.44 ± 4.76
Cs-137		0.18 ± 4.17	0.92 ± 5.14
Ba-140	(a)	4.63 ± 17.8	-8.33 ± 23.7
La-140		9.45 ± 6.78 **A**	6.46 ± 6.39 **A**
I-131		-0.15 ± 0.48	0.49 ± 0.42 **A**
K-40		**1269** ± 170	**1140** ± 189

*Sr-89/90 analysis performed quarterly on location Colonial Parkway only.
A= <MDC
(a): See section 5 program exceptions.

TABLE 3-6
MILK
GAMMA EMMITER AND STRONTIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

NUCLIDE	EPPS	*COLONIAL PARKWAY	BEACHY FARM-C
JUNE			
Cs-134		-0.88 ± 5.30	-1.02 ± 4.76
Cs-137		2.72 ± 4.84	-0.20 ± 4.63
Ba-140	(a)	-1.65 ± 19.2	17.7 ± 18.9
La-140		1.34 ± 5.04	2.00 ± 6.14
I-131		-0.18 ± 0.34	0.25 ± 0.43
K-40		**1301** ± 174	**1183** ± 155
Sr-89		3.66 ± 2.34 **A**	
Sr-90		**1.78** ± 0.73	
JULY			
Cs-134		-2.16 ± 5.46	-0.70 ± 4.92
Cs-137		0.93 ± 4.48	2.10 ± 4.61
Ba-140	(a)	-15.6 ± 21.0	-0.38 ± 18.1
La-140		-1.32 ± 5.73	2.40 ± 4.50
I-131		-0.02 ± 0.46	0.52 ± 0.57
K-40		**1250** ± 171	**1244** ± 179
AUGUST			
Cs-134		1.01 ± 5.71	2.50 ± 5.08
Cs-137		2.87 ± 5.11	-3.16 ± 5.21
Ba-140	(a)	24.3 ± 27.2	-6.90 ± 20.7
La-140		-8.11 ± 5.96	1.59 ± 4.97
I-131		-0.06 ± 0.47	-0.02 ± 0.49
K-40		**1319** ± 186	**1198** ± 175
SEPTEMBER			
Cs-134		-3.92 ± 6.25	1.40 ± 4.43
Cs-137		1.31 ± 5.48	3.63 ± 4.97
Ba-140	(a)	4.41 ± 20.2	-7.63 ± 17.4
La-140		4.17 ± 7.40	-0.11 ± 4.01
I-131		-0.31 ± 0.47	-0.40 ± 0.48
K-40		**1294** ± 217	**1060** ± 186
Sr-89		0.18 ± 2.17	
Sr-90		0.81 ± 0.53 **A**	
OCTOBER			
Cs-134		-3.08 ± 5.13	-1.28 ± 4.12
Cs-137		0.31 ± 4.95	-0.40 ± 4.04
Ba-140	(a)	1.72 ± 17.7	13.2 ± 14.7
La-140		-2.38 ± 5.27	-4.03 ± 4.90
I-131		-0.09 ± 0.45	-0.18 ± 0.53
K-40		**1209** ± 164	**923** ± 160

*Sr-89/90 analysis performed quarterly on location Colonial Parkway only.
A= <MDC
(a): See section 5 program exceptions.

TABLE 3-6
MILK
GAMMA EMMITER AND STRONTIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

NUCLIDE	EPPS	*COLONIAL PARKWAY	BEACHY FARM-C
NOVEMBER			
Cs-134		3.65 ± 4.76	3.07 ± 4.36
Cs-137		2.43 ± 4.23	-1.34 ± 4.28
Ba-140	(a)	2.25 ± 16.0	-12.8 ± 16.3
La-140		2.36 ± 4.67	0.74 ± 4.30
I-131		0.42 ± 0.42	0.09 ± 0.33
K-40		**1429** ± 178	**1028** ± 148
DECEMBER			
Cs-134		-4.51 ± 5.27	
Cs-137		1.50 ± 4.85	
Ba-140	(a)	7.70 ± 17.6	(a)
La-140		5.55 ± 5.63	
I-131		-0.25 ± 0.46	
K-40		**1161** ± 166	
Sr-89		-1.71 ± 2.43	
Sr-90		**1.87** ± 0.67	

*Sr-89/90 analysis performed quarterly on location Colonial Parkway only.
(a): See section 5 program exceptions.

TABLE 3-7
FOOD PRODUCTS
GAMMA EMMITER CONCENTRATIONS
(pCi/kg (wet) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	SAMPLE TYPE	NUCLIDE			
			Cs-134	**Cs-137**	**I-131**	**K-40**
BROCK FARM	11/7/2023	CORN	6.15 ± 15.3	-3.00 ± 12.8	0.29 ± 14.8	**2464** ± 426
	11/7/2023	PEANUTS	-0.09 ± 14.4	-3.26 ± 16.0	-3.17 ± 16.7	**5843** ± 553
			Cs-134	**Cs-137**	**I-131**	**K-40**
SLADE FARM	11/7/2023	SOYBEANS	-8.47 ± 17.3	11.1 ± 17.2	-12.8 ± 17.6	**15270** ± 1068

TABLE 3-8
WELL WATER
GAMMA EMMITER AND TRITIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SS	3/30/2023	1.58 ± 3.15	0.91 ± 3.01	-4.18 ± 6.42	0.44 ± 3.26	-5.83 ± 8.43
	6/6/2023	1.02 ± 4.24	-0.53 ± 4.29	-6.13 ± 8.26	-0.21 ± 4.14	-9.17 ± 11.0
	9/12/2023	0.18 ± 4.56	2.81 ± 5.07	-3.11 ± 8.24	4.88 ± 5.49	-12.2 ± 8.70
	12/12/2023	-2.08 ± 2.85	2.21 ± 2.95	-7.83 ± 7.15	-2.83 ± 3.25	0.04 ± 7.55
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/30/2023	-1.35 ± 3.18	4.81 ± 5.91	0.22 ± 0.41	0.27 ± 3.56	-0.65 ± 2.67
	6/6/2023	-2.00 ± 3.88	1.16 ± 7.32	0.64 ± 0.55 **A**	4.16 ± 3.95 **A**	-1.08 ± 5.02
	9/12/2023	-2.25 ± 5.10	1.16 ± 7.18	-0.05 ± 0.48	-1.94 ± 4.35	0.32 ± 4.97
	12/12/2023	1.94 ± 3.23	0.78 ± 6.20	0.30 ± 0.57	0.38 ± 3.54	3.56 ± 3.50 **A**
		Ba-140	**La-140**	**H-3**		
	3/30/2023	-2.74 ± 18.5	-3.24 ± 5.69	-43.1 ± 710		
	6/6/2023	0.25 ± 16.7	4.79 ± 5.15	-25.3 ± 633		
	9/12/2023	11.4 ± 17.8	3.69 ± 6.66	-357 ± 718		
	12/12/2023	-10.4 ± 14.8	2.96 ± 5.17	283 ± 782		
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
HIR	3/30/2023	-0.50 ± 3.26	-0.06 ± 2.89	-0.52 ± 6.55	-1.20 ± 3.67	-1.06 ± 6.15
	6/6/2023	2.05 ± 4.03	-1.96 ± 3.92	2.84 ± 8.24	-0.37 ± 4.55	-5.30 ± 9.44
	9/12/2023	-1.59 ± 4.19	2.40 ± 3.55	11.4 ± 8.53 **A**	4.47 ± 4.53	-0.29 ± 9.48
	12/12/2023	1.94 ± 2.34	-1.46 ± 2.28	-1.20 ± 5.42	2.76 ± 3.47	3.76 ± 5.28
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/30/2023	-0.61 ± 3.45	-1.37 ± 5.51	-0.07 ± 0.54	-3.21 ± 3.67	0.64 ± 3.41
	6/6/2023	0.22 ± 3.22	3.60 ± 6.82	0.02 ± 0.52	-0.86 ± 4.95	2.58 ± 4.78
	9/12/2023	-1.62 ± 3.43	1.05 ± 6.43	-0.03 ± 0.46	-1.12 ± 3.86	-0.12 ± 4.32
	12/12/2023	0.33 ± 2.05	-1.41 ± 4.25	0.17 ± 0.51	1.49 ± 2.34	2.93 ± 3.36
		Ba-140	**La-140**	**H-3**		
	3/30/2023	-6.65 ± 13.4	-0.95 ± 4.54	269 ± 725		
	6/6/2023	-2.55 ± 14.9	-3.44 ± 5.15	-57.0 ± 631		
	9/12/2023	1.92 ± 14.7	-2.64 ± 4.43	-322 ± 716		
	12/12/2023	-4.29 ± 12.5	-0.27 ± 3.58	640 ± 788		
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
TC	3/30/2023	-0.38 ± 3.41	0.35 ± 3.26	-5.04 ± 7.78	-2.14 ± 3.24	-3.82 ± 7.33
	6/6/2023	1.38 ± 4.37	-1.92 ± 3.58	7.50 ± 8.30	2.02 ± 5.04	-9.94 ± 10.9
	9/12/2023	0.69 ± 3.91	1.36 ± 4.77	0.48 ± 9.22	3.09 ± 4.21	-9.79 ± 11.4
	12/12/2023	-1.80 ± 3.00	0.49 ± 3.23	-2.91 ± 6.27	-1.56 ± 3.40	0.44 ± 7.65
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/30/2023	-0.60 ± 3.33	1.89 ± 5.05	0.15 ± 0.41	0.16 ± 3.67	1.19 ± 3.16
	6/6/2023	5.50 ± 4.03 **A**	-0.64 ± 6.88	-0.25 ± 0.47	-2.41 ± 4.76	-1.86 ± 4.71
	9/12/2023	0.21 ± 4.61	1.79 ± 7.25	-0.36 ± 0.44	0.07 ± 5.60	-3.87 ± 3.66
	12/12/2023	-1.98 ± 3.54	1.94 ± 6.04	0.17 ± 0.46	1.07 ± 3.03	2.58 ± 3.18
		Ba-140	**La-140**	**H-3**		
	3/30/2023	-11.3 ± 15.0	2.15 ± 5.93	234 ± 730		
	6/6/2023	-2.95 ± 15.6	-2.04 ± 5.11	-272 ± 616		
	9/12/2023	5.28 ± 16.1	1.94 ± 6.00	239 ± 741		
	12/12/2023	-13.9 ± 15.8	-2.04 ± 5.82	-226 ± 750		

A= <MDC

TABLE 3-9
RIVER WATER
GAMMA EMITTER AND TRITIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SD	1/3/2023	1.36 ± 4.08	2.45 ± 3.37	-1.22 ± 5.84	-0.51 ± 4.05	-5.69 ± 7.84
	2/8/2023	-3.19 ± 4.20	0.45 ± 3.64	1.69 ± 7.67	2.00 ± 3.84	-5.62 ± 9.51
	3/7/2023	-2.28 ± 3.60	0.23 ± 3.24	-1.36 ± 6.61	-1.52 ± 4.24	-2.07 ± 8.10
	4/4/2023	0.45 ± 3.23	-3.38 ± 4.37	-1.42 ± 7.01	0.01 ± 4.71	-4.24 ± 9.07
	5/2/2023	-0.07 ± 2.76	-1.34 ± 3.13	7.77 ± 8.16	-3.45 ± 4.00	-3.16 ± 6.97
	6/6/2023	-0.09 ± 3.65	1.70 ± 3.96	-0.43 ± 6.98	-1.46 ± 2.81	-0.32 ± 8.26
	7/3/2023	1.24 ± 3.52	-0.31 ± 3.65	0.41 ± 8.77	-0.55 ± 4.61	-1.83 ± 8.57
	8/1/2023	-0.90 ± 2.32	0.03 ± 2.85	-0.98 ± 5.69	-0.96 ± 1.90	1.69 ± 6.42
	9/5/2023	0.88 ± 2.80	0.68 ± 3.39	-2.51 ± 6.64	-0.65 ± 3.60	-5.22 ± 7.97
	10/3/2023	-0.14 ± 1.60	-0.51 ± 1.80	3.47 ± 4.15	1.72 ± 2.62	-0.61 ± 4.24
	11/7/2023	1.07 ± 2.16	-1.72 ± 1.93	-1.51 ± 3.63	1.27 ± 2.55	-2.07 ± 5.15
	12/5/2023	-3.03 ± 3.48	2.63 ± 3.74	-3.45 ± 6.95	0.09 ± 3.96	7.38 ± 7.66
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/3/2023	0.49 ± 2.93	-1.08 ± 5.25	0.21 ± 3.63	1.94 ± 3.89	1.52 ± 3.74
	2/8/2023	1.02 ± 3.45	3.93 ± 6.89	4.56 ± 5.35	-0.94 ± 2.96	1.03 ± 4.36
	3/7/2023	1.24 ± 3.26	-1.41 ± 6.65	-0.13 ± 3.76	1.30 ± 3.68	0.38 ± 3.47
	4/4/2023	1.79 ± 4.09	-0.44 ± 6.93	0.22 ± 5.65	-3.28 ± 4.86	2.46 ± 4.35
	5/2/2023	2.07 ± 3.62	0.09 ± 5.77	5.73 ± 5.26 **A**	-0.30 ± 3.33	-2.58 ± 3.45
	6/6/2023	0.22 ± 3.97	0.91 ± 6.36	0.44 ± 4.49	-3.77 ± 4.92	1.27 ± 3.89
	7/3/2023	0.42 ± 3.35	0.75 ± 6.20	2.49 ± 5.33	0.45 ± 4.45	-0.60 ± 4.52
	8/1/2023	1.99 ± 2.36	4.53 ± 4.23 **A**	-1.17 ± 5.39	0.44 ± 2.89	1.82 ± 2.90
	9/5/2023	2.03 ± 2.96	-1.07 ± 4.79	0.78 ± 4.60	-0.37 ± 3.86	-1.94 ± 3.39
	10/3/2023	-0.04 ± 2.29	1.29 ± 3.37	-1.05 ± 2.39	1.34 ± 2.34	0.01 ± 2.48
	11/7/2023	0.76 ± 2.05	-2.68 ± 3.65	1.31 ± 2.25	2.18 ± 2.30	-1.90 ± 2.36
	12/5/2023	1.71 ± 3.73	3.34 ± 6.15	4.47 ± 5.02	0.64 ± 3.59	-3.72 ± 3.90
		Ba-140	**La-140**	**H-3**	**K-40**	
	1/3/2023	5.15 ± 12.4	1.08 ± 4.72			
	2/8/2023	9.99 ± 15.2	-1.72 ± 6.31		**112** ± 94.0	
	3/7/2023	1.35 ± 12.6	-2.15 ± 3.65	57.6 ± 620		
	4/4/2023	-5.61 ± 16.0	-1.01 ± 5.38			
	5/2/2023	5.19 ± 14.6	-0.91 ± 5.13			
	6/6/2023	3.92 ± 14.0	-1.53 ± 5.07	-279 ± 749		
	7/3/2023	-3.43 ± 15.3	1.57 ± 5.63		**102** ± 84.8	
	8/1/2023	4.73 ± 11.9	0.11 ± 4.86		**103** ± 63.7	
	9/5/2023	-2.31 ± 13.0	-2.39 ± 4.79	**6850** ± 985		
	10/3/2023	1.13 ± 7.09	-4.97 ± 3.49			
	11/7/2023	-3.98 ± 8.06	-0.46 ± 2.98		**98.0** ± 55.6	
	12/5/2023	-5.69 ± 14.3	-1.61 ± 4.55	313 ± 765	**118** ± 71.0	

A= <MDC

TABLE 3-9
RIVER WATER
GAMMA EMITTER AND TRITIUM CONCENTRATIONS
(pCi/Liter ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SW-C	1/3/2023	-2.22 ± 4.26	-1.99 ± 3.92	-1.72 ± 6.59	1.20 ± 3.63	-4.73 ± 9.39
	2/8/2023	-2.24 ± 3.67	3.18 ± 4.16	5.95 ± 7.02	-1.26 ± 3.66	-8.74 ± 7.53
	3/7/2023	-2.09 ± 3.21	-2.65 ± 3.03	5.01 ± 5.80	1.88 ± 4.20	-5.79 ± 7.42
	4/4/2023	1.09 ± 4.20	-1.46 ± 3.81	-3.37 ± 10.8	-7.35 ± 4.97	-1.93 ± 10.1
	5/2/2023	-0.59 ± 4.01	-0.43 ± 3.45	3.33 ± 5.40	2.24 ± 3.78	-0.56 ± 7.38
	6/6/2023	-1.08 ± 3.68	2.10 ± 3.65	-7.87 ± 9.11	0.17 ± 4.91	-4.82 ± 7.53
	7/3/2023	-2.11 ± 3.58	1.20 ± 3.65	-4.15 ± 6.66	-1.98 ± 3.78	-1.50 ± 7.91
	8/1/2023	1.05 ± 2.50	-2.47 ± 2.68	1.11 ± 5.78	0.26 ± 2.25	1.41 ± 5.16
	9/5/2023	-1.03 ± 2.27	-1.00 ± 2.01	0.80 ± 3.93	0.41 ± 3.31	-5.20 ± 6.13
	10/3/2023	1.06 ± 2.12	0.09 ± 2.47	0.44 ± 5.35	1.24 ± 2.47	0.95 ± 4.20
	11/7/2023	1.96 ± 2.36	0.73 ± 2.35	-1.75 ± 4.65	1.79 ± 2.23	-6.39 ± 5.62
	12/5/2023	0.59 ± 3.38	0.85 ± 3.24	3.14 ± 7.01	1.33 ± 4.01	2.51 ± 8.90
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/3/2023	3.54 ± 4.04	-5.02 ± 6.98	-0.04 ± 4.08	-2.69 ± 4.13	2.89 ± 3.89
	2/8/2023	-2.80 ± 3.27	-4.73 ± 7.40	-0.52 ± 5.46	-2.34 ± 3.80	-1.16 ± 3.46
	3/7/2023	-1.71 ± 3.38	-3.70 ± 6.74	0.68 ± 3.56	1.72 ± 3.31	1.00 ± 3.53
	4/4/2023	-1.14 ± 4.64	-4.43 ± 7.23	1.52 ± 5.29	2.15 ± 5.43	-2.60 ± 4.81
	5/2/2023	-0.15 ± 3.72	-5.84 ± 5.81	-2.14 ± 6.12	-1.13 ± 3.24	-0.17 ± 3.90
	6/6/2023	0.02 ± 3.70	2.44 ± 6.53	0.31 ± 4.39	-1.38 ± 4.26	-3.58 ± 4.24
	7/3/2023	0.44 ± 3.30	-2.09 ± 5.81	-4.95 ± 5.18	0.13 ± 3.75	0.11 ± 4.15
	8/1/2023	-0.42 ± 2.70	-1.17 ± 5.07	4.53 ± 5.08	-1.66 ± 3.31	-0.08 ± 2.86
	9/5/2023	-3.06 ± 2.44	-0.47 ± 3.92	-2.00 ± 3.42	0.11 ± 2.41	-0.70 ± 2.50
	10/3/2023	0.46 ± 2.16	0.88 ± 3.04	-2.57 ± 3.30	0.31 ± 2.64	0.50 ± 2.63
	11/7/2023	-0.51 ± 2.32	1.17 ± 4.07	-0.59 ± 2.52	1.47 ± 2.71	-1.47 ± 2.51
	12/5/2023	2.87 ± 4.02	0.36 ± 6.56	3.54 ± 4.96	0.53 ± 4.23	2.04 ± 4.79
		Ba-140	**La-140**	**H-3**	**K-40**	
	1/3/2023	1.82 ± 13.1	3.80 ± 4.48			
	2/8/2023	0.08 ± 13.5	2.62 ± 5.80			
	3/7/2023	6.53 ± 11.9	1.90 ± 5.01	51.2 ± 619		
	4/4/2023	0.92 ± 14.6	2.73 ± 4.90			
	5/2/2023	12.7 ± 18.8	1.83 ± 4.75			
	6/6/2023	8.40 ± 13.6	-1.22 ± 5.56	668 ± 793		
	7/3/2023	-0.60 ± 16.1	2.46 ± 4.48			
	8/1/2023	14.2 ± 13.0 **A**	0.69 ± 5.49			
	9/5/2023	-3.14 ± 9.41	-0.52 ± 4.13	-58.8 ± 684		
	10/3/2023	-0.32 ± 8.02	0.61 ± 3.58		**79.2** ± 74.1	
	11/7/2023	3.76 ± 8.94	-1.14 ± 3.52		**69.3** ± 55.3	
	12/5/2023	-6.26 ± 16.7	3.56 ± 5.76	54.7 ± 763		

A= <MDC

TABLE 3-10
SEDIMENT SILT
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (dry) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE							
		Cs-134		**Cs-137**		**K-40**		**Th-228**	
SD	3/27/2023	44.9 ± 50.0		25.6 ± 44.6		**10740** ± 1540		**967** ± 114	
	9/26/2023	92.1 ± 65.9	**A**	156 ± 83.2	**A**	**13660** ± 2066		**1032** ± 168	
		Th-232		**Ra-226**		**Ac-228**			
	3/27/2023	**797** ± 238		**1866** ± 1357		**932** ± 237			
	9/26/2023	**855** ± 277				**1162** ± 560			
		Cs-134		**Cs-137**		**K-40**		**Th-228**	
SI	3/28/2023	74.3 ± 51.5	**A**	48.0 ± 54.7		**14040** ± 1610		**889** ± 147	
	10/3/2023	32.4 ± 70.0		93.0 ± 76.4	**A**	**14380** ± 1918		**1592** ± 311	
		Th-232		**Be-7**		**Ac-228**			
	3/28/2023	**762** ± 217		**1972** ± 868		**663** ± 457			
	10/3/2023	**1054** ± 259							
		Cs-134		**Cs-137**		**K-40**		**Th-228**	
CHIC-C	3/21/2023	59.2 ± 44.8	**A**	108 ± 54.4	**A**	**11830** ± 1525		**823** ± 135	
	9/26/2023	70.3 ± 51.4	**A**	49.2 ± 61.8		**15930** ± 1749		**1211** ± 154	
		Th-232		**Ra-226**		**Ac-228**			
	3/21/2023	**723** ± 206		**3967** ± 1879		**671** ± 475			
	9/26/2023	**1171** ± 195		**4311** ± 1672					

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TABLE 3-11
SHORELINE SEDIMENT
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (dry) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE				
		Cs-134	**Cs-137**	**K-40**	**Th-228**	
HIR	2/14/2023	33.0 ± 29.2 **A**	-20.8 ± 29.0	**5897** ± 1029		
	8/8/2023	20.7 ± 22.3	-12.0 ± 21.8	**4638** ± 710	**166** ± 65.6	
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
CHIC-C	2/14/2023	-6.89 ± 29.8	-11.11 ± 32.5	**1503** ± 582	**229** ± 68.3	**336** ± 97.0
	8/8/2023	14.2 ± 37.7	12.04 ± 38.5	**1866** ± 816	**334** ± 115	

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TABLE 3-12
FISH
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (wet) ± 2 Sigma)

SAMPLING LOCATION	COLLECTION DATE	FISH TYPE	NUCLIDE			
			Mn-54	**Co-58**	**Fe-59**	**Co-60**
SD	4/20/2023	Catfish	-11.8 ± 35.3	-5.00 ± 33.3	1.71 ± 95.6	14.6 ± 39.1
	4/20/2023	Gamefish	12.6 ± 32.8	-14.1 ± 39.3	-7.10 ± 89.2	-19.7 ± 30.9
	10/17/2023	Catfish	10.8 ± 17.3	6.82 ± 19.1	17.9 ± 50.0	-1.76 ± 19.6
	10/17/2023	Gamefish	-1.40 ± 21.2	3.73 ± 22.0	33.8 ± 52.0	2.58 ± 20.7
			Zn-65	**Cs-134**	**Cs-137**	**K-40**
	4/20/2023	Catfish	-45.3 ± 58.7	-2.35 ± 36.2	-18.9 ± 33.8	**1737** ± 678
	4/20/2023	Gamefish	-91.5 ± 80.6	8.16 ± 39.7	-21.8 ± 34.1	**1989** ± 729
	10/17/2023	Catfish	-21.5 ± 43.1	4.12 ± 17.3	9.92 ± 16.3	**1635** ± 534
	10/17/2023	Gamefish	-14.8 ± 50.8	4.98 ± 23.9	-33.6 ± 20.4	**1145** ± 441

TABLE 3-13
OYSTERS
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (wet) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
POS	3/28/2023	-4.98 ± 29.3	8.67 ± 35.2	12.1 ± 86.5	3.40 ± 27.0
	10/3/2023	-13.3 ± 26.3	10.6 ± 25.4	-24.1 ± 58.8	5.81 ± 29.0
		Zn-65	**Cs-134**	**Cs-137**	
	3/28/2023	10.8 ± 52.0	-2.29 ± 31.0	11.6 ± 28.8	
	10/3/2023	-14.9 ± 67.7	7.83 ± 27.2	17.5 ± 24.6	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
MP	3/28/2023	21.6 ± 36.5	-26.3 ± 39.5	-15.3 ± 84.8	14.5 ± 32.2
	10/3/2023	-39.8 ± 34.5	0.99 ± 34.9	-19.2 ± 81.7	25.9 ± 38.4
		Zn-65	**Cs-134**	**Cs-137**	
	3/28/2023	-26.3 ± 83.4	-10.7 ± 32.2	-27.3 ± 34.6	
	10/3/2023	-49.9 ± 81.5	11.0 ± 36.1	11.2 ± 35.9	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SHI	3/28/2023	-3.46 ± 26.3	-23.8 ± 37.3	106 ± 80.8 **A**	-38.1 ± 31.4
	10/3/2023	-10.1 ± 38.5	-1.12 ± 36.3	5.47 ± 69.8	38.4 ± 38.4 **A**
		Zn-65	**Cs-134**	**Cs-137**	
	3/28/2023	12.4 ± 62.4	28.7 ± 35.2	5.72 ± 29.9	
	10/3/2023	-154 ± 93.9	-21.4 ± 37.0	-11.1 ± 39.5	

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TABLE 3-14
CLAMS
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (wet) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE							
		Mn-54	**Co-58**		**Fe-59**	**Co-60**			
JI	3/27/2023	-3.28 ± 34.7	-6.79 ± 43.6		-39.2 ± 86.8	-10.7 ± 27.5			
	9/26/2023	12.2 ± 29.9	19.3 ± 28.2		55.6 ± 69.1	17.3 ± 23.5			
		Zn-65	**Cs-134**		**Cs-137**				
	3/27/2023	-7.73 ± 85.9	27.7 ± 42.4		1.82 ± 27.9				
	9/26/2023	-14.3 ± 59.2	19.0 ± 28.8		20.4 ± 24.6				
		Mn-54	**Co-58**		**Fe-59**	**Co-60**			
SD	3/21/2023	1.32 ± 35.0	-3.51 ± 30.1		62.0 ± 88.7	-15.2 ± 40.3			
	9/26/2023	3.17 ± 23.8	-8.05 ± 21.0		-32.1 ± 45.6	-0.15 ± 23.5			
		Zn-65	**Cs-134**		**Cs-137**				
	3/21/2023	-14.5 ± 65.5	-7.23 ± 32.8		-9.94 ± 32.6				
	9/26/2023	13.8 ± 43.6	-3.14 ± 21.6		-0.06 ± 18.4				
		Mn-54	**Co-58**		**Fe-59**	**Co-60**			
CHIC-C	3/21/2023	11.8 ± 34.9	47.4 ± 42.4	**A**	21.9 ± 88.4	-1.54 ± 32.0			
	9/26/2023	-5.96 ± 36.4	-26.7 ± 43.9		-22.5 ± 82.9	-13.5 ± 34.6			
		Zn-65	**Cs-134**		**Cs-137**				
	3/21/2023	-53.3 ± 83.4	23.9 ± 41.4		36.6 ± 40.4				
	9/26/2023	-119 ± 107	5.35 ± 40.2		-44.2 ± 38.5				

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TABLE 3-15
CRABS
GAMMA EMITTER CONCENTRATIONS
(pCi/kg (wet) ± 2 Sigma)

SAMPLING LOCATIONS	COLLECTION DATE	NUCLIDE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SD	7/6/2023	5.75 ± 30.7	-1.46 ± 31.6	43.6 ± 85.8	-0.88 ± 38.0
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	7/6/2023	-24.0 ± 66.2	8.10 ± 33.2	7.72 ± 33.8	**1394** ± 732

4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 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 was from external sources, such as fallout from nuclear weapons tests (cesium-137) and naturally occurring radionuclides. Naturally occurring nuclides, such as beryllium-7, radium-226, actinium-228, thorium-228, thorium-232 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 reporting period.

4.1 Gamma Exposure Rate

A thermoluminescent dosimeter (TLD) is an inorganic crystal used to detect ambient radiation. These TLDs are made of CaF and LiF compounds and are specifically designed for environmental monitoring. Three TLDs are deployed at each sampling location. TLDs are placed in two concentric rings around the station. The inner ring is 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. No detectable external dose to members of the public was attributable from Surry Power Station in 2023. The results of the TLD analyses shown in Table 3-2 comply with Section 7 of ANSI/HPS N13.37-2014 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.

4.2 Airborne Gross Beta

Air is continuously sampled by passing through glass fiber particulate filters. The filters collect airborne particulate radionuclides. These samples are collected weekly and analyzed for gross beta activity. Results of the weekly gross beta analyses are presented in Table 3-3. The analysis results from the control and indicator locations continue to show no significant variation in measured activities. Refer to Figures 4.1 and 4.2 for details. Data presented in these figures indicate that any contribution from station related activities 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 except for the Chernobyl accident in 1986, airborne gross beta results have remained steady.

Figure 4-1:
2023 GROSS BETA IN AIR PARTICULATES

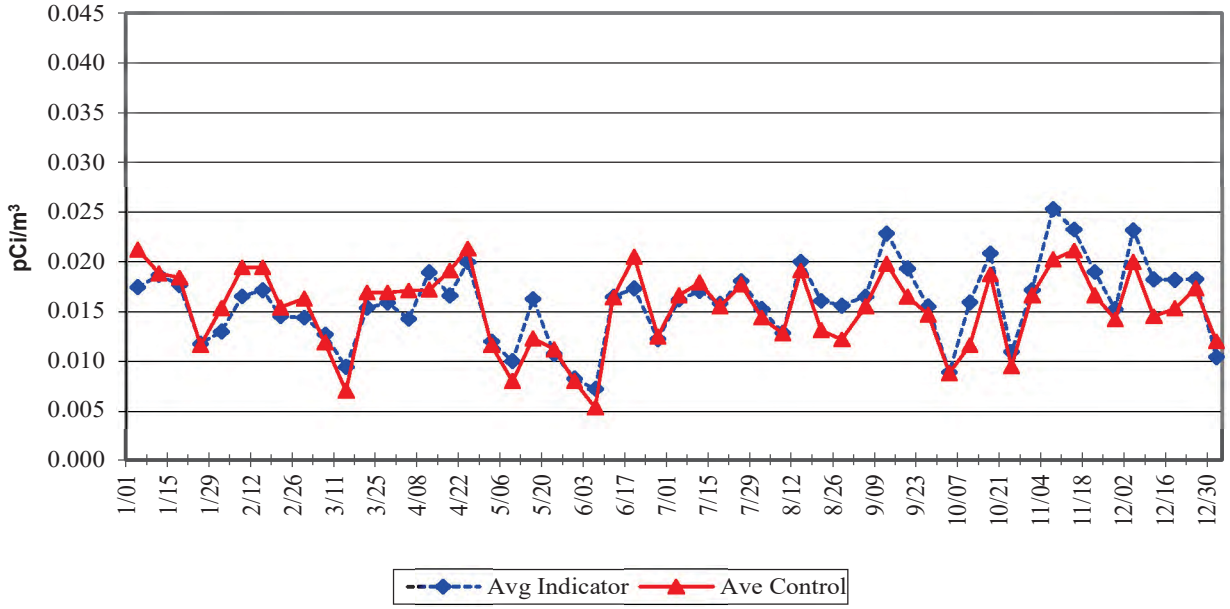
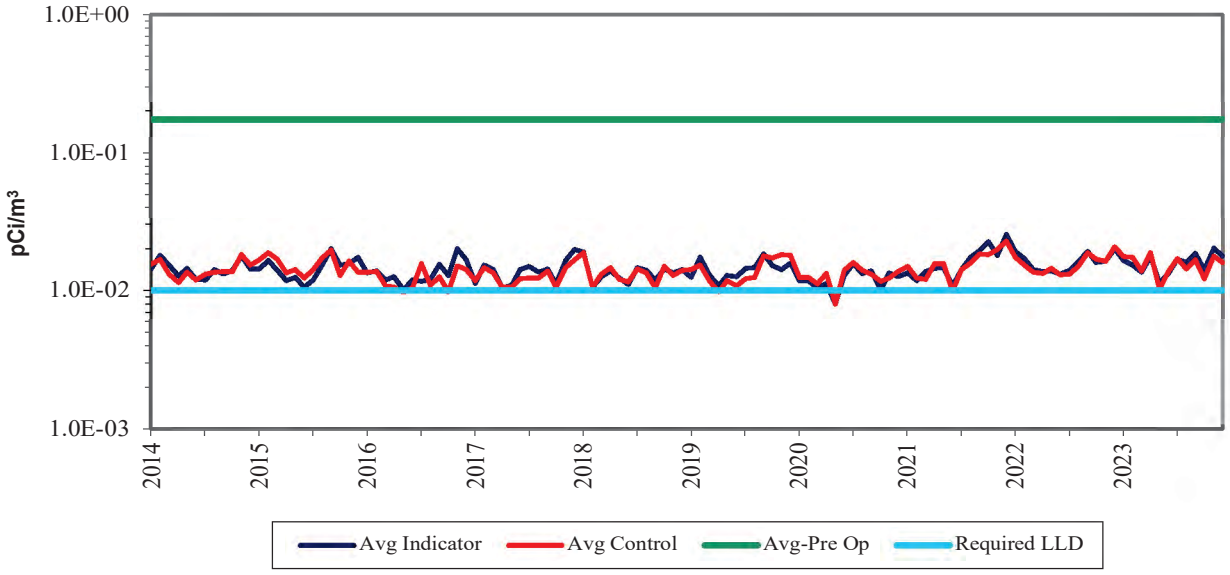


Figure 4-2:
GROSS BETA IN AIR PARTICULATES
10 YEAR HISTORICAL TREND



4.3 Airborne Radioiodine

Air is also continuously sampled for radioiodine by passing air through a charcoal cartridge. ee he 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 in air samples in 2023.

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 analysis results are listed in Table 3-5. The results indicate the presence of naturally occurring beryllium-7, which is produced by cosmic processes. No man-made radionuclides were identified. These analyses confirm there are 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 significant human consumption of milk, results in this pathway often being the most critical as it relates to station radiological effluents. 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 was identified in milk samples in 2022. Only naturally occurring potassium-40 was detected. The analysis results are presented in Table 3-6.

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. Strontium-89 was detected in the four composite samples analyzed. Strontium-90 was detected in three of the composite samples, with an average concentration of 1.50pCi/L. Strontium-90 is not a component of station radiological effluents and is a product of nuclear weapons testing fallout.

4.6 Food Products

Three food product samples (corn, peanuts, and soybeans) were collected and analyzed by gamma spectroscopy. The analysis results are presented in Table 3-7. Only naturally occurring potassium-40 was detected in all samples. No station related radioactivity was detected in this pathway.

4.7 Well Water

Well water is not considered to be affected by station operations, because no effluent discharges are made to this pathway. However, Surry Power Station monitors well water on a quarterly frequency at three indicator locations. Well water samples are analyzed for gamma radiation and tritium. The results are presented in Table 3-8. No station related radioactivity was detected in well water in 2023. Historically, prior to station operations and as a baseline, no gamma emitting isotopes were detected in well water samples.

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. Monthly samples are also composited and analyzed for tritium on a quarterly basis. No station related radioactivity was detected in this pathway in 2023. Only naturally occurring potassium-40 was detected.

4.9 Silt

Silt is sampled to evaluate e 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. The accumulation of radionuclides in silt could indirectly increase the radioactivity levels in clams, oysters, crabs, and fish.

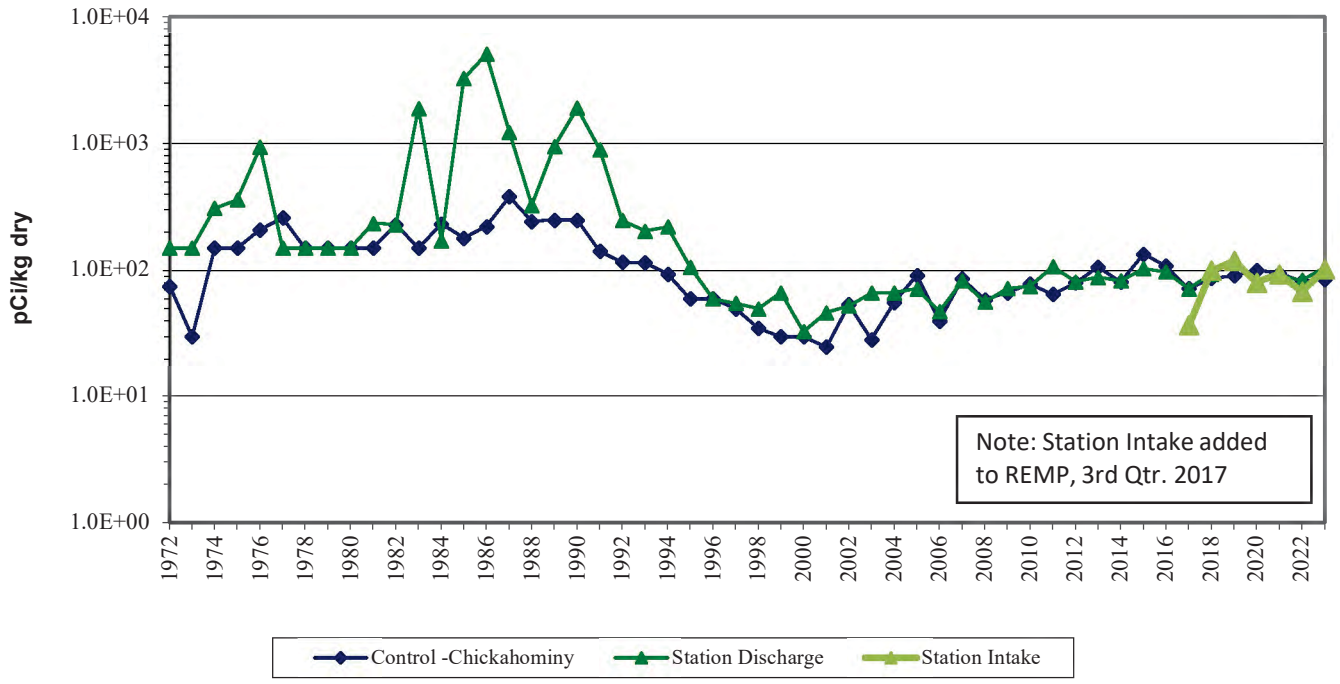
Samples of silt are collected from three locations: one upstream, one downstream of the station and one in the dredge area of the station intake. The results of the gamma spectroscopy analyses are presented in Table 3-10. Naturally occurring beryllium-7, potassium-40, radium-226, actinium-228, thorium-228, and thorium-232 were detected. Historically, cobalt-60 has been detected in samples obtained from the station discharge indicator location. Cobalt-60 has not been detected since 2003. A trend of cesium-137 and cobalt-60 concentrations is graphed and presented in Figures 4- and 4- . For three decades, the general concentration for cesium-137 has continued to decrease. This trend is the calculated average of the semi-annual analysis results.

The presence of cesium-137 in indicator location, Station Intake, and control location, Chickahominy, is indicative of the accumulation, through runoff, of cesium-137 into the James River from residual weapons testing fallout. Samples collected from the James River, during the pre-operational period, indicated the presence of cesium-137. The pre-operational average cesium-137 concentration is indicated in Figure 4- .

The Station Intake indicator sample was added to the REMP in 2017. The additional sample is collected in the dredge channel area at the station intake. The dredge channel is approximately 150’ wide and 1750’ in length. This location was added to support future station intake channel dredging operations. The trend of cesium-137 concentration in silt in the station intake dredge channel is procedurally monitored and evaluated.

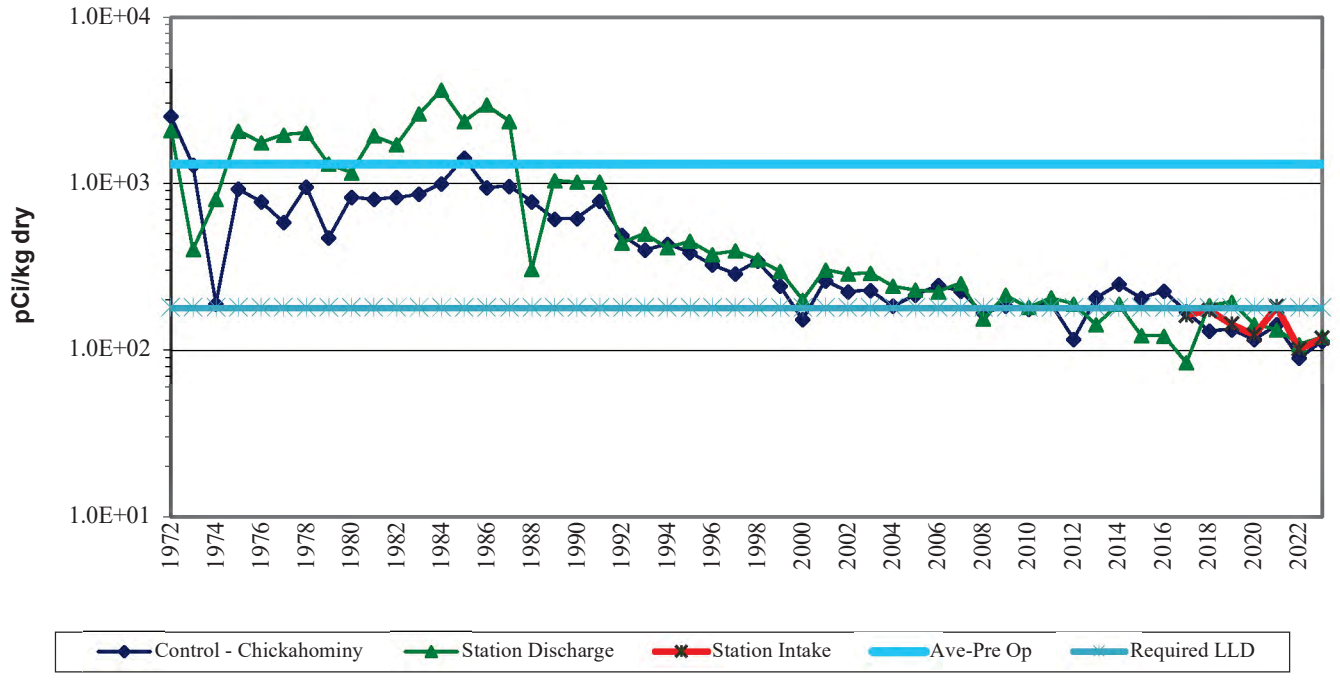
The Station Intake dredge channel average cesium-137 concentration was 118 pCi/kg. The Station Discharge average concentration was 120 pCi/kg. These indicator location activities trend well with the Chickahominy control location.

Figure 4-3:
COBALT-60 IN SILT



Chickahominy had detectable activity in 1982 and 1984 through 1994. Other years were less than minimum detectable activity (MDA). Station Discharge was <MDA activity 1996 through 1998 and 2004 through 2023.

Figure 4-4:
CESIUM-137 IN SILT



4.10 Shoreline Sediment

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

The naturally occurring radionuclides potassium-40, thorium-228, and thorium-232 were detected at concentrations equivalent to normal background activities. There were no radionuclides attributable to the operation of the station detected in 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. The 2023 analysis results are similar to those seen over the last decade. Only naturally occurring potassium-40 was detected. No radionuclides attributable to the operation of the station were detected in fish samples.

4.12 Oysters

The results of the gamma spectroscopy analyses in oyster samples are presented in Table 3-13. No gamma emitting radionuclides attributable to the operation of the station were detected in oysters sampled in 2023. No station related radioactivity has been detected in this media since 1991.

4.13 Clams

The results of the gamma spectroscopy analyses in clam samples are presented in Table 3-14. No gamma emitting radionuclides attributable to the operation of the station were detected in clams sampled in 2023.

4.14 Crabs

The results of the gamma spectroscopy analyses rof the annual crab sample are presented in Table 3-15. Other than naturally occurring potassium-40, no other gamma emitting radionuclides related to station effluents were detected in this media. This is consistent with pre-operational data and data collected over the past decade.

5. PROGRAM EXCEPTIONS

There were two exceptions to the REMP sampling schedule in 2023.
The exceptions are detailed below:

1. Epps Dairy closed in May 2023and will no longer supply milk to support the REMP (CR1227829). Indicator sample location, Colonial Parkway (CP) at 3.7 miles remains and active milk sampling location. Sampling of broad-leaf vegetation is not required.

2. Milk from the Beachy Farm control lohuman consumption. catioon was unavailable during December 2023 to support the calving process. The birth and nursing of a new calve resulted in limited milk being available for human consumption. Milk collection from Beachy Farm resumed in January 2024.

6. CONCLUSIONS

The 2023 Radiological Environmental Monitoring Program analysis results for Surry Power Station are recorded in Section 3 and discussed in Section 4 of this document. This section provides a conclusion of each listed pathway.

- **Direct Radiation Exposure Pathway -** No detectable external dose to members of the public was attributable to the operation of Surry Power Station in 2023.

- **Airborne Exposure Pathway** - Radioiodine analyses of charcoal cartridge samples indicated that no positive activity was detected. Quarterly, the gamma isotopic analysis of the composite particulate samples identified beryllium-7, which is naturally occurring. All indicator locations for air particulate gross beta concentrations trend well with the control locations. The effluent data, reviewed for the period of interest, 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. No positive cesium-137 nor iodine-131 activity was detected in this pathway. Only naturally occurring potassium-40 was detected in this pathway . Strontium-90 was detected in each of the quarterly composite samples with an average concentration of 1.50 pCi/L. Strontium-90 is not a component of station effluents, but rather, a product of nuclear weapons testing fallout.

- **Food Products** - Only naturally occurring potassium-40 was detected in all three food product samples. Food product sample analyses results indicate no radioactivity was attributable to the operation of the station.

- **Well Water** - Well water samples were analyzed for gamma emitting radionuclides and tritium. Well water sample analysis results indicate no radioactivity was attributable to the operation of the station.

- **River Water** - River water samples were analyzed for gamma emitting radionuclides and tritium. Only naturally occurring potassium-40 was detected. No positive tritium activity was detected. River water sample analysis results indicate no radioactivity was attributable to the operation of the station.

- **Silt -** No radioactivity attributable to the operation of the station was detected in any of the indicator and control locations. Only naturally occurring potassium-40, beryllium-7, radium-226, thouium-228, thorium-232, and actinium-228 were detected.

- **Shoreline Sediment** - No radionuclides attributable to the operation of Surry Power Station was detected in any of the shoreline sediment samples. Only naturally occurring potassium-40, thorium-228, and thorium-232 were detected.

Aquatic Biota

- **Fish** – Other than naturally occurring potassium-40, no other positive gamma emitting radionuclides were detected in any of the fish samples.

- **Oysters** – No positive gamma emitting radionuclides were detected in any of the oyster samples.

- **Clams** – No positive gamma emitting radionuclides were detected in any of the clam samples.

- **Crabs** – Other than naturally occurring potassium-40, no other positive gamma emitting radionuclides were detected in any of the crab samples.

REFERENCES

References

1. NUREG-0472, "Radiological Effluent Technical Specifications for PWRs", Draft Rev. 3, March 1982.

2. United States Nuclear Regulatory Commission, Regulatory Guide 1.109, Rev. 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I", October 1977.

3. United States Nuclear Regulatory Commission, Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

4. United States Nuclear Regulatory Commission Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

5. Dominion, Station Administrative Procedure, VPAP-2103S, “Offsite Dose Calculation Manual (Surry)”.

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

7. HASL-300, Environmental Measurements Laboratory, “EML Procedures Manual,” 27th Edition, Volume 1, February 1992.

8. NUREG/CR-4007, “Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements,” September 1984.

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 2023

(Page 1 of 1)

Attachment 1
LAND USE CENSUS

SECTOR	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 radius center of Unit 1 Containment.

(a) None

APPENDIX B: SUMMARY OF INTERLABORATORY COMPARISONS

Year 2023

Summary of Results – Inter-laboratory Comparison Program (ICP)

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate (AP), air iodine, milk, soil, vegetation, and water matrices that represent test & matrix combinations available for REMP programs. 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 US EPA, 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 always resemble typical environmental samples obtained at commercial nuclear power facilities.

For the TBE laboratory, 124 out of 131 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary is found below:

1. The MAPEP February 2023 Soil Ni-63 result was evaluated as *Not Acceptable*. TBE's reported value was 294 Bq/kg and the known result was 1130 Bq/kg (range 791 - 1469). The sample was reprepped by a different (senior) lab technician with results of 1120 & 1250 Bq. It was determined that there was a difference between the two techs during the sample prep (technique) and the procedure was revised to reflect these differences including using a specific aliquot amount. (NCR 23-08)

2. The MAPEP February 2023 vegetation Sr-90 result was evaluated as *Not Acceptable*. The reported value was 0.05 Bq (not detected) and the known result was a “false positive”. This was considered to be a statistical failure because TBE’s reported result with 3 times the uncertainty resulted in a slightly positive net result (0.03194 Bq/kg). The reported result was significantly below TBE’s average detection limit for vegetation samples. (NCR 23-09)

3. The ERA RAD February 2023 water Ba-133 result was evaluated as *Not Acceptable*. The reported value was 26.0 pCi/L and the known was 22.3 (acceptance range 17.1 – 25.8 pCi) or 117% of the known (acceptable for TBE QC). The sample was used as the workgroup duplicate with a result of 25.4 (114%). The sample had also been counted on a different detector with a result of 21.9 (98%). This was TBE’s first failure for Ba-133. (NCR 23-10)

4. The MAPEP August 2023 soil Fe-55 result was evaluated as *Not Acceptable*. The reported value was 346 Bq/kg and the known result was 1280 (acceptance range of 896-1664 Bq/kg). This was TBE’s initial evaluation for Fe-55 in soils. The result was received at the end of December and the root cause is under investigation. No client samples were associated with this cross-check. (CAR 23-31)

5. The Analytics September 2023 milk Sr-90 result was evaluated as Not Acceptable. The reported result was 7.28 pCi/L and the known result was 12.8 (57% of known). This sample was used as the workgroup duplicate and the carrier yields for both samples were 107% and 75%. The LCS recovery for the workgroup was at 106%. The ERA drinking water Sr-90 cross check that was analyzed around the same time was acceptable at 108%. There was no explanation for the failure. This is the first low biased failure for Sr-90 milk. The last failure (high) was in 2016. (NCR 23-24)

6. The ERA RAD October 2023 water Gross Alpha result was evaluated as *Not Acceptable*. The reported result was 53.2 pCi/L and the known result was 70.6 (acceptable range of 54.0 – 87.2 pCi/L). The reported result was the workgroup duplicate and was within 75% of the known value (within TBE QC range). The original result was 63.3 pCi/L (90% of the known). Because the LCS result was biased slightly high, the decision was made to report the lower value. (NCR 23-20)

7. The ERA RAD October 2023 water I-131 result was evaluated as *Not Acceptable*. The reported value was 23.5 pCi/L and the known result was 29.7 (acceptable range of 25.8 – 33.6) The reported result was 79% of the known, which is within the acceptable TBE QC range. The workgroup was reviewed with no anomalies found. The LCS/LCSD results were 109% and 86.1%. The sample was not processed in a timely manner as per the ERA instructions which stated to analyze shortly after receipt due to the short half-life. Going forward, the QA &/or Lab Mgr. will ensure that this analysis is started sooner. (NCR 23-21)

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 2023	E13826	Milk	Sr-89	pCi/L	70.5	93.1	0.76	W
			Sr-90	pCi/L	12.3	14.7	0.84	A
	E13827	Milk	Ce-141	pCi/L	127	139	0.91	A
			Co-58	pCi/L	119	131	0.91	A
			Co-60	pCi/L	250	279	0.90	A
			Cr-51	pCi/L	246	302	0.82	A
			Cs-134	pCi/L	172	200	0.86	A
			Cs-137	pCi/L	125	140	0.89	A
			Fe-59	pCi/L	122	122	1.00	A
			I-131	pCi/L	70.2	82.0	0.86	A
			Mn-54	pCi/L	165	180	0.92	A
			Zn-65	pCi/L	306	306	1.00	A
	E13828	Charcoal	I-131	pCi	79.0	89.9	0.88	A
	E13829	AP	Ce-141	pCi	91.9	87.8	1.05	A
			Co-58	pCi	87.5	82.5	1.06	A
			Co-60	pCi	199	176	1.13	A
			Cr-51	pCi	218	191	1.14	A
			Cs-134	pCi	119	126	0.94	A
			Cs-137	pCi	92.4	88.7	1.04	A
			Fe-59	pCi	95.5	76.9	1.24	W
			Mn-54	pCi	120	113	1.06	A
			Zn-65	pCi	179	193	0.93	A
	E13830	Soil	Ce-141	pCi/g	0.224	0.220	1.02	A
			Co-58	pCi/g	0.193	0.207	0.93	A
			Co-60	pCi/g	0.406	0.441	0.92	A
			Cr-51	pCi/g	0.464	0.477	0.97	A
			Cs-134	pCi/g	0.334	0.316	1.06	A
			Cs-137	pCi/g	0.270	0.288	0.94	A
			Fe-59	pCi/g	0.183	0.193	0.95	A
			Mn-54	pCi/g	0.263	0.284	0.93	A
			Zn-65	pCi/g	0.475	0.484	0.98	A
	E13831	AP	Sr-89	pCi	99.4	90.8	1.09	A
			Sr-90	pCi	14.6	14.3	1.02	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

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]
N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30								
September 2023	E13832	Milk	Sr-89	pCi/L	49.8	71.4	0.70	W
			Sr-90	pCi/L	7.28	12.8	0.57	N(1)
	E13833	Milk	Ce-141	pCi/L	93.4	104	0.90	A
			Co-58	pCi/L	58.2	65.8	0.88	A
			Co-60	pCi/L	190	223	0.85	A
			Cr-51	pCi/L	207	205	1.01	A
			Cs-134	pCi/L	96.0	114	0.84	A
			Cs-137	pCi/L	121	141	0.86	A
			Fe-59	pCi/L	78.8	78.8	1.00	A
			I-131	pCi/L	27.9	37.4	0.75	W
			Mn-54	pCi/L	128	146	0.88	A
			Zn-65	pCi/L	185	203	0.91	A
	E13834	Charcoal	I-131	pCi	76.9	78.7	0.98	A
	E13835	AP	Ce-141	pCi	91.9	87.1	1.05	A
			Co-58	pCi	58.7	55.2	1.06	A
			Co-60	pCi	200	187	1.07	A
			Cr-51	pCi	192	172	1.12	A
			Cs-134	pCi	89.6	96	0.94	A
			Cs-137	pCi	109	119	0.92	A
			Fe-59	pCi	68.3	66.1	1.03	A
			Mn-54	pCi	129	123	1.05	A
			Zn-65	pCi	163	171	0.96	A
	E13836	Soil	Ce-141	pCi/g	0.228	0.184	1.24	W
			Co-58	pCi/g	0.103	0.116	0.89	A
			Co-60	pCi/g	0.364	0.394	0.92	A
			Cr-51	pCi/g	0.371	0.362	1.02	A
			Cs-134	pCi/g	0.176	0.202	0.87	A
			Cs-137	pCi/g	0.285	0.315	0.90	A
			Fe-59	pCi/g	0.140	0.139	1.00	A
			Mn-54	pCi/g	0.237	0.259	0.92	A
			Zn-65	pCi/g	0.349	0.359	0.97	A
	E13837	AP	Sr-89	pCi	74.6	80.2	0.93	A
			Sr-90	pCi	13.9	14.4	0.96	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 23-24

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [(a)]	Acceptance Range	Evaluation [(b)]
February 2023	23-MaS48	Soil	Ni-63	Bq/kg	294	1130	791 - 1469	N[(3)]
	23-MaSU48	Urine	Cs-134	Bq/L	9.92	10	6.7 - 12.4	A
			Cs-137	Bq/L	0.0994		(1)	A
			Co-57	Bq/L	9.35	8.67	6.07 - 11.27	A
			Co-60	Bq/L	9.03	8.13	5.69 - 10.57	A
			Mn-54	Bq/L	11.80	10.0	7.0 - 13.0	A
			U-234	Bq/L	0.01		Not spiked	
			U-238	Bq/L	0.01		Not spiked	
			Zn-65	Bq/L	10.60	9.29	6.50 - 12.08	A
	23-MaW48	Water	Ni-63	Bq/L	23.1	27.3	19.1 - 35.5	A
	23-RdV48	Vegetation	Cs-134	Bq/sample	5.6	7.6	5.32 - 9.88	W
			Cs-137	Bq/sample	0.03		*(1)*	A
			Co-57	Bq/sample	5.9	6.9	4.85 - 9.01	A
			Co-60	Bq/sample	5.00	6.51	4.56 - 8.46	W
			Mn-54	Bq/sample	6.08	8.03	5.62 - 10.44	W
			Sr-90	Bq/sample	0.05		*(1)*	N[(4)]
			Zn-65	Bq/sample	5.49	7.43	*5.20 - 9.66*	W
August 2023	23-MaS49	Soil	Fe-55	Bq/kg	346	1280	896 - 1664	N[(5)]
			Ni-63	Bq/kg	1260	1370	959 - 1781	A
	23-MaW49	Water	Ni-63	Bq/L	1.0	1	*(2)*	A
	23-RdV49	Vegetation	Cs-134	Bq/sample	3.860	4.98	3.49 - 6.47	W
			Cs-137	Bq/sample	0.027		*(1)*	A
			Co-57	Bq/sample	3.88	4.24	2.97 - 5.51	A
			Co-60	Bq/sample	2.37	2.79	1.95 - 3.63	A
			Mn-54	Bq/sample	2.04	2.56	1.79 - 3.33	W
			Sr-90	Bq/sample	0.96	1.17	0.82 - 1.52	A
			Zn-65	Bq/sample	-0.514		*(1)*	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) Sensitivity evaluation

(3) See **NCR 23-08**

(4) See **NCR 23-09**

(5) Initial evaluation - See **CAR 23-31**

ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2023	MRAD-38	Water	Am-241	pCi/L	28.1	32.1	22.0 - 41.0	A
			Fe-55	pCi/L	1180	1380	811 - 2010	A
			Pu-238	pCi/L	65.6	70.7	42.5 - 91.6	A
			Pu-239	pCi/L	82.9	92.4	57.2 - 114	A
		Soil	Sr-90	pCi/kg	2630	2580	803 - 4020	A
		AP	GR-A	pCi/filter	69.6	76.8	40.1 - 127	A
			GR-B	pCi/filter	36.8	32.8	19.9 - 49.6	A
April 2023	RAD-133	Water	Ba-133	pCi/L	26.0	22.3	17.1 - 25.8	N(1)
			Cs-134	pCi/L	72.1	77.6	63.4 - 85.4	A
			Cs-137	pCi/L	62.1	63.1	56.8 - 72.2	A
			Co-60	pCi/L	32.6	30.3	26.7 - 36.1	A
			Zn-65	pCi/L	253	242	218 - 283	A
			GR-A	pCi/L	34.2	29.2	14.9 - 38.2	A
			GR-B	pCi/L	64.3	60.7	41.8 - 67.4	A
			U-Nat	pCi/L	61.75	62.7	51.2 - 69.0	A
			H-3	pCi/L	13,300	12700	11,100 - 14,000	A
			Sr-89	pCi/L	67.0	61.1	49.2 - 69.0	A
			Sr-90	pCi/L	36.5	36.0	26.4 - 41.5	A
			I-131	pCi/L	24.3	28.7	23.9 - 33.6	A
September 2023	MRAD-39	Water	Am-241	pCi/L	54.0	71.0	48.7 - 90.8	A
			Fe-55	pCi/L	2430	2630	1550 - 3830	A
			Pu-238	pCi/L	172	177	106 - 229	A
			Pu-239	pCi/L	171	182	113 - 224	A
		Soil	Sr-90	pCi/kg	9580	6800	2120 - 10,600	A
		AP	GR-A	pCi/filter	82.2	79.8	41.7 - 131	A
			GR-B	pCi/filter	54.3	42.6	25.8 - 64.4	A
October 2023	RAD-135	Water	Ba-133	pCi/L	86.3	92.2	73.8 - 111	A
			Cs-134	pCi/L	38.4	41.2	27.9 - 54.5	A
			Cs-137	pCi/L	194	199	161 - 237	A
			Co-60	pCi/L	49.5	47.8	33.8 - 61.8	A
			Zn-65	pCi/L	59.7	57.0	23.7 - 90.3	A
			GR-A	pCi/L	53.2	70.6	54.0 - 87.2	N(2)
			GR-B	pCi/L	46.9	42.2	30.5 - 53.9	A
			U-Nat	pCi/L	51.26	51.7	45.9- 57.5	A
			H-3	pCi/L	20,100	22,900	19,700 - 26,100	A
			Sr-89	pCi/L	51.1	38.2	25.2 - 51.2	A
			Sr-90	pCi/L	31.7	35.7	30.3 - 41.1	A
			I-131	pCi/L	23.5	29.7	25.8 - 33.6	N(3)

(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 23-10***
*(2) See **NCR 23-20***
*(3) See **NCR 23-21***