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Nuclear LLC

Technical Specification Section 6.9.1.7(Salem)
Technical Specification Section 6.9.1.6 (Hope Creek)

LR-N21-0034

April 23, 2021

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555-001

Salem Nuclear Generating Station, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket NOS. 50-272 and 50-311

Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
Docket No. 50-354

Subject: 2020 Annual Radiological Environmental Operating Report

As required with Section 6.9.1.7 of Appendix A to Renewed Facility Operating License Nos. DPR-70 (Unit 1) and DPR-75 (Unit 2) for SGS, and Section 6.9.1.6 of Appendix A to Renewed Facility Operating License NPF-57 for HCGS, PSEG Nuclear hereby transmits one (1) copy of the combined 2020 Annual Radiological Environmental Operating Report (Enclosure 1). This report summarizes the results of the radiological environmental surveillance program for 2020 in the vicinity of the Salem and Hope Creek Generating Stations. The result of this program for 2020 was specifically compared to the result of the pre-operational program.

There are no regulatory commitments contained in this letter.

If you have any questions or comments on this transmittal, please contact Mr. Rick Heathwaite at (856) 279-1239 (cell), or Rick.Heathwaite@PSEG.com.

Sincerely,

Richard DeSanctis
Plant Manager
Salem Generating Stations

Steven Poorman
Plant Manager
Hope Creek Generating Station

Enclosure 1: 2020 Annual Radiological Environmental Operating Report for Salem and Hope Creek Generating Stations

cc: Administrator - Region I - USNRC
Project Manager - USNRC
Mr. Justin Hawkins, Salem Senior Resident Inspector - USNRC
Mr. Jigar Patel, Hope Creek Senior Resident Inspector - USNRC
Mr. Scott Wilson, NRC Inspector - Region I - USNRC
Chief - NJ Bureau of Nuclear Engineering (NJBNE)
Mr. Lee Marabella, Corporate Commitment Tracking Coordinator - w/o attachment
Mr. Thomas Cachaza, Salem/Hope Creek Commitment Tracking Coordinator - w/o attachment

PSEG Nuclear LLC

Salem and Hope Creek Generating Stations

Annual Radioactive Environmental Operating Report

2020

Document Number: SGS-AREOR-69 / HCGS-AREOR-43

Unit 1	Unit 2	Unit 1
Docket No. 50-272	Docket No. 50-311	Docket No. 50-354
Operating License No. DPR-070	Operating License No. DPR-075	Operating License No. NPF-057

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AREOR (REMP) Review and Approval Confirmation in SAP (I.A.W. AD-AA-1006 SIGNATURE AUTHORITY)

SAP 80126317

Opr

0021	Stephen Gattuso, Salem Chemistry Manager	Date: 04/17/2021
0022	Ronald Rattigan, Hope Creek Chemistry Manager	Date: 04/20/2021
0023	William Gropp, Salem Radiation Protection Manager	Date: 04/19/2021
0024	Harold Trimble, Hope Creek Radiation Protection Manager	Date: 04/20/2021
0025	William Muffley, Salem Senior Director of Operations	Date: 04/17/2021
0026	James Priest, Hope Creek Senior Director of Operations	Date: 04/18/2021
0027	Richard DeSanctis, Salem Plant Manager	Date: 04/21/2021
0028	Steven Poorman, Hope Creek Plant Manager	Date: 04/21/2021

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TABLE OF CONTENTS

TABLES

1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media. Periodic soil samples are collected for gamma isotopic analysis to provide information on deposition to the soil from airborne releases.

2. APT: Air Particulate

3. AIO: Air Iodine Sample

4. Analyte: The substance being identified and measured in a chemical analysis

5. ARERR: Annual Radioactive Effluent Release Report

6. AREOR: Annual Radioactive Environmental Operating Report

7. BLV: Broad Leaf Vegetation

8. BNE: Bureau of Nuclear Engineering: A New Jersey state agency regulating, as applicable, the nuclear industry within the Department of Environmental Protection.

9. BWR: Boiling Water Reactor

10. CARR: Corrective/Preventive Action Request and Report (GEL CAP)

11. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.

12. Control (C): A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Columbia Generating Station.

13. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.

14. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters, Optical Stimulated Luminance dosimeters and pressurized ionization chambers.

15. DOE: Department of Energy

16. DQO: Data Quality Objective

17. DW: Drinking Water

18. ECH: Crab sample

19. ERA: Environmental Resource Associates

20. ESF: Fish sample

21. ESS: Sediment sample

22. EZA: Eckert & Ziegler Analytics, Inc.

23. FPL: Broad Leafy Vegetation sample

24. FPV: Vegetables sample

25. GAM: Game sample

26. GEL: General Engineering Laboratories; Duplicate sample analysis vendor

27. Gr-A: Gross alpha

28. Gr-B: Gross beta

29. Grab Sample: A single discrete sample drawn at one point in time.

30. H-3: Hope Creek Generating Station

31. HCGS: Hope Creek Generating Station

32. IDM: Immersion Dose Monitor sample (direct radiation measurement made with field TLD)

33. Indicator: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the plant.

34. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation and animal products such as eggs and meat when additional information about particular radionuclides is needed.

35. ISFSI: Independent Spent Fuel Storage Installation

36. Kg: Kilogram

37. L: Liter

38. LIMS: Laboratory Information Management System

39. Lower Limit of Detection (LLD): The smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with a 5% probability of a false conclusion that a blank observation represents "real" signal.

40. LTS: Laboratory Testing Services

41. m^3: Cubic meter

42. MAPEP: Mixed Analyte Performance Evaluation Program

43. MDA: Minimum Detectable Activity

44. MDC: Minimum Detectable Concentration

45. Mean: The average, i.e., the sum of results divided by the number of results.

46. Microcurie: 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.

47. mL: Milliliter

48. MLK: Milk sample

49. MWe: Megawatts Electric

50. N: Not Acceptable

51. NA: Not Applicable

52. NCR: Nonconformance Report (TBE CAP)

53. NDA: No Detectable Activity

54. NEI: Nuclear Energy Institute

55. NIST: National Institute of Standards and Technology.

56. NPDES: National Pollutant Discharge Elimination System.

57. NRC: Nuclear Regulatory Commission

58. ODCM: Offsite Dose Calculation Manual

59. pCi/L: picocuries per Liter

60. Protected Area: An area encompassed by physical barriers and to which access is controlled.

61. PSEG: Public Service Enterprise Group

62. PWR: Pressurized Water Reactor

63. PWR/PWT: Potable Water sample (Raw/Treated)

64. REMP: Radiological Environmental Monitoring Program

65. Restricted Area: An area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.

66. RGPP: Radiological Groundwater Protection Program
67. RL: Reporting Level
68. SA: Salem
69. SLC: Selected Licensee Commitment
70. SD: Sample Deviation
71. SGS: Salem Generating Station
72. SOL: Soil Sample
73. Std Quarter: Standard Quarter = 91 days
74. SWA: Surface Water
75. TBE: Teledyne Brown Engineering; Primary sample analysis vendor
76. TLD: Thermoluminescent Dosimeter
77. TRM: Technical Requirement Manual
78. TS: Technical Specification
79. uCi: Microcuries (one-millionth of a Curie)
80. USEPA: United States Environmental Protection Agency
81. VGT: Fodder Crop sampl
82. WWA: Ground (well) Water sample

2.0 EXECUTIVE SUMMARY

Salem and Hope Creek Generating Stations Radiological Environmental Monitoring Program (REMP) was established prior to the station becoming operational to provide information on background radiation present in the area. The goal of SGS/HCGS REMP is to evaluate the impact of the station on the environment. Environmental samples from different media are monitored as part of the program in accordance with specifications detailed in the Offsite Dose Calculation Manual (ODCM). The program compares data from indicator locations near the plant, to control locations farther away from the site to assess operation impacts.

The Annual Radioactive Environmental Operating Report (AREOR) provides data obtained through analyses of environmental samples collected at Salem and Hope Creek Generating Station for the reporting period of January 1st through December 31st, 2020. During that time period 1634 analyses were performed on 1292 samples and there was no instance of radioactivity from plant effluents observed in the environment that exceeded any Reporting Levels identified in SGS ODCM Table 3.12-2 or HCGS ODCM Table 3.12.1-2. Also, in assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of Salem and Hope Creek Generating Stations had no significant radiological impact on the health and safety of the public or on the environment.

2.1 Summary Of Conclusions:

There was one instance of a plant related radionuclide above baseline detected during this sampling period. Tritium was detected in Surface Water but was below reporting levels (Order 80126317-120). Radionuclides identified are summarized in Table 1, 2020 Radiological Environmental Monitoring Program Summary of Results. Natural occurring radionuclides come from minerals and raw materials and exists at exposure levels that are not of concern for radiation protection. These elements are present in the Earth's crust and atmosphere and exists in detectable quantities throughout the world. It is common to detect natural occurring radionuclides in many of the samples collected for REMP. Some examples of naturally occurring radionuclides that are frequently seen in samples are potassium-40, beryllium-7, actinium-228 (present as a decay product of radium-228), and radium-226. Additionally, some relatively long-lived anthropogenic radioisotopes, such as strontium-90 and cesium-137, are also seen in some REMP samples; these radionuclides exist in measurable quantities throughout the world as a result of fallout from historic atmospheric nuclear weapons testing. Neither cesium-137 nor strontium-90 were detected in any of the indicator or control locations. Detailed information on the exposure of the U.S. population to ionizing radiation can be found in NCRP Report No. 160 [5].

Table 1, 2020 Radiological Environmental Monitoring Program Summary of Results

Media	Radionuclide identified but within historical levels	Naturally Occurring	Dose Impact from Radionuclide identified > 1mRem	N/A[1]
Direct Radiation	☒	☐	☐	☐
Airborne Radioiodine and Particulates	☐	☒	☐	☐
Surface Water	☒	☒	☐	☐
Groundwater - REMP	☐	☒	☐	☐
Drinking Water	☐	☒	☐	☐
Shoreline Sediment	☐	☒	☐	☐
Milk	☐	☒	☐	☐
Fish and invertebrates	☐	☒	☐	☐
Food Products	☐	☒	☐	☐
Soil	☐	☐	☐	☒
Grass or Leafy Vegetation	☐	☒	☐	☐
Aquatic Vegetation	☐	☐	☐	☒
Other aquatic (Crustacean, mollusks, etc.)	☐	☒	☐	☐

3.0 INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) provides data on measurable levels of radiation and radioactive materials in the site environs. This program also evaluates the relationship between quantities of radioactive materials released from the plant and resultant doses to individuals from principal pathways of exposure. In this capacity, REMP provides a check on the effluent release program and dispersion modeling to ensure that concentrations in the environment radioactive effluents conform to the "As Low as Is Reasonably Achievable" (ALARA) design objectives of 10 CFR 50, Appendix I. REMP is designed to conform to the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1 [18], NUREG 1301/1302 [6][7], and the 1979 NRC Branch Technical Position [17].

[1] Media is not analyzed in accordance with implemented regulatory program at this facility.

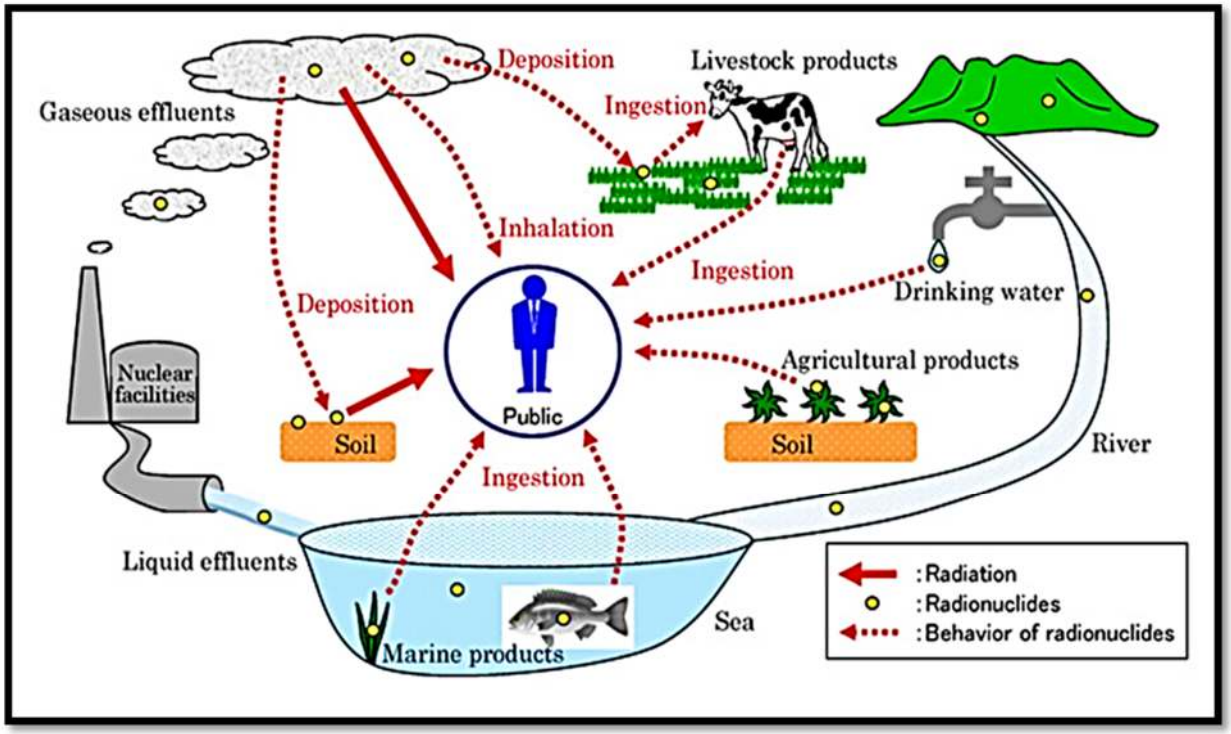


Figure 1, Potential exposure pathways to Members of the Public due to Plant Operations (1)

Quality assurance aspects of the sampling program and TLD data collection are conducted in accordance with Regulatory Guides 4.15 [13] and Regulatory Guides 4.13 [22]. REMP also adheres to the requirements of New Jersey, SGS/HCGS Technical Specifications, and Offsite Dose Calculation Manual (ODCM). These governing documents dictate the environmental sampling, sample analysis protocols, data reporting and quality assurance requirements for the environmental monitoring program.

The REMP is based on NRC guidance as reflected in the Site ODCMs and establishes sample media, sampling locations, sampling frequency and analytical sensitivity requirements. It also identifies indicator and control locations established for comparison purposes to distinguish plant related radioactivity from naturally occurring or other radioactivity from man-made sources. The environmental monitoring program also verifies the projected and anticipated radionuclide concentrations in the environment and evaluates exposures associated with releases of radionuclides from the Site as described by the ODCM.

This program satisfies the requirements of Section IV.B.2 of Appendix I to 10 CFR 50 and provides surveillance of all appropriate critical exposure pathways to man.

To demonstrate compliance with the requirements, samples of air particulates, air iodine, milk, surface water, ground (well) water, potable (drinking) water, vegetables, fodder crops, fish, crabs, oysters, game, and sediment were collected and analyzed. External radiation dose measurements were also made in the vicinity of the Site using passive dosimeters. These environmental media were analyzed for one or more of the following: gamma emitting isotopes, tritium (H-3), iodine-131 (I-131), gross alpha, gross beta, direct and immersion dose. Measurements made in the vicinity of the Site were compared to background or control measurements and the preoperational REMP study performed before SGS Unit 1 became operational. The results of these analyses were used to assess the impact on the health and safety of the public or on the environment of Site operations, thereby demonstrating compliance with the applicable Technical Specifications, ODCMs, and Federal regulations.

The detection capabilities for environmental samples, required by the Site ODCMs, were achieved for the Reporting Period. Any exceptions to the program are noted in the Report and the associated PSEG Nuclear corrective action identifier was included in parenthesis.

4.0 SITE DESCRIPTION AND SAMPLE LOCATIONS

The Site is located in Lower Alloway's Creek Township, Salem County, New Jersey. SGS consists of two operating pressurized water nuclear power reactors. SGS Unit 1 has an approximate net electrical rating of 1,180 megawatts electric (MWe) and SGS Unit 2 has an approximate net electrical rating of 1,178 MWe. The licensed core thermal power rating for both Units is 3,459 megawatts thermal (MWth). HCGS consists of an operating boiling water nuclear power reactor, which has an approximate net electrical rating of 1,212 MWe. The licensed core thermal power rating is 3,902 MWth.

The Site is located on a man-made peninsula on the east bank of the Delaware River called Artificial Island. The peninsula was created by the deposition of hydraulic fill from dredging operations. The surrounding environment is characterized mainly by the Delaware River Estuary, extensive tidal marshlands, and low-lying meadowlands. These land types make up a vast majority of the land area within five miles of the Site, with most of the remaining land used for agriculture.

Since 1968, a Radiological Environmental Monitoring Program (REMP) has been conducted at the Site. Starting in December 1972, a more extensive radiological monitoring program was initiated in preparation for the operation of SGS Unit 1. The operational REMP was initiated in December 1976 when SGS Unit 1 achieved criticality.

SGS/HCGS sampling media are selected based on site specific information such as meteorology, receptor locations, and water usage around the plant. Sampling and analysis frequencies are documented in the Offsite Dose Calculation Manual and site procedures. Required sampling, analysis frequencies and location of sample collected are captured in the following tables and figures:

- Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne
- Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne
- Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion
- Table 5, Radiological Environmental Monitoring Program Sampling Locations
- Figure 2, REMP Sample Locations (On-Site Sampling Locations To 1 Mile)
- Figure 3, REMP Sample Locations (Off-Site Sampling Locations 1 to 10 Miles)
- Figure 4, REMP Sample Locations (Off-Site Sampling Locations Greater Than 10 Miles)

5.0 RADIOLOGICAL ENVIRONMENTAL SAMPLING PROGRAM REQUIREMENTS

Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne

Exposure Pathway	Number of Representative Samples and Sample Locations	Sampling Collection/ Frequency	Type and Frequency of Analyses
1. DIRECT RADIATION a. Dosimeters (IDM)	Fifty-eight routine monitoring locations with two or more dosimeters placed as follows: An inner ring of locations, one in each land based meteorological sector in the general area of the SITE BOUNDARY. An outer ring of locations, one in each land based meteorological sector in the 5 to 11 km (3.1 - 6.8 miles) range from the site; and The balance of the locations placed in areas of special interest such as population centers, nearby residences, and schools and in six areas beyond 10 miles to serve as control locations.	Quarterly	Gamma dose / quarterly
2. ATMOSPHERIC a. Air Particulate (APT) b. Air Iodine (AIO)	3 samples from close to the Site Boundary: 05S1, 07S2, 15S2. One duplicate sample from close to the site boundary: 05S2. 3 samples in different land based sectors: 01F1, 02F6, 05D1. One sample from the vicinity of a community having a highest annual average ground level D/Q: 16E1. One sample from a control location; for example 15 - 30 km distant (9.3 - 18.6 miles) and in the least prevalent wind direction: 14G1	Continuous sampler operation with sample collection weekly or more frequently if required by dust loading Continuous sampler operation with sample collection weekly or more frequently if required by dust loading	Gross Beta / weekly Gamma isotopic analysis / quarterly composite* Iodine-131 / weekly

Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne

Exposure Pathway	Number of Representative Samples and Sample Locations	Sampling Collection/ Frequency	Type and Frequency of Analyses
Surface Water (SWA)	One sample upstream: 01F2. One sample downstream: 07E1. One sample outfall: 11A1. One sample cross-stream (mouth of Appoquinimink River): 12C1(2). And an additional location in the Chesapeake & Delaware Canal: 16F1.	Semi-Monthly	Gamma scan / monthly Tritium / monthly**
Potable Water (Drinking Water) (PWR, PWT)	Although no potable water samples are required as liquid effluents discharged from SGS/HCGS do not directly affect this pathway and it is not required by SGS/HCGS ODCM, one raw and one treated water sample from a public water supply (City of Salem Water and Sewer Department) are collected: 02F3 as management audit samples.	Monthly (composited weekly)	Gross alpha / monthly Gross beta / monthly Tritium / monthly Gamma scan / monthly Iodine-131 / monthly
Well Water (Ground) (WWA)	Although wells in the vicinity of SGS/HCGS are not directly affected by plant operations so sampling is not required by SGS/HCGS ODCM, samples of 03E1 farm's well are collected as management audit samples.	Monthly	Gamma scan / monthly Gross alpha / monthly Gross beta / monthly Tritium / monthly
Sediment (ESS)	One sample from downstream area: 07E1. One sample from cross-stream area and control location: 12C1(2). One sample from outfall area: 11A1. One sample from upstream, the C & D Canal: 16F1. One sample from shoreline area: 06S2. One sample from Cooling Tower Blowdown discharge: 15A1. One sample south storm drain discharge line: 16A1.	Semi-Annually	Gamma scan / on collection

Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion

Exposure Pathway	Number of Representative Samples and Sample Locations	Sampling Collection/ Frequency	Type and Frequency of Analyses
Milk (MLK)	Samples from milking animals in 3 locations within 5 km distance (3.1 miles) having the highest dose potential. If there are none, then 1 sample from milking animals in each of 3 areas between 5 - 8 km distant (3.1 - 5.0 miles) where doses are calculated to be greater than 1 mrem per yr: 13E3, 14F4, 02G3(1). 1 Sample from milking animals at a control location 15 30 km distant (9.3 - 18.6 miles): 03G1.	Semi-monthly (when animals are on pasture) Monthly (when animals are not on pasture)	Gamma scan / semi-monthly Iodine-131 / semi-monthly Gamma scan / monthly Iodine-131 / monthly
Edible Fish (ESF)	One sample of each commercially and recreationally important species in vicinity of plant discharge area: 11A1. One sample of same species in area not influenced by plant discharge: 12C1(2), and an additional location downstream: 7E1.	Semi-Annually	Gamma scan (flesh) / on collection
Blue Crabs (ECH)	One sample of each commercially and recreationally important species in vicinity of plant discharge area 11A1. One sample of same species in area not influenced by plant discharge 12C1(2).	Semi-Annually	Gamma scan (flesh) /on collection

Table 4, Radiological Environmental Sampling Program – Exposure Pathway – Ingestion (Continued)

Exposure Pathway	Number of Representative Samples and Sample Locations	Sampling Collection/ Frequency	Type and Frequency of Analyses
Vegetables (FPL, FPV)	Although the Delaware River at the location of SGS/HCGS is a brackish water source and is not used for irrigation of food products and so sampling is not required by SGS/HCGS ODCM, samples of vegetables are collected as management audit samples from various locations during harvest. In addition, broad leaf vegetation is collected from various offsite locations as well as being planted & collected onsite (01S1, 07S2, 15S2, 16S1). This is in lieu of having a milk farm within 5 km (3.1 miles) of the Site(1).	Monthly (during growing season)	Gamma scan / on collection
Fodder Crops (VGT)	Although not required by SGS/HCGS ODCM, samples of crops normally used as cattle feed (silage) were collected from milk farms as management audit samples: 14F4, 03G1, 2G3, 13E3.	Annually (at harvest)	Gamma scan / on collection
Game (GAM)	Although not required by SGS/HCGS ODCM, game samples were collected as management audit samples from three indicator locations: 3E1,13E3, 5C1.	Annually	Gamma scan / on collection
Soil (SOL)	Although not required by SGS/HCGS ODCM, samples of soil are collected as management audit samples.	Every 3 years (2013-2016-2019)	Gamma scan / on Collection

6.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING LOCATIONS

Table 5 Site # Nomenclature

First 2 digits represent each of the sixteen angular sectors of 22.5 degrees centered about the reactor site. Sector one is divided evenly by the north axis and other sectors are numbered in a clockwise direction, e.g. 1=N, 2=NNE, 3=NE, 4=ENE, 5=E, 6=ESE, 7=SE, 8=SSE, 9=S, 10=SSW, 11=SW, 12=WSW, 13=W, 14=WNW,15=NW, and 16=NNW.

The next digit is a letter which represents the radial distance from the reference point: S=On-site location, A=0-1 miles off-site, B=1-2 miles off-site, C=2-3 miles off-site, D=3-4 miles off-site, E=4-5 miles off-site, F=5-10 miles off-site, G=10-20 miles off-site and H=>20 miles off-site.

The last number is the station numerical designation within the sector and zone; e.g. 1,2,3,…etc

For example, the Site # 03E1 would indicate a sample in sector number 3, centered at 45 degrees (north east) with respect to the midpoint between Salem 1 and 2 containments at a radial distance of 4 to 5 miles offsite, (therefore, radial distance E). The number 1 indicates that this is sampling station number 1 in that particular sector.

Table 5 Definitions

SB	Site Boundary	A	Alternate Location	MLK	Milk
IR	Intermediate Ring	D	Duplicate	WWA	Well Water (Ground)
OR	Outer Ring	APT	Air Particulate	PWR,PWT	Potable Water (Raw,Treated
C	Control	AIO	Air Iodine	FPL,FPV	Vegetables
MA	Management Audit	ECH	Hard Shell Blue Crab	VGT	Fodder Crops
I	Indicator	ESF	Edible Fish	SOL	Soil
IDM	Dosimeters (TLD)	ESS	Sediment	SWA	Surface Water
SI	Special Interest	GAM	Game	-	-

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
01S1	I	N	0.55 mi. N side of road near ISFSI pad.	SI			FPL	
02S2a	I	NNE	0.41 mi. lamp pole 65 near HC switch yard	SB				
02S4	I	NNE	0.60 mi.; in the equipment laydown area	SB				
03S1	I	NE	0.58 mi.; behind refrigeration building	SB				
04S1	I, D	ENE	0.60 mi.; site access road near intersection to TB-02	SB				
05S1	I	E	0.86 mi.; site access road	SB	AIO, APT			
05S2	I,D	E	0.86 mi.; site access road, duplicate sample		AIO, APT			
06S2	I	ESE	0.23mi.; area around helicopter pad	SB				
07S1	I	SE	0.14 mi.; station personnel gate	SB				
07S2	I	SE	0.12 mi.; station personnel gate		AIO, APT	FPL		SOL
08S1	I	SSE	0.12 mi.; fuel oil storage	SB				
09S1	I	S	0.12 mi.; fuel oil storage	SB				
10S1	I	SSW	0.14 mi.; circulating water building	SB				

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
11S1	I	SW	0.09 mi.; circulating water building	SB				
12S1	I	WSW	0.09 mi.; outside security fence	SB				
13S1	I	W	0.09 mi.; outside security fence	SB				
14S1	I	NNW	0.10 mi.; outside security fence	SB				
15S1	I	NW	0.57 mi.; near river and HCGS barge slip	SB				
15S2	I	NW	0.59 mi.; near river and HCGS barge slip	SB	AIO, APT		FPL	
16S1	I	NNW	0.57 mi.; on road near fuel oil storage tank	SB			FPL	
16S2	SI	NNW	0.60 mi.; near security firing range	SI				
16S3	SI	NNW	1.0 mi.; consolidated spoils facility	SB				
06A1	I	ESE	0.27 mi., near shoreline			ESS		
11A1	I, D	SW	0.20 mi.; SGS outfall area			ESS,SWA	ECH,ESF	
11A1A	A	SE	0.15 mi.; Located in the plant barge slip area			SWA		
15A1	I	NW	0.65 mi.; HCGS outfall area			ESS		

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
16A1	I	NNW	0.24 mi.; South Storm Drain outfall			ESS		
12C1	C	WSW	2.5 mi.; West bank of Delaware River			ESS,SWA	ECH,ESF	
12C1A	A	WSW	3.7 mi.; Tip of Augustine Beach Boat Ramp			SWA		
04D2	I	ENE	3.7 mi.; Alloway Creek Neck Road	IR				
05D1	I	E	3.5 mi.; local farm along SGS/HCGS access road.	IR	AIO, APT			
10D1	I	SSW	3.9 mi.; Taylor's Bridge Spur, DE	IR			FPL	SOL
14D1	I	WNW	3.4 mi.; Bay View, DE	IR				
15D1	I	NW	3.8 mi ; Route 9, Augustine Beach, DE	IR				
02E1	I	NNE	4.4 mi.; local farm, NJ	IR				
03E1	I	NE	4.2 m; local farm, NJ	IR				WWA,GAM
07E1	I	SE	4.5 mi.; River Bank 1 mi. W of Mad Horse Creek			ESS,SWA	ESF	
7E1A	A	SE	8.9 mi.; Located at the end of Bayside Road, NJ			SWA		
11E2	I	SW	5.0 mi.; Route 9, DE	IR				

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
12E1	I	WSW	4.4 mi.; Thomas Landing, DE	IR				
13E1	I	W	4.2 mi.; Diehl House Lab, DE	IR				
13E3	I	W	5.0 mi.; local farm, DE				MLK	VGT,SOL,GAM
16E1	I	NNW	4.1 mi.; Port Penn, DE	IR	AIO, APT			SOL
01F1	I	N	5.8 mi.; Fort Elfsborg, NJ	OR	AIO, APT			
01F2	I	N	7.1 mi.; midpoint of Delaware River			SWA		
02F2	I	NNE	8.5 mi.; Salem Substation, Salem NJ	OR				
02F3	I	NNE	8.0 mi.; City of Salem, NJ Water and Sewage Dep					PWR, PWT
02F5	I	NNE	7.4 mi.; Salem High School, Salem, NJ	OR, SI				
02F6	I	NNE	7.3 mi.; PSE&G Training Center, Salem NJ	OR	AIO, APT			
02F9	I, D	NNE	7.5 mi.; Local Farm , Tilbury Rd, Salem, NJ					FPV, SOL
03F2	I	NE	5.1 mi.; Hancocks Bridge, NJ Munc Bldg	OR				
03F3	I	NE	8.6 mi.; Quinton Township Elem. School NJ	OR, SI				

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
03F8	I	NE	9.3 mi.; Circle M Orchard, NJ					FPV
04F2	I	ENE	6.0 mi.; Mays Lane, Harmersville, NJ	OR				
05F1	I	E	6.5 mi.; Canton, NJ	OR				SOL
06F1	I	ESE	6.4 mi.; Stow Neck Road, NJ	OR				
07F2	I	SE	9.1 mi.; Bayside, NJ	OR				
08F1	I	SE	9.7 mi.; Woodland Beach, DE	OR				
09F1	I, D	S	5.3 mi.; off Route #9, DE	OR				FPV
10F2	I	SSW	5.8 mi.; Route #9, DE	OR				
11F1	I	SW	6.2 mi.; Taylor's Bridge, DE	OR				
12F1	I	WSW	9.4 mi.; Townsend Elementary School, DE	OR				
13F2	I	W	6.5 mi ; Odessa, DE	OR				
13F3	I	W	9.3 mi.; Redding Middle School, Middletown, DE	OR, SI				
13F4	I	W	9.8 mi.; Middletown, DE	OR, SI				

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
14F2	I	WNW	6.7 mi.; Route 13 and Boyds Corner Rd, DE	OR				
14F4	I, D	WNW	8.0 mi.; local farm, DE				MLK	SOL, VGT, FPV
15F3	I	NW	5.4 mi., Port Penn Rd. at Pole Bridge Rd., DE	OR				
15F4	I, D	NW	7.0 mi.; local farm; Port Penn Road; DE					FPV
16F1	I	NNW	6.9 mi.; C&D Canal, DE			ESS, SWA		
16F1A	A	NNW	6.8 mi.; Located at the C&D Canal Tip, DE			SWA		
16F2	I	NNW	8.1 mi.; Delaware City Public School, DE	OR, SI				
01G1	I, D	NNE	10.9 mi.; Route 49, South Broadway, NJ				FPL	FPV
01G3	I	N	19 mi.; N. Church Street Wilmington, DE	C				
02G2	I, D	NNE	13.5 mi.; Local Farm; Pointers Auburn Road (Route 540), Salem, NJ					FPV
02G3	C	NNE	11.8 mi.; Local Milk Farm, NJ				MLK	VGT, SOL
03G1	I	NE	17 mi.; local farm, NJ	C				SOL

Table 5, Radiological Environmental Monitoring Program Sampling Locations

Specific information about the individual sampling locations are given in Tables 2, 3, and 4. Figures 2, 3, and 4 show the locations of sampling locations with respect to the Site.

All sample types are not required to be collected at all possible sites every year.

Site #	Measurement Type	Sector	Location Description	IDM (SB/IR/OR/C/SI)	Airborne	Waterborne	Ingestion	MA
10G1	I	SSW	12 mi.; Smyrna, DE	C				
14G1	C	WNW	11.8 mi.; Route 286, Bethel Church Road, DE	C	AIO,APT			
16G1	I	NNW	15 mi.; Wilmington Airport, DE	C				
03H1	I	NE	32 mi.; National Park, NJ	C				
03H5	C, D	NE	25 mi.; Farm Market, Route 77, NJ				FPL	FPV

TABLE 5 NOTATIONS:

Vegetable samples are not always collected in consecutive years from the same farmer due to crop rotation.

7.0 MAPS OF COLLECTION SITES

Figure 2, REMP Sample Locations (On-Site Sampling Locations To 1 Mile)

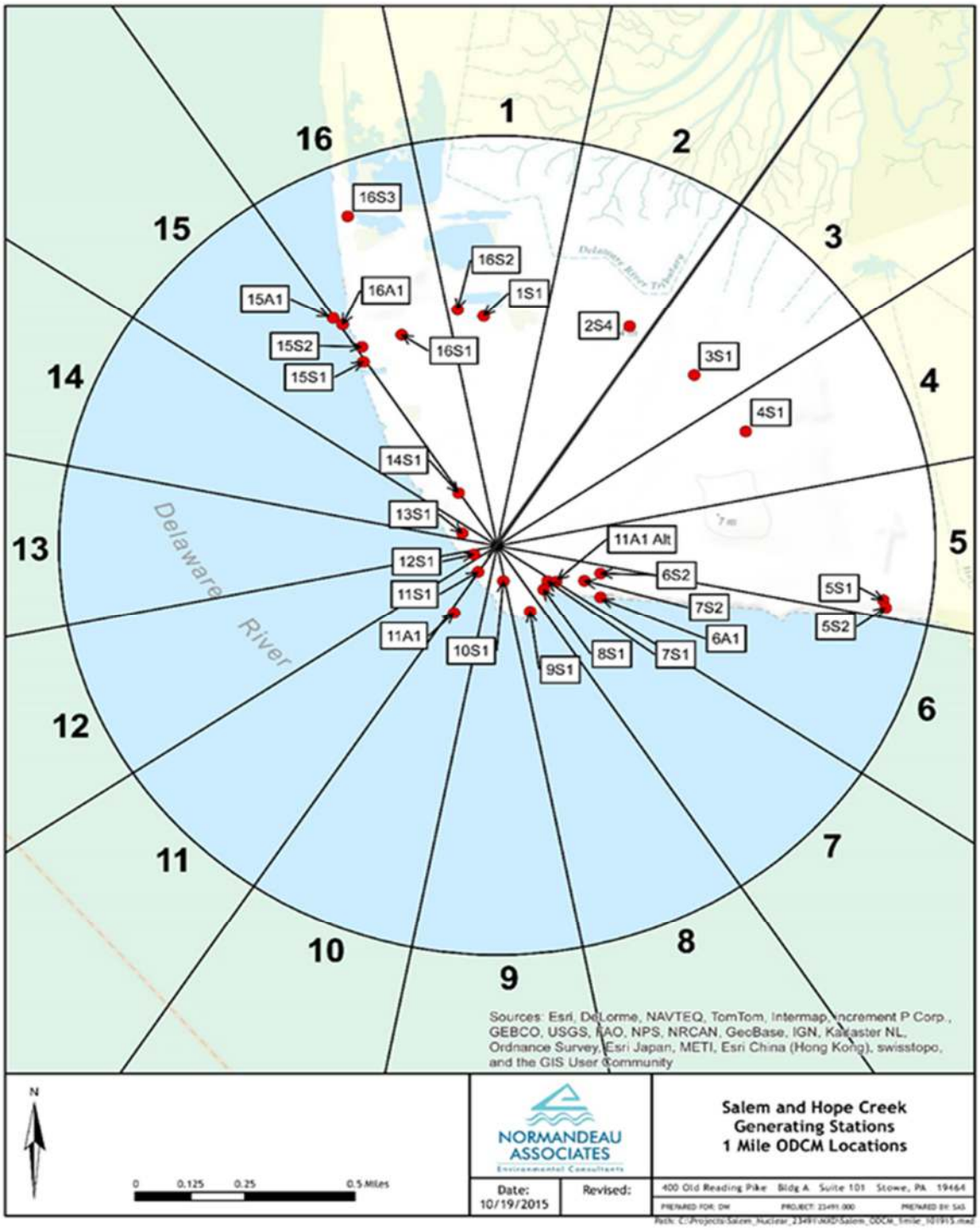


Figure 3, REMP Sample Locations (Off-Site Sampling Locations 1 to 10 Miles)

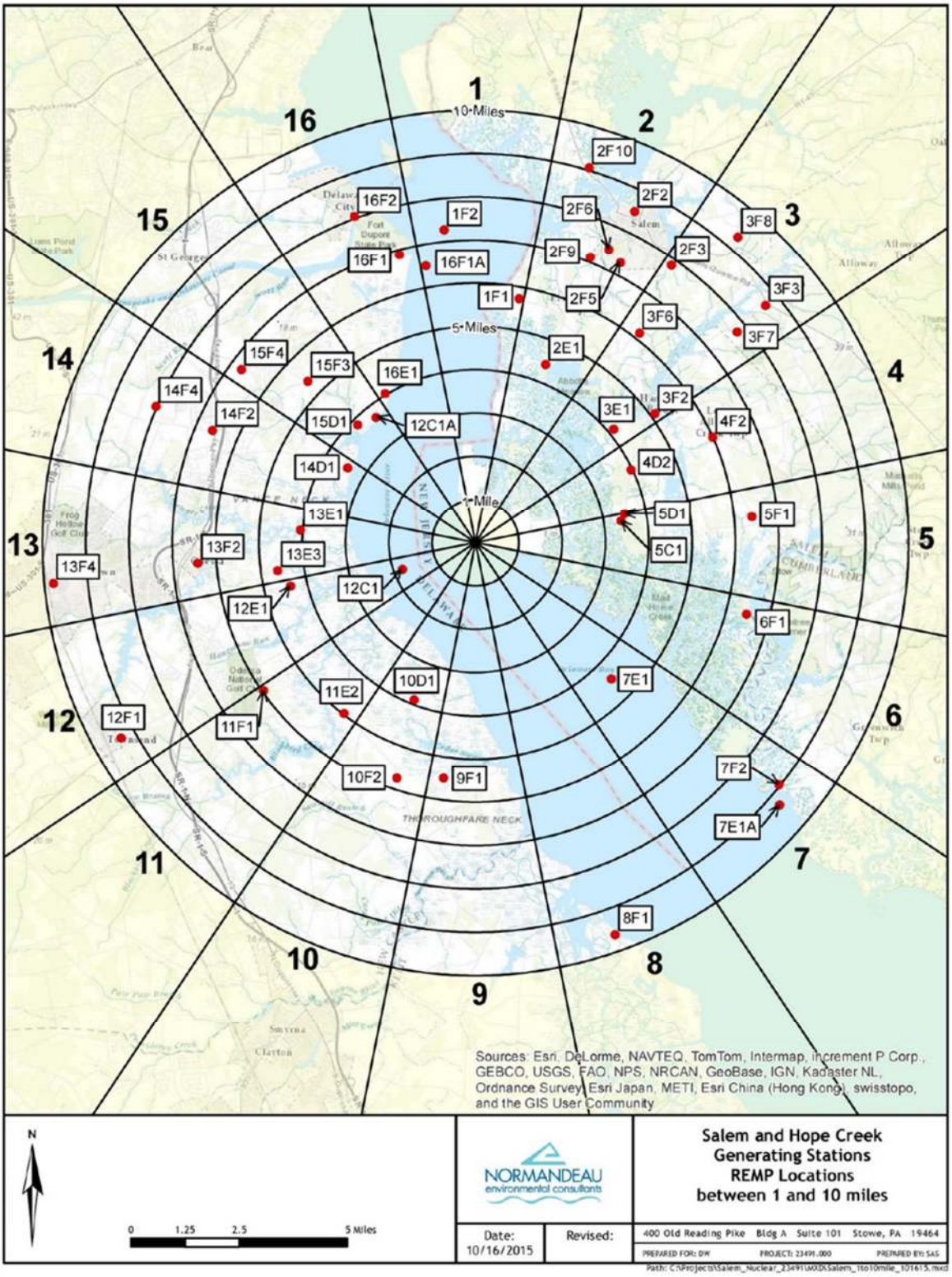
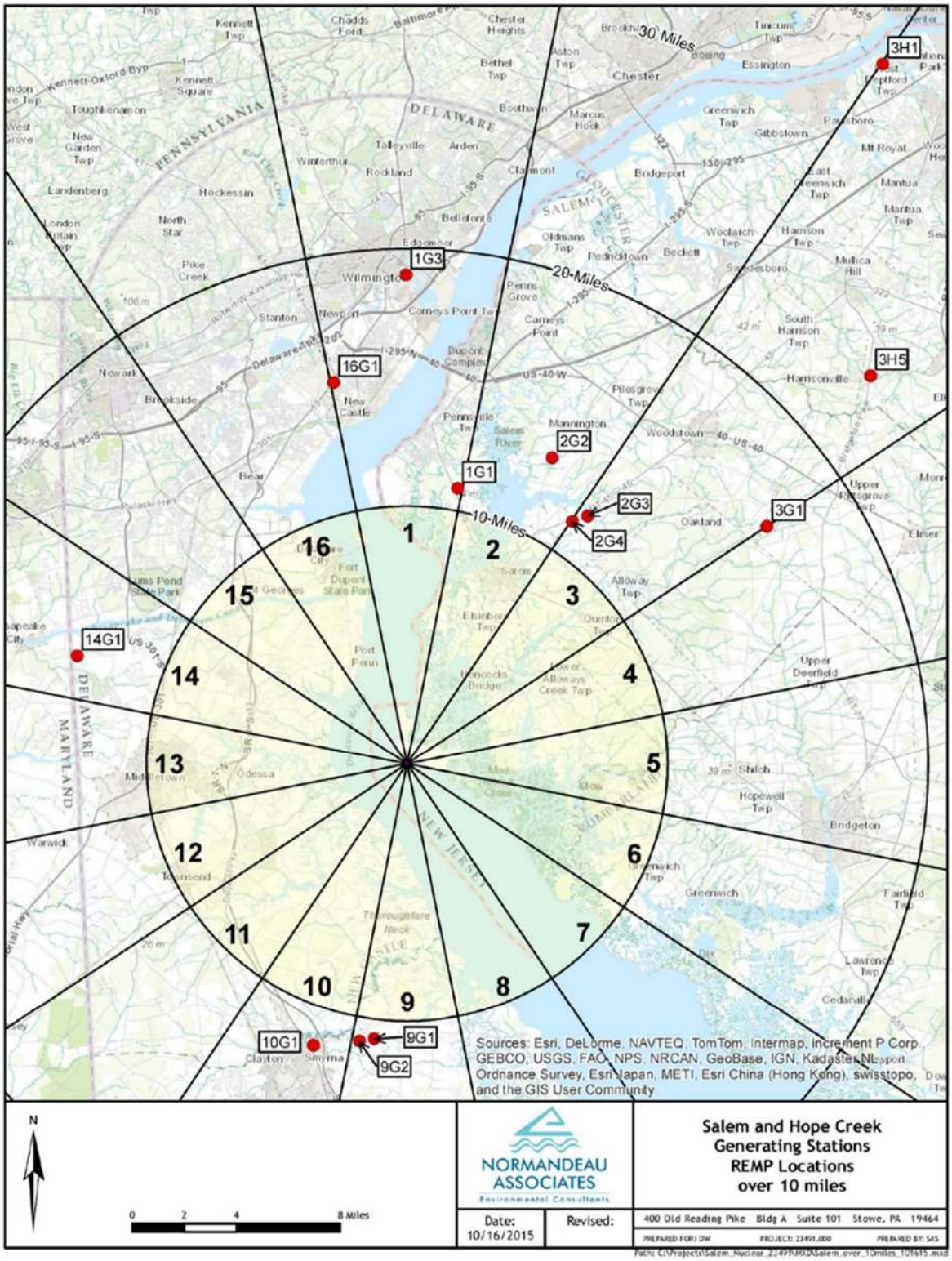


Figure 4, REMP Sample Locations (Off-Site Sampling Locations Greater Than 10 Miles)



8.0 REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Table 6, Reporting Levels for Radioactivity Concentrations in Environmental Samples

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)
H-3	30,000[2]	NA	NA	NA	NA
Mn-54	1,000	NA	30,000	NA	NA
Fe-59	400	NA	10,000	NA	NA
Co-58	1,000	NA	30,000	NA	NA
Co-60	300	NA	10,000	NA	NA
Zn-65	300	NA	20,000	NA	NA
Zr-Nb-95	400	NA	NA	NA	NA
I-131	20[3]	0.9	NA	3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200	NA	NA	300	NA

[2] **No** drinking water pathway exists on site or downstream. If a drinking water pathway existed, then the water reporting limit for H-3 would be 20,000 pCi/L.

[3] **No** drinking water pathway exists on site or downstream. If a drinking water pathway existed, then the reporting limit for I-131 would be 2 pCi/L.

Table 7, Lower Limits of Detection (LLD)

Radionuclide	Water (pCi/L)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/L)	Food Products (pCi/Kg-wet)	Sediment (pCi/Kg-dry)
Gross Beta	4	0.01	NA	NA	NA	NA
H-3	3,000[4]	NA	NA	NA	NA	NA
Mn-54	15	NA	130	NA	NA	NA
Fe-59	30	NA	260	NA	NA	NA
Co-58, Co-60	15	NA	130	NA	NA	NA
Zn-65	30	NA	260	NA	NA	NA
Zr-Nb-95	15	NA	NA	NA	NA	NA
I-131	15[5]	0.07	NA	1	60	NA
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15	NA	NA	15	NA	NA

[4] **No** drinking water pathway exists on site or downstream. If a drinking water pathway existed, then the maximum LLD value would be 2,000 pCi/L.

[5] **No** drinking water pathway exists on site or downstream. If a drinking water pathway existed, then the maximum LLD value would be 1 pCi/L.

9.0 SAMPLING PROGRAM, PROGRAM MODIFICATION AND INTEPRETATION OF RESULTS

At most nuclear stations, historical[6] data was collected prior to plant operation to determine background radioactivity levels in the environment. Annual data is routinely compared to preoperational and/or 10-year average values to determine if changes in the environs are present. Strict comparison is difficult to make due to fallout from historical nuclear weapon testing. Cesium-137 can be routinely found in environmental samples as a results of above ground nuclear weapons testing. It is important to note, levels of Cs-137 in environment are observed to fluctuate, for example as silt distributions shift due to natural erosion and transport processes, Cs-137 may or may not be observed in sediment samples. Results from samples collected and analyzed during the year, 2020, are described below.

In the following sections, results from direct radiation, air, water, and food products analyzed as part of REMP in 2020 will be discussed. Sampling program descriptions and deviations will also be discussed.

9.1 Environmental Direct Radiation Dosimetry Sample Results

Dose is measured as net exposure (field reading less transit reading) normalized over 91 days and relies on comparison of indicator locations to the control location to determine plant impact. During this calendar year 2020, a total of 236 samples were collected and analyzed in accordance with the requirements in Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne. There are different tools used to measure radiation exposure by measuring the intensity of visible light emitted from a sensitive crystal. Thermoluminescent Dosimeter (TLD) or Optical Stimulated Luminance Dosimeter (OSLD) can be used to measure radiation exposure. The SGS/HCGS direct radiation program uses TLD's. Environmental ODCM TLD results are compared by location to historical data to determine if results are within low and high ranges expected for each TLD location as shown in Table 8: TLD Average Sample Results Direct Radiation Summary.

Ambient radiation levels in the environment were monitored at locations on the Site and in the surrounding areas with pairs of passive dosimeters (PD) supplied and analyzed by Stamford Dosimetry/Environmental Dosimetry Co. Packets containing the PDs were placed in the owner-controlled area, around the Site at various distances, and in each land based meteorological sector. Six were placed in control locations and the balance of measurement locations were placed at areas of interest such as population centers, nearby residences, and schools.

[6] Preoperational or 10-year average data.

A total of 59 Immersion Dose Monitor (IDM) locations were established to monitor for direct radiation during 2020, including:

21 on-site locations:

01S1, 01S2, 02S2a, 02S4, 03S1, 04S1, 05S1, 06S2, 07S1, 08S1, 09S1, 10S1, 11S1, 12S1, 13S1, 14S1, 15S1, 15S2, 16S1, 16S2, and 16S3

27 off-site locations within the 10 mile zone:

04D2, 05D1, 10D1, 14D1, 15D1, 02E1, 03E1, 11E2, 12E1, 13E1, 16E1, 01F1, 02F2, 02F6, 03F2, 04F2, 05F1, 06F1, 07F2, 08F1, 09F1, 10F2, 11F1, 12F1, 13F2, , 14F2, and 15F3

5 areas of interest (population centers, nearby residences, and schools)

02F5, 03F3, 13F3, 13F4 and 16F2

6 control locations beyond 10 miles:

01G3, 03G1, 10G1, 14G1, 16G1, and 03H1.

The PDs at each location are changed and analyzed quarterly.

Two PDs (Panasonic type UD-814) are placed at each location. The laboratory utilizes a Panasonic based system using UD-814 dosimeters that are constructed of three rectangular, lead-shielded (protects against low-energy gamma radiation) teflon wafers, impregnated with 25% calcium sulfate phosphor ($CaSO_4$:Dy) to monitor gamma radiation. Additionally, each PD has one lithium borate (LiBO:Mn) element to monitor beta radiation (which is not used).

In 2019 PSEG implemented American National Standards Institute (ANSI) N13.37-2014 Environmental Dosimetry - Criteria for System Design and Implementation for comparing each PD location dose result to its historical background dose. Per the standard a well-functioning dosimetry system should be able to detect a 5 mrem difference in the quarterly data and a 10 mrem difference in the yearly data above background.

Two on site ISFSI locations 01S1 and 16S2 showed measurable dose rates above background as seen in Table 16, Direct and Immersion Radiation Measurements, 2020. The net dose radiation levels as measured by these site boundary locations ranged from 16.0 to 23.3 mrem/Standard Quarter and an annual dose of 88.8 mrem for Locations 01S1, and 71.7 mrem for Location 16S2.

Dose to the nearest resident due to direct radiation from ISFSI was calculated to be 0.008 mrem/yr, which is a very small fraction (0.03%) of the 25 mrem/yr limit per 40 CFR 190 and 10 CFR 72.104. Both regulations limit the dose to a real member of the public to 25 mrem in a year to the total body. The calculation was performed using the formula provided in ANSI/HPS N13.37-2014 as follows:

$$D_2 = OF * \left(\left(D_1 * R_1^{\,2} \right) / R_2^{\,2} \right)$$

Where:

D1 = Dose that was measured from TLD Location 16S2 (01S1 was also calculated and had a slightly lower dose)

D2 = Dose that will be extrapolated to Nearest Resident

R1 = Distance from the source to the location where D1 was obtained. (Distance from ISFSI to TLD at 16S2)

R2 = Distance from ISFSI to the location that dose will be extrapolated (Nearest Resident)

OF = Occupancy Factor (1 = full time)

Location	**R_1** (ft)	**D_1 Annual Net Dose** (mrem)	**R_2** (ft)	**OF**	**D_2 Annual Net Dose** (mrem)
Nearest Resident	203	71.7	19,536	1.0	7.74 E-03

Table 8: TLD Average Sample Results Direct Radiation Summary

Year	Average Inner Ring Gross Quarterly Dose* (0 - 5 Miles) *mR/QTR[1]*	Average Special Interest Gross Quarterly Dose* (Population) *mR/QTR[1]*	Average Outer Ring Gross Quarterly Dose* (5 - 10 Miles) *mR/QTR[1]*	Average Control Location Gross Quarterly Dose* (> 10 Miles) *mR/QTR[1]*
2011	14.5	15.2	14.8	14.8
2012	14.9	15.2	15.8	15.4
2013	13.4	14.2	14.3	14.2
2014	13.2	13.8	14.2	14.0
2015	13.0	13.5	13.9	13.8
2016	12.4	12.8	13.0	13.1
2017	12.8	13.6	13.5	13.6
2018	13.1	13.7	13.6	13.6
2019	12.5	13.4	13.5	13.5
2020	14.0	14.7	14.7	14.9
2020 Average Sample Net Quarterly Dose* ***mR/QTR[1]***	14.6			

* Gross quarterly dose is the observed field value minus transit and extraneous dose. However, this net dose is not a final net value because the location background has not yet been subtracted. With background subtracted in accordance with ANSI/HPS N13.37-2014, section 7.3.5, all values would be non-detect (ND).

1 QTR is a standard quarter, which is normalized over 91 days.

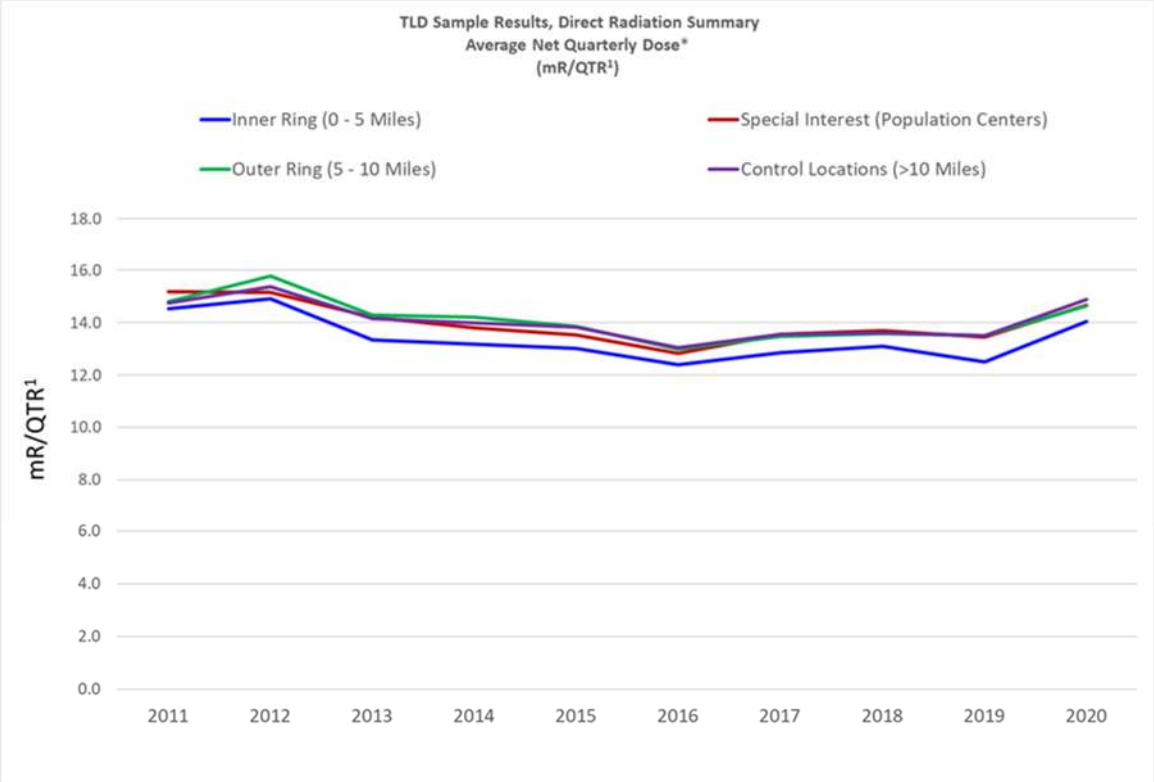


Figure 5, TLD Sample Results

9.2 Air Particulate and Radioiodine Sample Results

Air particulate filters and charcoal canisters were collected from locations specified in Table 2, Radiological Environmental Sampling Program – Exposure Pathway - Airborne. During this calendar year 2020, a total of 832 samples (416 particulate filters and 416 iodine cartridges) were collected and analyzed for gross beta, gamma emitters and iodine. Particulate samplers are used to analyze for gross beta activity following filter change out which occurs weekly. Gamma isotopic analysis is performed on composite samples collected at each location and is analyzed quarterly. Radioiodine (I-131) analysis is performed weekly at the community location.

APT (Air Particulate) samples were collected on glass fiber filters with low-volume air samplers sampling at approximately 1.5 SCFM. Air sample volumes were measured with calibrated dry-gas meters.

AIO samples (Air Iodine) were collected from the air by adsorption on triethylene-diamine (TEDA) impregnated charcoal cartridges connected in series after the APT filters.

9.2.1 Air Particulates

APT samples were collected weekly at seven indicator locations (05S1, 07S2, 15S2, 05D1, 16E1, 01F1, and 02F6), one duplicate location (05S2) and one control location (14G1). Each weekly sample collected was analyzed for gross beta by TBE. Quarterly composites of the weekly samples from each location were analyzed for specific gamma emitters. The duplicate air location sample was shipped to GEL for analysis (Table 13, Table 14, and Table 15).

9.2.2 Gamma Spectroscopy

Gamma spectroscopy was performed on each of the 32 quarterly composite samples. Naturally occurring Be-7 was detected and no other gamma emitters were detected in any of the samples.

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in all 28 indicator location composites at concentrations ranging from 41E-03 pCi/m3 to 83E-03 pCi/m3 with an average concentration of 61E-03 pCi/m3, and in the four control location composites ranging in concentration from 50E-03 pCi/m3 to 75E-03 pCi/m3 with an average concentration of 62E-03 pCi/m3. The maximum preoperational level detected was 330E-03 pCi/m3 with an average concentration of 109E-03 pCi/m3 (Table 9, Table 13 and RMC-TR-77-03 [21]).

9.2.3 Gross Beta

Gross beta activity was detected in all 364 of the indicator location samples at concentrations ranging from 5E-03 pCi/m3 to 27E-03 pCi/m3 with an average concentration of 12E-03 pCi/m3, and in 52 of 52 of the control location samples at concentrations ranging from 6E-03 pCi/m3 to 25E-03 pCi/m3 with an average of 12E-03 pCi/m3. Gross beta activity was less than ten times the yearly mean of control samples. Therefore, per the ODCM gamma isotopic analysis was not required to be performed on the individual samples. The maximum preoperational level detected was 920E-03 pCi/m3 with an average concentration of 74E-03 pCi/m3 (Table 9, Table 14 and RMC-TR-77-03 [21]). See Figure 4.

9.2.4 Air Iodine

AIO were collected weekly at seven indicator locations (05S1, 07S2, 15S2, 05D1, 16E1, 01F1, and 02F6), one duplicate location (05S2) and one control location (14G1). The duplicate air location sample was shipped to GEL for analysis. Each sample was analyzed by TBE for I-131, and all 416 samples were less than the MDC for both indicator and control samples during the Reporting Period. The maximum preoperational level detected was 42E-03 pCi/m3 (Table 9, Table 15 and RMC-TR-77-03 [21]).

Table 9: Air Particulate and Radioiodine Comparison of Current Year and Historic Data

Analysis	Preoperational Data (pCi/m^3)	2020 Sample Result Average (pCi/m^3)
Gamma	109E-03	61E-03
Beta	74E-03	12E-03
Iodine	42E-03	< MDC

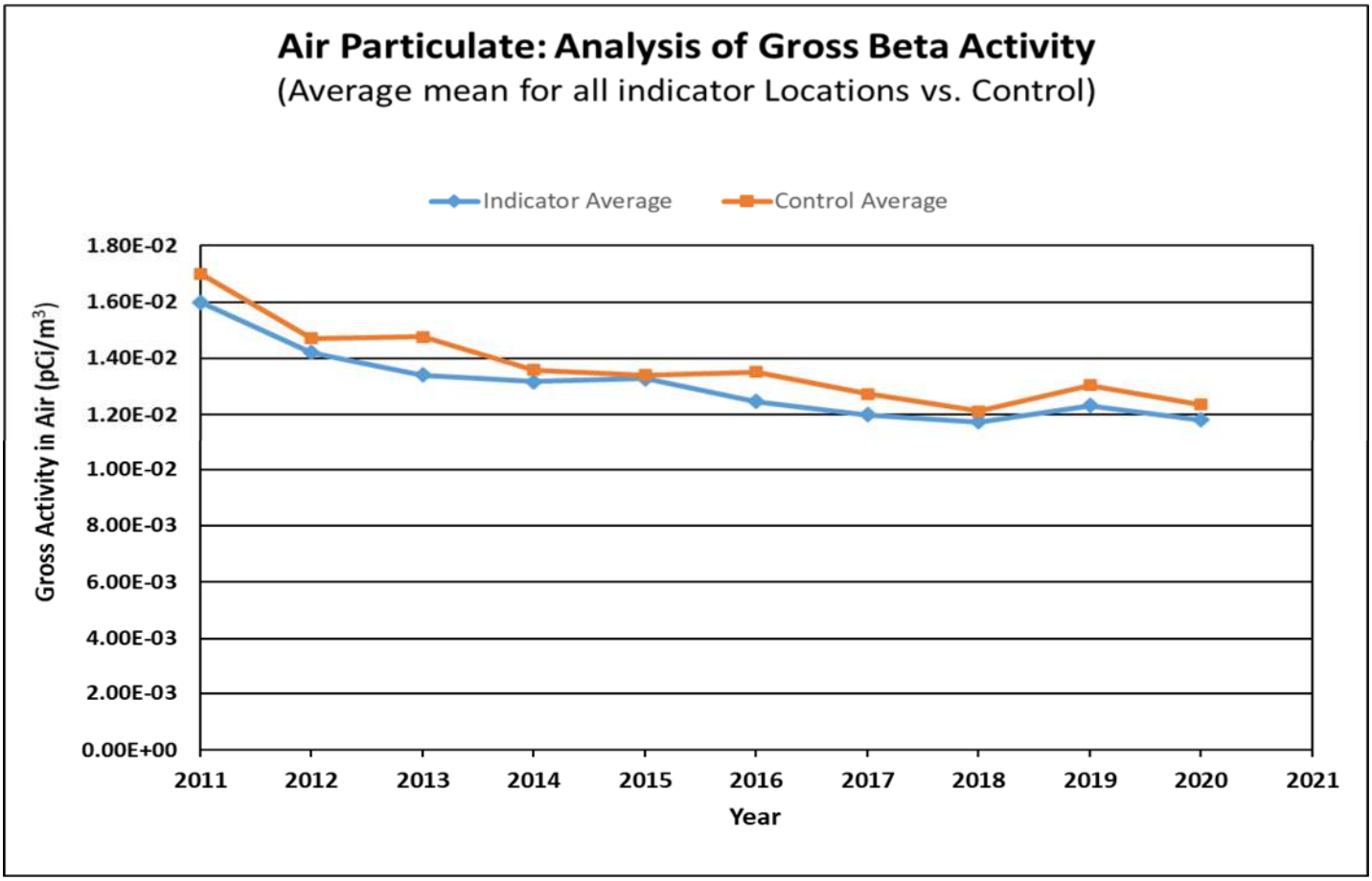


Figure 6: Air Particulate: Analysis for Gross Beta, Average Mean for All Indicator Vs. Control

Air particulate and radioiodine results from this monitoring period, 2020, were compared to preoperational data as shown in Table 9 and Figure 6, and there were no significant changes.

9.3 Waterborne Sample Results

9.3.1 Surface Water

Surface water samples were collected twice a month at four indicator locations and one control location in the Delaware River Estuary. The two samples for the month were combined to create a single monthly composite sample that was then analyzed. One location (11A1) is at the outfall area (which is the area potentially impacted by effluents discharged from the Site into the Delaware River), one location is downstream from the outfall area (07E1), and one location is directly west of the outfall area at the mouth of the Appoquinimink River (12C1). Samples were collected upstream in the Delaware River (01F2) and at the mouth of the Chesapeake and Delaware Canal (16F1) the latter being sampled when the flow was from the Canal into the river.

Surface water samples were collected offshore in new polyethylene containers that were rinsed twice with the sample medium prior to collection. The surface water samples were transported to TBE for analysis.

Location 12C1, located directly west of the Site, at the mouth of the Appoquinimink River, serves as the control. 12C1 was chosen as the control location because the physical characteristics of this location more closely resemble those of the outfall area than do those at the farther upstream location (01F2). As discussed in the preoperational summary report, due to its tidal nature, there were flow rate and salinity variations in the Delaware River Estuary. These variations accounted for the differences in K-40 concentrations.

During this calendar year 2020, a total of 60 surface water samples were collected and analyzed in accordance with the requirements of Table 3, Radiological Environmental Sampling Program – Exposure Pathway - Waterborne.

1. Tritium

Tritium activity was detected in 1 of the 48 indicator and none of the 12 control location samples (Order 80126317-120). The occurrence was from a sample collected at location 11A1. The detected concentration was 827 pCi/L. The maximum preoperational level detected was 600 pCi/L, with an average concentration of 210 pCi/L (Table 27 and RMC-TR-77-03 [21]). See Figure 7 for graphical presentation.

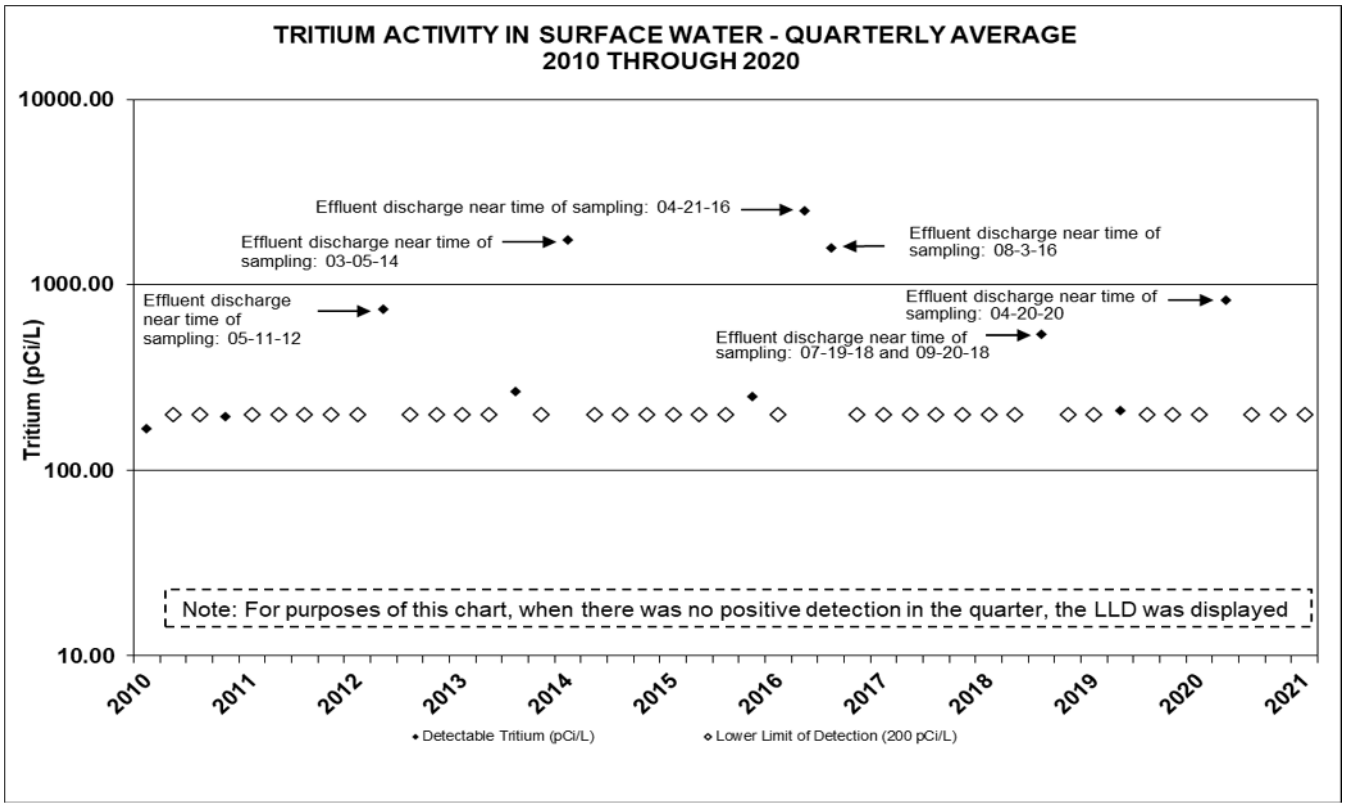


Figure 7: Surface Water Tritium Results

2. Gamma Spectroscopy

No plant related gamma emitters were detected above the MDC in any of the indicator or control surface water samples.

Naturally occurring K-40 was detected in 16 of the 48 indicator location samples at concentrations ranging from 42 pCi/L to 126 pCi/L, with an average of 92 pCi/L. K-40 was detected in 3 of the 12 control location samples at an average concentration of 81 pCi/L. The maximum preoperational level detected for K-40 was 200 pCi/L with an average concentration of 48 pCi/L (Table 28 and RMC-TR-77-03 [21]).

3. I-131Low Level

I-131 was not detected above the MDC in any of the 48 indicator samples or in any of the control location samples (Table 28).

9.3.2 Potable Water (Drinking Water)

Both raw and treated potable water samples were collected and composited at the local water treatment facility. Each sample consisted of weekly aliquots composited into a monthly sample. The raw water source for this plant is a combination of surface water from Laurel Lake and groundwater from its adjacent wells. These are Management Audit samples as no liquid effluents discharged from the Site directly affect this pathway.

1. Gross Alpha

No Gross alpha activity was detected above the MDC in any of the raw or treated water samples. The maximum preoperational level detected was 2.7 pCi/L (Table 20 and RMC-TR-77-03 [21]).

2. Gross Beta

Gross beta activity was detected in all 12 of the raw and 12 treated water samples. The concentrations for the raw samples ranged from 4.6 pCi/L to 10.2 pCi/L, with an average concentration of 7.3 pCi/L. Concentrations for the treated water ranged from 5.1 pCi/L to 10.2 pCi/L, with an average concentration of 8.1 pCi/L. The maximum preoperational level detected was 9.0 pCi/L with an average concentration of 4.2 pCi/L (Table 20 and RMC-TR-77-03 [21]).

3. Tritium

Tritium activity was not detected above the MDC in any of the 12 raw or 12 treated water samples. The maximum preoperational level detected was 350 pCi/L with an average of 179 pCi/L (Table 20 and RMC-TR-77-03 [21]).

4. I-131

I-131 activity was not detected above the MDC in any of the 12 raw or 12 treated water samples. No preoperational data were available for comparison, since I-131 was not analyzed as a specific radionuclide prior to 1989. However, I-131 analytical results to date have been below the MDC (Table 21 and RMC-TR-77-03 [21]).

5. Gamma Spectroscopy

No plant related gamma emitters were detected above the MDC in any of the 24 potable water samples. Naturally occurring K-40 was detected in 1 of the 12 treated samples at 61 pCi/L. No preoperational data were available for comparison. Naturally occurring Ra-226 was not detected in any raw or treated water samples. The maximum preoperational level detected for Ra-226 was 1.4 pCi/L (Table 21 and RMC-TR-77-03 [21]).

9.3.3 Well Water (Ground Water)

Although offsite wells in the vicinity of the Site are not directly affected by plant operations, well water samples were collected monthly from one farm (03E1). Samples from this well are considered Management Audit samples.

1. Gross Alpha

Gross alpha activity was not detected above the MDC in any of the 12 well water samples. The maximum preoperational level detected was 9.6 pCi/L (Table 18 and RMC-TR-77-03 [21]).

2. Gross Beta

Gross beta activity was detected in 2 of the 12 well water samples. Concentrations ranged from 3.2 pCi/L to 4.1 pCi/L with an average concentration of 3.7 pCi/L. The preoperational results ranged from <2.1 pCi/L to 38 pCi/L, with an average value of 9 pCi/L (Table 18 and RMC-TR-77-03 [21]).

3. Tritium

Tritium activity was not detected above the MDC in any of the 12 well water samples. The maximum preoperational level detected was 380 pCi/L (Table 18 and RMC-TR-77-03 [21]).

4. I-131

I-131 activity was not detected in any of the 12 well water samples. No preoperational data were available for comparison, since I-131 was not analyzed as a specific radionuclide prior to 1989. However, I-131 analytical results to date have been below the MDC (Table 19 and RMC-TR-77-03 [21]).

5. Gamma Spectroscopy

No plant related gamma emitters were detected above the MDC in any of the indicator or control location well water samples. Naturally occurring K-40 was not detected in any of the well water samples. The maximum preoperational levels detected were 30 pCi/L (Table 19 and RMC-TR-77-03 [21]).

9.3.4 Sediment

Sediment samples were collected semi-annually from six indicator locations and one control location. Location 06A1 was the only shoreline sediment sample location that was directly subjected to tidal fluctuations. The remaining locations were located offshore.

Sediment samples were taken with a bottom grab sampler and frozen in sealed polyethylene containers before being transported in ice chests to TBE. For the river bottom sediment, a marine GPS was used to locate the correct site and the sampling boat was maneuvered over the area until the correct amount of sample was obtained (grabbed) with the sediment dredge.

Location 06A1 shoreline sediment sample (an onsite location) was sampled as follows: A square area, measuring one meter on each side was staked out and then divided into a grid of nine smaller boxes, three per side. A one inch deep scoop from the center of each of the small grids was taken. All the aliquots were combined and the total sample transported in the ice chest to TBE and analyzed for gamma emitters.

Naturally occurring K-40 was detected in all 12 indicator location samples at concentrations ranging from 2,479 pCi/kg (dry) to 17,790 pCi/kg (dry), with an average concentration of 6,923 pCi/kg (dry). Both control locations samples had concentrations of 16,730 pCi/kg (dry) and 17,440 pCi/kg (dry) with an average concentration of 17,085 pCi/kg (dry). The maximum preoperational level detected was 21,000 pCi/kg (dry) with an average concentration of 15,000 pCi/kg (dry) (Table 31 and RMC-TR-77-03 [21]).

Cs-137 was not detected in any of the indicator or control samples. The maximum preoperational level detected was 400 pCi/kg (dry) with an average concentration of 150 pCi/kg (dry) (Table 31 and RMC-TR-77-03 [21]).

Naturally occurring Ra-226 was detected in 2 of the 12 indicator location samples at concentrations ranging from 1,442 pCi/kg (dry) to 2,492 pCi/kg (dry) with an average concentration of 1,967 pCi/kg (dry) and was not detected above the MDC in the control location samples. The maximum preoperational level detected was 1,200 pCi/kg (dry) with an average concentration of 760 pCi/kg (dry) (Table 31 and RMC-TR-77-03 [21]).

Naturally occurring Th-232 was detected in 6 of the 12 indicator location samples at concentrations ranging from 340 pCi/kg (dry) to 837 pCi/kg (dry) with an average concentration of 542 pCi/kg (dry), and in both of the control location samples at concentrations of 756 pCi/kg (dry) and 770 pCi/kg (dry) with an average concentration of 763 pCi/kg (dry). The maximum preoperational level detected was 1,300 pCi/kg (dry) with an average concentration of 840 pCi/kg (dry). All other gamma emitters were less than the MDC (Table 31 and RMC-TR-77-03 [21]).

9.4 Ingestion Pathway Sample Results

9.4.1 Milk

Milk samples (MLK) were taken semi-monthly when cows were on pasture and monthly when cows were not grazing on open pasture, from three indicator locations (13E3, 14F4, 02G3) and one control location (03G1). Animals were considered on pasture from April to November of each year. Samples were collected in new polyethylene containers, sodium bisulfite was added as a sample preservative, and then samples were frozen and transported in ice chests to TBE. Each sample was analyzed for I-131 and gamma emitters.

There is no dairy farm within three miles of the Site, and there is only one dairy farm within five miles (13E3). Therefore, broadleaf vegetation is grown, maintained, and harvested monthly during the growing season.

1. I-131

I-131 was not detected above MDC in any of the 46 samples analyzed. The maximum preoperational level detected was 65 pCi/L, which occurred following a period of atmospheric nuclear weapons tests (Table 17 and RMC-TR-77-03 [21]).

2. Gamma Spectroscopy

No plant related gamma emitters were detected above the MDC in any of the indicator or control location milk samples.

Naturally occurring K-40 was detected in all 46 milk samples with concentrations for the 26 indicator location samples ranging from 1,027 pCi/L to 1,614 pCi/L with an average concentration of 1,317 pCi/L, and the 20 control location sample concentrations ranging from 989 pCi/L to 1,577 pCi/L, with an average concentration of 1,266 pCi/L. The maximum preoperational level detected was 2,000 pCi/L with an average concentration of 1,437 pCi/L ((Table 17 and RMC-TR-77-03 [21]).

9.4.2 Fish and Invertebrates

A total of 18 fish and invertebrate samples were analyzed in 2020, for gamma emitting radionuclides in accordance with requirements of Table 4: Radiological Environmental Sampling Program – Exposure Pathway - Ingestion. These samples are collected from the indicator and control areas as required by the ODCM.

1. Fish

Edible species of fish were collected semi-annually at two indicator locations and one control location and analyzed for gamma emitters in edible flesh. Sample species collected in 2020 were white perch, striped bass, bluefish, channel catfish, white and catfish (non-specific). Edible fish were collected using gill nets while crabs were caught in commercial traps. These samples were processed by separating the flesh from the bone and shell. The flesh was placed in sealed containers and frozen before being transported in ice chests to TBE for analysis.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location fish samples. Naturally occurring K-40 was detected in all 8 indicator location samples at concentrations ranging from 2,865 pCi/kg (wet) to 4,954 pCi/kg (wet) with an average concentration of 3,829 pCi/kg (wet). All 6 control location samples had concentrations ranging from 2,656 pCi/kg (wet) to 5,259 pCi/kg (wet), with an average of 3,857 pCi/kg (wet). The maximum preoperational detection was 13,000 pCi/kg (wet) with an average concentration of 2,900 pCi/kg (wet) (Table 29 and RMC-TR-77-03 [21]).

2. Blue Crab

Blue crab samples were collected twice during the season at one indicator and one control location. The edible portions were analyzed for gamma emitters.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location blue crab samples. Naturally occurring K-40 was detected in both indicator location samples at concentrations of 2,857 pCi/kg (wet) and 3,178 pCi/kg (wet) with an average concentration of 3,018 pCi/kg (wet). Both control location samples had concentrations of 2,546pCi/kg (wet) and 3,402 pCi/kg (wet), with an average concentration of 2,974 pCi/kg (wet). The maximum preoperational level for K-40 detected was 12,000 pCi/kg (wet) with an average concentration of 2,835 pCi/kg (wet). All other gamma emitters were less than the MDC (Table 30 and RMC-TR-77-03 [21]).

9.4.3 Vegetation

A total of 50 food samples were analyzed in 2020, for gamma emitting radionuclides in accordance with requirements of Table 4, Radiological Environmental Sampling Program – Exposure Pathway - Ingestion.

Locally grown vegetables (FPV) were collected at the time of harvest at six locations (02F9, 03F8, 15F4, 01G1, 02G2, and 03H5); fodder crops (VGT) were sampled at three locations (13E3, 14F4, and 02G3); and broad leaf vegetation (FPL) was sampled at five locations (01S1, 07S2, 15S2, 16S1, and 10D1). The vegetables and fodder samples are additional samples (Management Audit) taken to enhance the radiological monitoring program.

1. Broadleaf Vegetation

Broadleaf vegetation samples were collected since there were no dairy farms operating within the five km (three mile) radius of the Site. The closest dairy farm (13E3) was located in Odessa, DE at 5.0 miles to the West.

All samples were analyzed for gamma emitters and included cabbage, broccoli, hosta, and lambs ear. These samples were obtained from five indicator locations (23 samples) and one control locations (1 samples). The results for these samples are discussed below.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location broadleaf vegetation samples.

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected above the MDC in 13 of the 23 indicator location samples with concentrations ranging from 592 pCi/kg (wet) to 2,697 pCi/kg (wet), with an average concentration of 1,268 pCi/kg (wet). Be-7 was not detected in the control location sample. No preoperational Be-7 data was available for comparison (Table 22).

Naturally occurring K-40 was detected in all 23 indicator samples, with concentrations ranging from 2,493 pCi/kg (wet) to 11,130 pCi/kg (wet) with an average concentration of 5,323 pCi/kg (wet), and in the control location sample at 2,220 pCi/kg (wet). The maximum preoperational level detected was 4,800 pCi/kg (wet) with an average concentration of 2,140 pCi/kg (wet) (Table 22 and RMC-TR-77-03 [21]).

Naturally occurring Th-232 was detected in 2 of the 23 indicator samples, with concentrations ranging from 89 pCi/kg (wet) to 127 pCi/kg (wet) with an average concentration of 108 pCi/kg (wet). Th-232 was not detected in the control location sample (Table 22).

2. Vegetables

There are no farm products that are irrigated with water in which plant effluents have been discharged. The Delaware River at the location of the Site is brackish and therefore is not used for irrigation.

A variety of food products were sampled on and around the Site; however, the variety was dependent on the farmer's preference. These vegetables were collected as Management Audit samples.

All samples were analyzed for gamma emitters and included asparagus, sweet corn, peppers, tomatoes, and peaches. These samples were obtained from seven indicator locations (20 samples). The results for these samples are discussed below.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location vegetable samples.

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was not detected above the MDC in any of the vegetable samples.

Naturally occurring K-40 was detected in all 20 indicator samples, with concentrations ranging from 1,197 pCi/kg (wet) to 3,076 pCi/kg (wet) with an average concentration of 2,070 pCi/kg (wet). The maximum preoperational level detected was 4,800 pCi/kg (wet) with an average concentration of 2,140 pCi/kg (wet) (Table 23 and RMC-TR-77-03 [21]).

3. Fodder Crops

Although not required by the Site ODCMs, three samples of silage normally used as cattle feed were collected from three indicator locations. It was determined that these products could be an element in the food-chain pathway. These fodder crops were collected as Management Audit samples and analyzed for gamma emitters. All three locations from which samples were collected are milk sampling locations.

No plant related gamma emitters were detected above the MDC in any of the indicator or control location fodder crop samples. Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in all of the three indicator samples ranging from 588 pCi/kg (wet) to 1,716 pCi/kg (wet) with an average concentration of 974 pCi/kg (wet). The maximum preoperational level detected for fodder was 4,700 pCi/kg (wet) with an average concentration of 2,000 pCi/kg (wet) (Table 24 and RMC-TR-77-03 [21]).

Naturally occurring K-40 was detected in all three indicator samples at concentrations ranging from 2,904 pCi/kg (wet) to 7,663 pCi/kg (wet) with an average concentration of 4,700 pCi/kg (wet). Preoperational results averaged 7,000 pCi/kg (wet) (Table 24 and RMC-TR-77-03 [21]).

4. Game

Although not required by the Site ODCMs, three muskrat samples were collected from three indicator locations. The game samples were collected as Management Audit samples and analyzed for gamma emitters.

No plant related gamma emitters were detected above the MDC in any of the indicator game samples. Naturally occurring K-40 was detected in all 3 samples at concentrations ranging from 2,611 to 3,140 pCi/kg (wet) with an average concentration of 2,840 pCi/kg (wet). No preoperational data was available for comparison (Table 26 and RMC-TR-77-03 [21]).

9.4.4 Soil

Soil is sampled every three years and analyzed for gamma emitters. Nine locations were sampled in 2019. These Management Audit samples were collected in areas that have been relatively undisturbed since the last collection in order to determine any change in the radionuclide inventory of the area.

The 2019 samples had naturally occurring K-40 was detected in all nine indicator samples at concentrations ranging from 4,610 to 14,410 pCi/kg (dry) with an average concentration of 9,376 pCi/kg (dry). The maximum preoperational level detected was 24,000 pCi/kg (dry) with an average of 10,000 pCi/kg (dry).

When soil was last collected in 2019, Cs-137 was detected in three of the nine indicator samples at concentrations ranging from 82 to 231 pCi/kg (dry) with an average concentration of 155 pCi/kg (dry). The maximum preoperational level detected was 2,800 pCi/kg (dry) with an average of 800 pCi/kg (dry). See Figure 2 for graphical presentation.

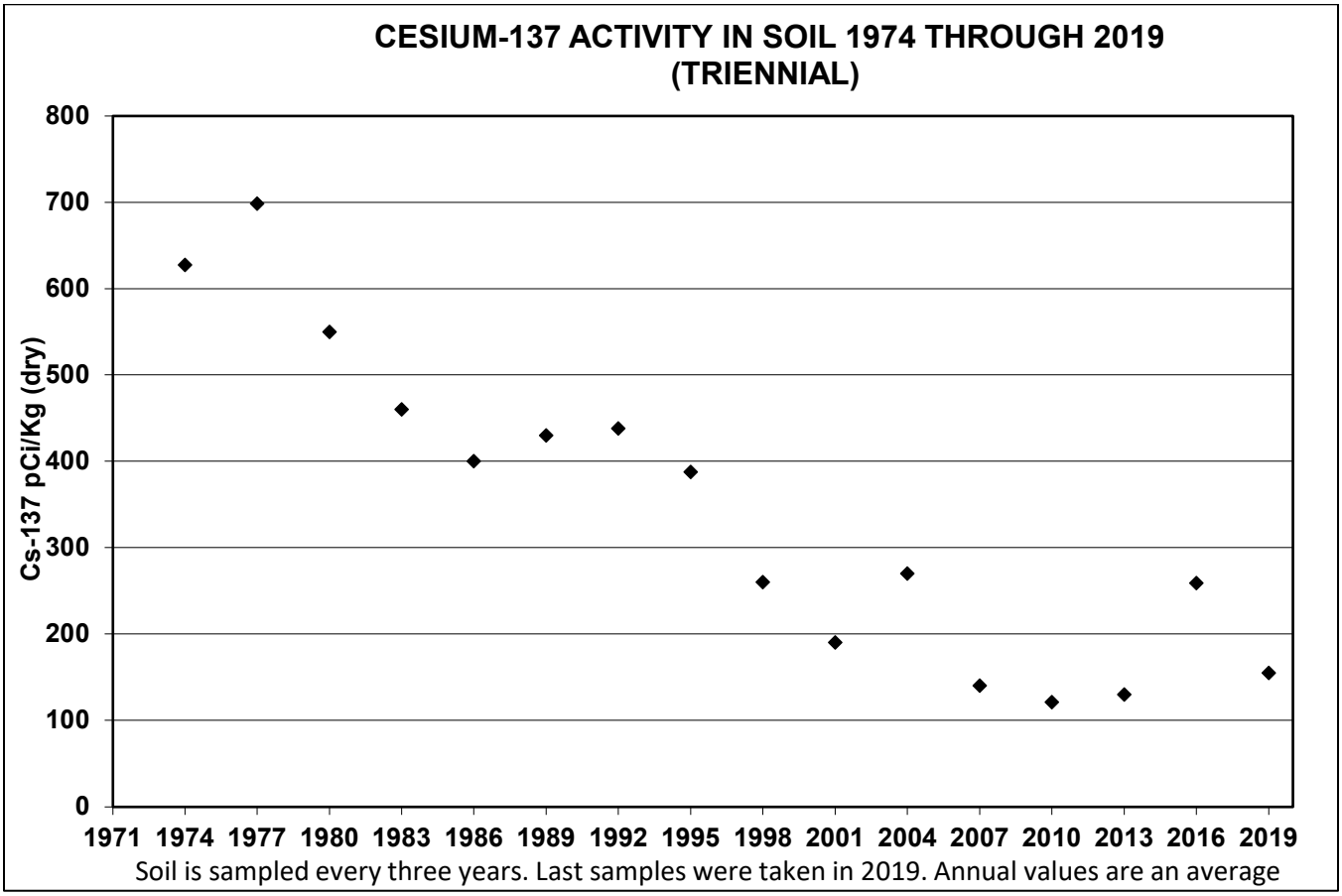


Figure 8, Cesium-137 Activity in Soil 1974 Through 2019

Historically, Cs-137 has been observed in REMP soil samples and attributed to weapons testing. The values observed in these samples are consistent with prior results, and are below the NRC's predicted values of Cs-137 for the New Jersey area soils as a result of fallout from atmospheric weapons testing. Furthermore, the analyzed samples were at concentrations many orders of magnitude above the theoretical impact by plant operation given the Cs-137 concentrations in plant effluents back through 2005.

Additionally, soil is not a formal component of the REMP, nor is it required to be collected as part of the REMP in accordance with the ODCM; it is collected as a REMP Management Audit sample. As such, the ODCM specifies no reportability or LLD thresholds for soil samples. PSEG REMP Implementation procedure, Attachment 1 (Analytical Results Investigation Levels) provides an investigation threshold of 1,000 pCi/kg for Cs-137 in soil and sediment, which is based on the expected concentrations for our region from sources other than plant operation as recognized by the NRC in DOCKET NO.50-219, RFTA NO. 99-040.

This evaluation validated suppositions and will appropriately characterize positive sample results obtained in future sampling evolutions as related to atmospheric testing, provided that:

- Soil concentrations are less than 1,000 pCi/kg
- Annual gaseous Cs-137 effluents are reviewed and do not show a significant increase
- Cs-134 is not detected (Cs-134 is plant related and has a much shorter half-life than Cs-137)
- D/Q values continue to be routinely evaluated and are updated as necessary

For the above reasons, it can be concluded that the samples are primarily the result of atmospheric testing, with negligible contribution from site operations at PSEG Nuclear's three reactors.

Although it has been concluded the Cs-137 in the soil is due to fallout from atmospheric weapons testing, there is essentially no radiological impact to the environment or a member of the public with respect to the annual dose. To demonstrate this, a skin dose calculation was performed for a theoretical person who stood on the soil at location 05F1 for 1,000 hours per year (arbitrary number). This calculation concluded the dose to a member of the public beyond the site boundary would be a mere 2.70E-1 mrem/yr (1.8% of the annual skin dose limit of 15 mrem/yr), which conforms to 10 CFR 50 Appendix I. Since this activity has been determined to be non-site related, a better comparison is the calculated skin dose against background radiation levels (or approximately 0.1% of the 300 mrem/yr background dose).

Naturally occurring Ra-226 was detected in three of the nine indicator samples at concentrations ranging from 2,090 to 4,079 pCi/kg (dry) with an average concentration of 2,901pCi/kg (dry). The maximum preoperational level detected was 1,500 pCi/kg (dry) with an average of 870 pCi/kg (dry).

Naturally occurring Th-232 was detected in all of the nine indicator samples at concentrations ranging from 387 to 1,007 pCi/kg (dry) with an average concentration of 678 pCi/kg (dry). The maximum preoperational level detected was 1,400 pCi/kg (dry) with an average of 740 pCi/kg (dry).

The analysis of data and review of industry reports indicates that the non-naturally occurring activity found in the soil samples associated with the 2019 triennial REMP soil collection could not be just from Salem and Hope Creek effluents, and likely are from atmospheric weapons testing.

10.0 LAND USE CENSUS EXPOSURE PATHWAY

Annual Land Use Census required by the Offsite Dose Calculation Manual is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and modifications to REMP are made if required by changes in land use. Land use census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR50. "A land use census shall be conducted and shall identify within a distance of 8 km (5 mi.) the location, in each of the 16 meteorological sectors, of the nearest milk animal, the nearest residence and the nearest garden of greater than 50m^2 (500 ft^2) producing broad leaf vegetation." Note, per NUREG 1301/1302, Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census.

A Land Use Census was conducted during the calendar year, 2020, within the growing season to identify changes in land use, receptor locations, and new exposure pathways. The results for the 2020 Land Use Census are listed in Table 10: Land Use Census – Nearest Residence within 5 miles. In summary, the highest D/Q locations for nearest garden, nearest residence and nearest milk animal did not change following the 2020 census.

Table 10: Land Use Census – Nearest Residence within 5 miles

Sector	Direction	Nearest Residence (Miles)	Nearest Milk Animal (Miles)	Garden (Miles)	Meat Animal Distance (Miles)
1	N	None	None	None	None
2	NNE	5.0	None	None	None
3	NE	3.9	None	None	None
4	ENE	3.9	None	None	None
5	E	None	None	None	None
6	ESE	None	None	None	None
7	SE	None	None	None	None
8	SSE	None	None	None	None
9	S	None	None	None	None
10	SSW	3.9	None	None	None
11	SW	4.3	None	None	None
12	WSW	4.4	None	None	None
13	W	4.0	5.0	None	None
14	WNW	3.4	None	None	None
15	NW	3.7	None	None	None
16	NNW	4.2	None	None	None

11.0 SAMPLE DEVIATIONS, ANOMALIES AND UNAVAILABILITY

Sampling and analysis are performed for media types addressed in the Offsite Dose Calculation Manual. Sampling and analysis challenges may be experienced due to a multitude of reasons including environmental factors, loss of TLDs, contamination of samples etc. To aid classification of sampling and analysis challenges experienced in 2020, the following three terms are used to describe the issues: Sample Anomalies (SA), Sample Deviation (SD), and Unavailable Samples (US).

Media that experienced downtime (i.e., air samplers or water samplers) during a surveillance period are classified a "Sample Deviation". "Sample Anomalies" are defined as errors that were introduce to a sample once it arrived in the laboratory, errors that prevents the sample from being analyzed as it normally would, or may have altered the outcome of the analysis (i.e., cross contamination, human error).

"Sample Unavailability" are defined as sample collection evolution with no available sample (i.e., food crop, TLD).

All required samples were collected and analyzed as scheduled except for the following:

Table 11: Sample Deviation Summary

Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for preventing reoccurrence
APT/AIO	Gross β Iodine	5S2	3/16/20 – 3/23/20	Tripped GFCI	Reset GFCI
APT/AIO	Gross β Iodine	14G1	4/20/20 -4/27/20	Blown Fuse	Replaced fuse
APT/AIO	Gross β Iodine	2F6	6/8/20 – 6/15/20	Blown Fuse	Replaced fuse
APT/AIO	Gross β Iodine	16E1	8/3/20 – 8/10/20	Loss of power due to storm	N/A
APT/AIO	Gross β Iodine	1F1	8/3/20 – 8/10/20	Loss of power due to storm	N/A
APT/AIO	Gross β Iodine	16E1	9/1/20 – 9/8/20	Pump failure	Replaced pump
APT/AIO	Gross β Iodine	1F1	11/9/20 - 11/16/20	Power Outage	N/A

- **Sample Anomaly (Order 80126317/30):** During the weekly air sampler collection on 03/23/2020 it was discovered that the air sampler at location 05S2 was not running. Upon inspection it was determined the GFCI had tripped. The GFCI was reset with no additional problems.

The total outage duration was 150.5 hours. A total of 1140 cubic feet were collected in that amount of time, which did not meet the LLD requirement for I-131.

Sample location 05S2 is a duplicate sample location. The primary air sample location is 05S1. This sampler was functional for the entire duration and detection sensitivity was met for this period.

In this instance, adequate sample volume was achieved and the LLD for I-131 was met using the primary sampler which was functional the entire period.

- **Sample Anomaly (Order 80126317/50):** During the weekly air sampler collection on 04/27/2020 it was discovered that air sampler at location 14G1 had a power failure due to a blown fuse. The fuse was replaced, and the air sampler was verified to be running without issue.

  The total time the sampler was in operation was 159.7 hours. The total outage duration was 9.0 hours. A total of 14,200 cubic feet were determined to have been collected in that amount of time, which met the LLD requirement for the sample.

- **Sample Anomaly (Order 80126317/60):** During the weekly air sampler collection on 06/15/2020 it was discovered that a pump failure had occurred on air sampler location 2F6. The fuse was replaced, and the air sampler was verified to be running without issue.

  The total time the sampler was in operation was 167.7 hours, however, the total volume collected was 7,290 cubic feet which is approximately 50% of normal collection volume for the period. The LLD requirements were met for Gross Beta and Iodine-131.

- **Sample Anomaly (Order 80126317/70):** During the weekly air sampler collection on 08/10/2020 it was discovered that two air samplers had lost power due to storm damage.

  Air sampler 16E1 was out of service for 28.4 hours, total run time was 140.1 hours and total volume collected was 11,800 cubic feet. Air sampler 1F1 was out of service for 5.7 hours, total run time was 164.3 hours and total volume collected was 14,800 cubic feet.

  The LLD requirements were still met for Gross Beta and Iodine-131 for the time that the air samplers were in service.

- **Sample Anomaly (Order 80126317/80):** During the weekly air sampler collection on 09/08/2020 it was discovered that air sampler 16E1 had a pump failure.

  Air sampler 16E1 was out of service for 72.5 hours, total run time was 119.0 hours and total volume collected was 10,500 cubic feet. The LLD requirements were still met for Gross Beta and Iodine-131 for the time that the air samplers were in service.

- **Sample Anomaly (Order 80126317/110):** During the weekly air sampler collection on 11/16/2020 it was discovered that air sampler 1F1 had a power outage.

  Air sampler 1F1 was out of service for 5 hours, total run time was 160.6 hours and total volume collected was 14,000 cubic feet. The LLD requirements were still met for Gross Beta and Iodine-131 for the time that the air samplers were in service.

12.0 OTHER SUPPLEMENTAL INFORMATION

12.1 NEI 07-07 Onsite Radiological Groundwater Monitoring Program

Salem and Hope Creek Generating Stations has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. During 2020, SGS/HCGS collected and analyzed groundwater samples in accordance with the requirements of site procedures.

Details of the GPI are included in the Salem and Hope Creek Generating Stations Annual Radiological Effluent Release Report. Table 12 provides a summary of the results.

Table 12: Groundwater Protection Program Monitoring Well Results

Well Name	Number of Positive Detections	Number of Analysis	Average Concentration[7] pCi/L	Maximum Concentration pCi/L
Well AA	5	5	1,449	3,220
Well AA-V	4	4	3,140	5,730
Well AB	4	4	7,463	8,440
Well AC	12	12	29,700	41,700
Well AD	4	4	9,640	11,500
Well AE	4	4	11,533	18,300
Well AF	1	2	248	248
Well AF-V	3	3	365	512
Well AG-D	2	2	845	905
Well AG-S	2	2	774	821
Well AH-D	2	2	557	627
Well AH-S	2	2	538	636
Well AI	2	2	2,720	3,280
Well AJ	1	1	292	292
Well AL	2	2	357	428
Well AM	4	4	15,703	26,400
Well AN	8	8	18,750	22,600
Well AP	2	2	2,470	3,210
Well AR	4	4	5,518	7,060
Well AS	2	2	4,385	5,070
Well AT	2	2	1,550	1,660
Well BA	0	2	N/A	N/A
Well BB	0	2	N/A	N/A
Well BC	12	12	1,612	3,550
Well BD	4	4	451	764
Well BE	5	5	658	991
Well BF	0	2	N/A	N/A
Well BG	1	4	206	206
Well BH	0	4	N/A	N/A
Well BH-V	1	2	290	290

[7] Tritium results <MDA should not be included in the average concentration calculation.

Table 12: Groundwater Protection Program Monitoring Well Results

Well Name	Number of Positive Detections	Number of Analysis	Average Concentration[7] pCi/L	Maximum Concentration pCi/L
Well BI	2	4	342	347
Well BJ	12	12	3,330	4,810
Well BK	0	2	N/A	N/A
Well BL	0	2	N/A	N/A
Well BM	4	4	481	541
Well BM-V	0	2	N/A	N/A
Well BN	4	4	481	796
Well BO	2	4	423	584
Well BP	0	2	N/A	N/A
Well BQ	0	4	N/A	N/A
Well BR	0	2	N/A	N/A
Well BS	0	2	N/A	N/A
Well BT	0	2	N/A	N/A
Well BU	0	2	N/A	N/A
Well BW	2	2	697	702
Well BX	2	2	561	567
Well BY	12	12	72,933	139,000
Well BY-V	4	4	8,383	11,400
Well BZ	2	2	1,360	1,410
Well CA	2	2	1,350	1,400
Well DA	7	7	2,933	4,920
Well DB	4	4	11,575	13,300
Well DC	6	6	5,565	10,300
Well DD	4	4	5,628	6,550
Well DE	5	5	18,060	19,900
Well DF	2	2	1,335	1,390
Well DG	4	4	3,665	4,080
Well DH	4	4	10,525	12,500
Well DI	4	4	2,780	3,850
Well DJ	2	2	949	1,010
Well K	0	2	N/A	N/A

Table 12: Groundwater Protection Program Monitoring Well Results

Well Name	Number of Positive Detections	Number of Analysis	Average Concentration[7] pCi/L	Maximum Concentration pCi/L
Well L	0	2	N/A	N/A
Well M	4	4	4653	5250
Well N	4	4	8,050	12,600
Well O	4	4	27,825	56,100
Well P	0	2	N/A	N/A
Well R	2	2	4,020	4,150
Well S	3	3	12,180	15,100
Well S-V	4	4	2,455	3,000
Well T	0	4	N/A	N/A
Well U	5	5	287	358
Well V	4	4	237	271
Well W	8	8	2,070	2,350
Well Y	0	2	N/A	N/A
Well Z	2	2	473	495

12.2 Voluntary Notification

During 2020, Salem and Hope Creek Generating Stations did not make any voluntary NEI 07-07 notification to State/Local officials, NRC, or to other stakeholders required by site procedures.

12.3 Independent Spent Fuel Storage Installation (ISFSI) Monitoring Program

ISFSI information is reported in the Salem and Hope Creek Generating Stations Annual Radiological Effluent Release Report.

12.4 Corrections to Previous Reports

2019 AREOR Errata

Three items in the 2019 AREOR submittal should be corrected. Attachment 5, 2019 AREOR Errata, contains three pages with revision bars for the corrections listed below.

Page 5 of 137, notification number was incorrect. Number should have been 20824370.

Page 17 of 137, Gross beta activity ranges were incorrect.

> "Gross beta activity was detected in all 364 of the indicator location samples at concentrations ranging from 4E-03 pCi/m^3 to 36E-03 pCi/m^3 with an average concentration of 12E-03 pCi/m^3, and in 52 of 52 of the control location samples at concentrations ranging from 4E-03 pCi/m^3 to 22E-03 pCi/m^3 with an average of 12E-03 pCi/m^3."
>
> Corrected:
>
> Gross beta activity was detected in all 364 of the indicator location samples at concentrations ranging from 5E-03 pCi/m^3 to 25E-03 pCi/m^3 with an average concentration of 12E-03 pCi/m^3, and in 52 of 52 of the control location samples at concentrations ranging from 7E-03 pCi/m^3 to 23E-03 pCi/m^3 with an average of 13E-03 pCi/m^3.

Page 52 of 137, Location code 03G1, Media Sampled was IDM, MLK, VGT, SOL and should have been IDM, SOL.

12.5 HOPE CREEK TECHNICAL SPECIFICATION LIMIT FOR PRIMARY WATER IODINE CONCENTRATION

The HCGS primary coolant results for Dose Equivalent Iodine-131, Total Gamma, and Total Beta were reviewed. The specific activity of the primary coolant did not exceed 0.2 micro curies per gram Dose Equivalent I-131 (DEI).

The Total Gamma and the Total Beta activity (microcuries per gram) did not exceed the 100/E-Bar limit. Therefore, HCGS did not exceed the Technical Specifications limit specified in section 3.4.5.

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Attachment 1, Data Table Summary

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
HOPE CREEK GENERATING STATION **DOCKET NO. 50-354**
SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2020 to December 31, 2020**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND *TOTAL NUMBER* OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD*)	ALL INDICATOR LOCATIONS	LOCATION WITH HIGHEST MEAN		CONTROL LOCATION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
			MEAN (f) ** (RANGE)	NAME DISTANCE AND DIRECTION	MEAN (f) ** (RANGE)	MEAN (f) ** (RANGE)	
I. AIRBORNE							
AIR PARTICULATE (E-3 pCi/m^3)	**Gr-B** ***416***	10	12 (364/364) *(5/27)*	SA-APT-14G1 (C) 11.8 MILES WNW	12 (52/52) *(6/25)*	12 (52/52) *(6/25)*	0
	GAMMA ***32***						
	Be-7	N/A	60.7 (28/28) *(40.7/82.6)*	SA-APT-7S2 0.12 MILES SE	65.4 (4/4) *(53.5/82.6)*	62.2 (4/4) *(50.2/75.3)*	0
	K-40	N/A	<MDC	N/A	N/A	<MDC	0
	Cs-134	50	<MDC	N/A	N/A	<MDC	0
	Cs-137	60	<MDC	N/A	N/A	<MDC	0
AIR IODINE (E-3 pCi/m^3)	**GAMMA** ***416*** I-131	70	<MDC	N/A	N/A	<MDC	0
II. DIRECT							
DIRECT RADIATION (mR/standard quarter)	**TLD-QUARTERLY** ***236***	N/A	15.1 (212/212) *(10.8/36.9)*	SA-IDM-1S1 0.55 MILES N OF SITE	35.8 (4/4) *(35.2/36.9)*	14.9 (24/24) *(13.2/16)*	0
III. TERRESTRIAL							
MILK (pCi/L)	**I-131 (LOW LVL)** ***46***	1	<MDC	N/A	N/A	<MDC	0
	GAMMA ***46*** K-40	N/A	1317 (26/26) *(1027/1614)*	SA-MLK-13E3 5.0 MILES W	1322 (13/13) *(1027/1614)*	1266 (20/20) *(989/1577)*	0

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			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
MILK (cont.) (pCi/L)	Cs-134	15	<MDC	N/A	N/A	<MDC	0
	Cs-137	18	<MDC	N/A	N/A	<MDC	0
	BaLa-140	15	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
WELL WATER (pCi/L)	**Gr-A** ***12***	3	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	4	3.7 (2/12) *(3.2/4.1)*	SA-WWA-3E1 4.2 MILES NE	3.7 (2/12) *(3.2/4.1)*	N/A	0
	H-3 ***12***	200	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	1	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	<MDC	N/A	N/A	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0
	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0
	Zn-65	30	<MDC	N/A	N/A	N/A	0

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
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SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2020 to December 31, 2020**

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
WELL WATER (cont.) (pCi/L)	ZrNb-95	15	<MDC	N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
POTABLE WATER (RAW) (pCi/L)	**Gr-A** ***12***	3	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	4	7.3 (12/12) *(4.6/10.2)*	SA-PWR-2F3 8.0 MILES NNE	7.3 (12/12) *(4.6/10.2)*	N/A	0
	H-3 ***12***	200	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	1	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	<MDC	N/A	N/A	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0
	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
POTABLE WATER (RAW) (cont.) (pCi/L)	Zn-65	30	<MDC	N/A	N/A	N/A	0
	ZrNb-95	15	<MDC	N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
POTABLE WATER (TREATED) (pCi/L)	**Gr-A** ***12***	**3**	<MDC	N/A	N/A	N/A	0
	Gr-B ***12***	**4**	8.1 (12/12) *(5.1/10.2)*	SA-PWT-2F3 8.0 MILES NNE	8.1 (12/12) *(5.1/10.2)*	N/A	0
	H-3 ***12***	**200**	<MDC	N/A	N/A	N/A	0
	I-131 (LOW LVL) ***12***	**1**	<MDC	N/A	N/A	N/A	0
	GAMMA ***12***						
	K-40	N/A	60.7 (1/12)	SA-PWT-2F3 8.0 MILES NNE	60.7 (1/12)	N/A	0
	Mn-54	15	<MDC	N/A	N/A	N/A	0
	Co-58	15	<MDC	N/A	N/A	N/A	0

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
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SALEM COUNTY, NEW JERSEY **REPORTING PERIOD: January 1, 2020 to December 31, 2020**

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
POTABLE WATER (TREATED) (cont.) (pCi/L)	Fe-59	30	<MDC	N/A	N/A	N/A	0
	Co-60	15	<MDC	N/A	N/A	N/A	0
	Zn-65	30	<MDC	N/A	N/A	N/A	0
	ZrNb-95	15	<MDC	N/A	N/A	N/A	0
	Cs-134	15	<MDC	N/A	N/A	N/A	0
	Cs-137	18	<MDC	N/A	N/A	N/A	0
	BaLa-140	15	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
BROAD-LEAF VEGETATION, FPL (pCi/kg wet)	**GAMMA** ***24***						
	Be-7	N/A	1268 (13/23) *(591.8/2697)*	SA-FPL-7S2 0.12 MILES SE	2697 (1/3)	<MDC	0
	K-40	N/A	5323 (23/23) *(2493/11130)*	SA-FPL-7S2 0.12 MILES SE	8238 (3/3) *(5496/11130)*	2220 (1/1)	0
	I-131	60	<MDC	N/A	N/A	<MDC	0
	Cs-134	60	<MDC	N/A	N/A	<MDC	0
	Cs-137	80	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
BROAD-LEAF VEGETATION, (cont.) FPL (pCi/kg wet)	Th-232	N/A	107.9 (2/23) *(89.2/126.5)*	SA-FPL-16S1 0.57 MILES NNW	126.5 (1/5)	<MDC	0
VEGETABLES, FPV (pCi/kg wet)	**GAMMA** ***20***						
	Be-7	N/A	<MDC	N/A	N/A	N/A	0
	K-40	N/A	2070 (20/20) *(1197/3076)*	SA-FPV-15F4 7.0 MILES NW	2338 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0
	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0
	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
	Th-232	N/A	<MDC	N/A	N/A	N/A	0
FODDER CROPS (pCi/kg wet)	**GAMMA** ***3***						
	Be-7	N/A	974.1 (3/3) (587.6/1716)	SA-VGT-13E3 5.0 MILES W	1716 (1/1)	N/A	0
	K-40	N/A	4700 (3/3) *(2904/7663)*	SA-VGT-13E3 5.0 MILES W	7663 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0
	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
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			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
FODDER CROPS (cont.) (pCi/kg wet)	Ra-226	N/A	<MDC	N/A	N/A	N/A	0
	Th-232	N/A	<MDC	N/A	N/A	N/A	0
SOIL (pCi/kg dry)	**GAMMA** ***0***						
	Be-7	N/A	N/A	N/A	N/A	N/A	0
	K-40	N/A	N/A	N/A	N/A	N/A	0
	Cs-134	150	N/A	N/A	N/A	N/A	0
	Cs-137	180	N/A	N/A	N/A	N/A	0
	Ra-226	N/A	N/A	N/A	N/A	N/A	0
	Th-232	N/A	N/A	N/A	N/A	N/A	0
GAME (pCi/kg wet)	**GAMMA** ***3***						
	Be-7	N/A	<MDC	N/A	N/A	N/A	0
	K-40	N/A	2840 (3/3) *(2611/3140)*	SA-GAM-5C1 3.14 MILES ENE	3140 (1/1)	N/A	0
	I-131	60	<MDC	N/A	N/A	N/A	0
	Cs-134	60	<MDC	N/A	N/A	N/A	0
	Cs-137	80	<MDC	N/A	N/A	N/A	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
SURFACE WATER (pCi/L)	**H-3** ***60***	200	827 (1/48)	SA-SWA-11A1 0.20 MILES SW	827 (1/12)	<MDC	0
	I-131 (LOW LVL) ***60***	1	<MDC	N/A	N/A	<MDC	0
	GAMMA ***60***						
	K-40	N/A	92 (16/48) *(42/126)*	SA-SWA-7E1 4.5 MILES SE	100 (8/12) *(59/126)*	81 (3/12) *(57/127)*	0
	Mn-54	15	<MDC	N/A	N/A	<MDC	0
	Co-58	15	<MDC	N/A	N/A	<MDC	0
	Fe-59	30	<MDC	N/A	N/A	<MDC	0
	Co-60	15	<MDC	N/A	N/A	<MDC	0
	Zn-65	30	<MDC	N/A	N/A	<MDC	0
	ZrNb-95	15	<MDC	N/A	N/A	<MDC	0
	Cs-134	15	<MDC	N/A	N/A	<MDC	0
	Cs-137	18	<MDC	N/A	N/A	<MDC	0
	BaLa-140	15	<MDC	N/A	N/A	<MDC	0
FISH (pCi/kg wet)	**GAMMA** ***14***						
	K-40	N/A	3829 (8/8) *(2865/4954)*	SA-ESF-7E1 4.5 MILES SE	3984 (3/3) *(2865/4954)*	3857 (6/6) *(2656/5259)*	0
	Mn-54	130	<MDC	N/A	N/A	<MDC	0

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			MEAN **(f)** ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN **(f)** ** *(RANGE)*	MEAN **(f)** ** *(RANGE)*	
FISH (cont.) (pCi/kg wet)	Co-58	130	<MDC	N/A	N/A	<MDC	0
	Fe-59	260	<MDC	N/A	N/A	<MDC	0
	Co-60	130	<MDC	N/A	N/A	<MDC	0
	Zn-65	260	<MDC	N/A	N/A	<MDC	0
	Cs-134	130	<MDC	N/A	N/A	<MDC	0
	Cs-137	150	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
BLUE CRABS (pCi/kg wet)	**GAMMA** ***4***						
	K-40	N/A	3018 (2/2) *(2857/3178)*	SA-ECH-11A1 0.2 MILES SW	3018 (2/2) *(2857/3178)*	2974 (2/2) *(2546/3402)*	0
	Mn-54	130	<MDC	N/A	N/A	<MDC	0
	Co-58	130	<MDC	N/A	N/A	<MDC	0
	Fe-59	260	<MDC	N/A	N/A	<MDC	0
	Co-60	130	<MDC	N/A	N/A	<MDC	0
	Zn-65	260	<MDC	N/A	N/A	<MDC	0
	Cs-134	130	<MDC	N/A	N/A	<MDC	0

SALEM GENERATING STATION **DOCKET NO. 50-272/-311**
HOPE CREEK GENERATING STATION **DOCKET NO. 50-354**
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			MEAN (f) ** *(RANGE)*	NAME DISTANCE AND DIRECTION	MEAN (f) ** *(RANGE)*	MEAN (f) ** *(RANGE)*	
BLUE CRABS (cont.) (pCi/kg wet)	Cs-137	150	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	<MDC	N/A	N/A	<MDC	0
SEDIMENT (pCi/kg dry)	**GAMMA** ***14***						
	Be-7	N/A	<MDC	N/A	N/A	<MDC	0
	K-40	N/A	6923 (12/12) *(2479/17790)*	SA-ESS-12C1 (C) 2.5 MILES WSW	17085 (2/2) *(16730/17440)*	17085 (2/2) *(16730/17440)*	0
	Cs-134	150	<MDC	N/A	N/A	<MDC	0
	Cs-137	180	<MDC	N/A	N/A	<MDC	0
	Ra-226	N/A	1967 (2/12) *(1442/2492)*	SA-ESS-16A1 0.24 MILES NNW	1967 (2/2) (1442/2492)	<MDC	0
	Th-232	N/A	542 (6/12) *(340/837)*	SA-ESS-7E1 4.5 MILES SE	837 (1/1)	763(2/2) *(756/770)*	0

* The LLD listed is the Lower Limit of Detection, which was requested by PSEG to be achieved.

** Mean was calculated using values above the MDC only. f = the fraction of measurements above the MDC.

(C) = Control Location

N/A = Not Applicable

Attachment 2,
Complete Data Table for All Analysis Results Obtained In 2020

Table 13, Concentrations of Gamma Emmitters In Quarterly Composites of Air Particulates, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	<----------GAMMA EMITTERS----------> Be-7	K-40	Cs-134	Cs-137
SA-APT-14G1 (C)	12/30/19	-	03/30/20	**55** ± 13	< 22	< 1	< 2
	03/30/20	-	06/29/20	**75** ± 16	< 29	< 2	< 2
	06/29/20	-	09/28/20	**68** ± 14	< 23	< 2	< 1
	09/28/20	-	12/28/20	**50** ± 12	< 31	< 2	< 2
			AVERAGE*	**62** ± 23	-	-	-
SA-APT-5S1	12/30/19	-	03/30/20	**61** ± 14	< 20	< 2	< 1
	03/30/20	-	06/29/20	**62** ± 15	< 23	< 1	< 1
	06/29/20	-	09/28/20	**76** ± 17	< 34	< 2	< 2
	09/28/20	-	12/28/20	**50** ± 12	< 22	< 1	< 1
			AVERAGE*	**62** ± 21	-	-	-
SA-APT-7S2	12/30/19	-	03/30/20	**83** ± 15	< 24	< 1	< 2
	03/30/20	-	06/29/20	**63** ± 12	< 23	< 1	< 1
	06/29/20	-	09/28/20	**62** ± 14	< 22	< 2	< 2
	09/28/20	-	12/28/20	**53** ± 13	< 24	< 1	< 1
			AVERAGE*	**65** ± 25	-	-	-
SA-APT-15S2	12/30/19	-	03/30/20	**73** ± 21	< 42	< 2	< 2
	03/30/20	-	06/29/20	**70** ± 13	< 21	< 1	< 1
	06/29/20	-	09/28/20	**62** ± 12	< 22	< 1	< 1
	09/28/20	-	12/28/20	**41** ± 10	< 29	< 2	< 2
			AVERAGE*	**62** ± 29	-	-	-
SA-APT-5D1	12/30/19	-	03/30/20	**46** ± 12	< 21	< 2	< 1
	03/30/20	-	06/29/20	**62** ± 12	< 24	< 1	< 1
	06/29/20	-	09/28/20	**70** ± 19	< 29	< 2	< 2
	09/28/20	-	12/28/20	**51** ± 12	< 27	< 1	< 1
			AVERAGE*	**57** ± 21	-	-	-
SA-APT-16E1	12/30/19	-	03/30/20	**56** ± 13	< 35	< 2	< 2
	03/30/20	-	06/29/20	**62** ± 12	< 24	< 1	< 1
	06/29/20	-	09/28/20	**51** ± 14	< 22	< 2	< 1
	09/28/20	-	12/28/20	**51** ± 13	< 27	< 1	< 1
			AVERAGE*	**55** ± 10	-	-	-

Table 13, Concentrations of Gamma Emmitters In Quarterly Composites of Air Particulates, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	<----------GAMMA EMITTERS----------> Be-7	K-40	Cs-134	Cs-137
SA-APT-1F1	12/30/19	-	03/30/20	**50** ± 13	< 22	< 2	< 1
	03/30/20	-	06/29/20	**64** ± 18	< 40	< 3	< 2
	06/29/20	-	09/28/20	**77** ± 15	< 23	< 1	< 1
	09/28/20	-	12/28/20	**52** ± 14	< 26	< 2	< 2
			AVERAGE*	**61** ± 25	-	-	-
SA-APT-2F6	12/30/19	-	03/30/20	**59** ± 16	< 32	< 2	< 2
	03/30/20	-	06/29/20	**79** ± 16	< 26	< 2	< 2
	06/29/20	-	09/28/20	**64** ± 16	< 26	< 2	< 2
	09/28/20	-	12/28/20	**49** ± 18	< 36	< 3	< 3
			AVERAGE*	**63** ± 26	-	-	-
			ALL INDICATOR AVERAGE * .	**61** ± 21	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 14, Concentrations of Gross Beta Emitters In Air Particulates, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS						
START		STOP	SA-APT-14G1	SA-APT-5S1	SA-APT-7S2	SA-APT-15S2	SA-APT-5D1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6
12/30/19	-	01/06/20	7 ± 3	9 ± 3	9 ± 3	7 ± 3	6 ± 3	6 ± 3	7 ± 3	9 ± 3
01/06/20	-	01/13/20	8 ± 3	9 ± 3	10 ± 3	8 ± 3	7 ± 3	8 ± 2	8 ± 3	7 ± 2
01/13/20	-	01/20/20	18 ± 3	18 ± 3	16 ± 3	15 ± 3	16 ± 3	16 ± 3	15 ± 3	18 ± 3
01/20/20	-	01/27/20	12 ± 3	14 ± 3	10 ± 3	14 ± 3	12 ± 3	13 ± 3	13 ± 3	11 ± 3
01/27/20	-	02/03/20	9 ± 3	9 ± 3	10 ± 3	7 ± 3	8 ± 3	6 ± 3	8 ± 3	7 ± 3
02/03/20	-	02/11/20	12 ± 3	11 ± 3	9 ± 2	12 ± 3	8 ± 2	12 ± 3	12 ± 3	7 ± 2
02/11/20	-	02/19/20	13 ± 3	11 ± 3	12 ± 3	11 ± 3	12 ± 3	11 ± 3	12 ± 3	11 ± 3
02/19/20	-	02/27/20	9 ± 2	11 ± 2	13 ± 3	11 ± 3	10 ± 3	10 ± 3	10 ± 3	11 ± 3
02/27/20	-	03/04/20	12 ± 3	13 ± 3	11 ± 3	16 ± 4	11 ± 3	10 ± 3	11 ± 3	12 ± 3
03/04/20	-	03/10/20	8 ± 3	7 ± 3	10 ± 3	6 ± 3	7 ± 3	7 ± 3	7 ± 3	10 ± 3
03/10/20	-	03/16/20	9 ± 3	9 ± 3	11 ± 3	9 ± 3	12 ± 3	11 ± 3	12 ± 4	9 ± 3
03/16/20	-	03/23/20	14 ± 3	13 ± 3	12 ± 3	12 ± 3	12 ± 3	11 ± 3	12 ± 3	13 ± 3
03/23/20	-	03/30/20	7 ± 3	8 ± 3	8 ± 3	7 ± 3	6 ± 2	7 ± 3	6 ± 3	7 ± 3
03/30/20	-	04/06/20	6 ± 3	9 ± 3	6 ± 3	6 ± 3	8 ± 3	6 ± 3	6 ± 3	7 ± 3
04/06/20	-	04/13/20	13 ± 3	11 ± 3	14 ± 3	12 ± 3	16 ± 3	11 ± 3	12 ± 3	13 ± 3
04/13/20	-	04/20/20	13 ± 3	15 ± 3	14 ± 3	12 ± 3	11 ± 3	10 ± 3	13 ± 3	12 ± 3
04/20/20	-	04/27/20	9 ± 3	9 ± 3	11 ± 3	9 ± 3	10 ± 3	8 ± 3	11 ± 3	9 ± 3
04/27/20	-	05/04/20	12 ± 3	13 ± 3	14 ± 3	13 ± 3	11 ± 3	10 ± 3	12 ± 3	14 ± 3
05/04/20	-	05/11/20	8 ± 3	8 ± 3	7 ± 3	8 ± 3	5 ± 2	8 ± 3	6 ± 3	8 ± 3
05/11/20	-	05/18/20	14 ± 3	13 ± 3	12 ± 3	13 ± 3	12 ± 3	9 ± 3	10 ± 3	12 ± 3
05/18/20	-	05/26/20	7 ± 2	5 ± 2	7 ± 2	7 ± 2	6 ± 2	9 ± 2	7 ± 2	7 ± 2
05/26/20	-	06/01/20	8 ± 3	7 ± 3	7 ± 3	8 ± 3	8 ± 3	8 ± 3	9 ± 3	8 ± 3
06/01/20	-	06/08/20	18 ± 3	18 ± 3	15 ± 3	15 ± 3	17 ± 3	15 ± 3	17 ± 3	16 ± 3
06/08/20	-	06/15/20	9 ± 3	10 ± 3	7 ± 3	11 ± 3	10 ± 3	10 ± 3	10 ± 3	10 ± 5
06/15/20	-	06/22/20	7 ± 3	7 ± 3	6 ± 2	7 ± 3	6 ± 3	8 ± 2	7 ± 3	6 ± 3
06/22/20	-	06/29/20	17 ± 4	17 ± 4	12 ± 3	13 ± 3	16 ± 3	16 ± 4	16 ± 4	15 ± 3
06/29/20	-	07/06/20	15 ± 3	12 ± 3	11 ± 3	9 ± 3	11 ± 3	11 ± 3	10 ± 3	13 ± 3
07/06/20	-	07/13/20	12 ± 3	11 ± 3	8 ± 3	11 ± 3	12 ± 3	11 ± 3	9 ± 3	12 ± 3
07/13/20	-	07/20/20	16 ± 3	12 ± 3	12 ± 3	15 ± 3	12 ± 3	12 ± 3	14 ± 3	11 ± 3
07/20/20	-	07/27/20	13 ± 3	10 ± 3	9 ± 3	9 ± 3	12 ± 3	15 ± 3	12 ± 3	13 ± 3
07/27/20	-	08/03/20	17 ± 3	16 ± 3	14 ± 3	16 ± 3	15 ± 3	17 ± 3	17 ± 3	14 ± 3
08/03/20	-	08/10/20	14 ± 3	11 ± 3	12 ± 3	8 ± 3	12 ± 3	14 ± 4	13 ± 3	15 ± 3

Table 14, Concentrations of Gross Beta Emitters In Air Particulates, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD		CONTROL	INDICATORS						
START	STOP	SA-APT-14G1	SA-APT-5S1	SA-APT-7S2	SA-APT-15S2	SA-APT-5D1	SA-APT-16E1	SA-APT-1F1	SA-APT-2F6
08/10/20 -	08/17/20	**14** ± 3	**13** ± 3	**14** ± 3	**13** ± 3	**15** ± 3	**16** ± 3	**14** ± 3	**16** ± 3
08/17/20 -	08/24/20	**15** ± 3	**17** ± 3	**13** ± 3	**19** ± 3	**13** ± 3	**15** ± 3	**14** ± 3	**15** ± 3
08/24/20 -	08/31/20	**20** ± 4	**17** ± 3	**14** ± 3	**16** ± 3	**14** ± 3	**15** ± 3	**15** ± 3	**16** ± 3
08/31/20 -	09/08/20	**13** ± 3	**12** ± 3	**14** ± 3	**10** ± 3	**13** ± 3	**14** ± 4	**14** ± 3	**14** ± 3
09/08/20 -	09/14/20	**14** ± 3	**13** ± 3	**10** ± 3	**11** ± 3	**11** ± 3	**16** ± 4	**12** ± 3	**12** ± 3
09/14/20 -	09/21/20	**12** ± 3	**13** ± 3	**9** ± 3	**10** ± 3	**10** ± 3	**13** ± 3	**11** ± 3	**12** ± 3
09/21/20 -	09/28/20	**24** ± 4	**25** ± 4	**21** ± 4	**27** ± 4	**26** ± 4	**24** ± 4	**22** ± 4	**22** ± 4
09/28/20 -	10/05/20	**11** ± 3	**11** ± 3	**12** ± 3	**9** ± 3	**13** ± 3	**13** ± 3	**11** ± 3	**13** ± 3
10/05/20 -	10/12/20	**16** ± 3	**17** ± 3	**14** ± 3	**19** ± 3	**19** ± 3	**19** ± 3	**18** ± 3	**15** ± 3
10/12/20 -	10/19/20	**9** ± 2	**10** ± 3	**10** ± 3	**8** ± 2	**11** ± 3	**10** ± 3	**10** ± 2	**11** ± 3
10/19/20 -	10/26/20	**11** ± 3	**7** ± 3	**7** ± 2	**8** ± 3	**9** ± 3	**9** ± 3	**7** ± 3	**7** ± 3
10/26/20 -	11/02/20	**8** ± 3	**12** ± 3	**10** ± 3	**10** ± 3	**10** ± 3	**11** ± 3	**11** ± 3	**10** ± 3
11/02/20 -	11/09/20	**23** ± 4	**20** ± 4	**20** ± 4	**22** ± 4	**21** ± 4	**23** ± 4	**20** ± 4	**21** ± 4
11/09/20 -	11/16/20	**13** ± 3	**15** ± 3	**15** ± 3	**17** ± 3	**14** ± 3	**15** ± 3	**15** ± 3	**14** ± 3
11/16/20 -	11/23/20	**13** ± 3	**11** ± 3	**13** ± 3	**11** ± 3	**11** ± 3	**14** ± 3	**13** ± 3	**12** ± 3
11/23/20 -	12/01/20	**10** ± 2	**12** ± 2	**12** ± 2	**13** ± 3	**10** ± 2	**11** ± 2	**10** ± 2	**12** ± 2
12/01/20 -	12/07/20	**10** ± 3	**11** ± 3	**9** ± 3	**12** ± 3	**12** ± 3	**10** ± 3	**11** ± 3	**13** ± 3
12/07/20 -	12/14/20	**25** ± 4	**24** ± 4	**21** ± 4	**19** ± 3	**19** ± 3	**21** ± 4	**22** ± 4	**22** ± 3
12/14/20 -	12/21/20	**8** ± 2	**9** ± 2	**9** ± 3	**8** ± 2	**10** ± 3	**12** ± 3	**12** ± 3	**9** ± 3
12/21/20 -	12/28/20	**11** ± 3	**9** ± 3	**9** ± 3	**12** ± 3	**13** ± 3	**9** ± 3	**7** ± 3	**10** ± 3
	AVERAGE*	**12** ± 9	**12** ± 8	**11** ± 7	**12** ± 9	**12** ± 8	**12** ± 8	**12** ± 8	**12** ± 8

ALL INDICATOR AVERAGE* **12** ± 8

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING ONLY THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

Table 15, Concentrations of Iodine-131 In Filtered Air, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS						
START		STOP	SA-AIO-14G1	SA-AIO-5S1	SA-AIO-7S2	SA-AIO-15S2	SA-AIO-5D1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6
12/30/19	-	01/06/20	< 5	< 8	< 12	< 13	< 8	< 7	< 8	< 8
01/06/20	-	01/13/20	< 13	< 20	< 13	< 13	< 20	< 10	< 20	< 20
01/13/20	-	01/20/20	< 15	< 21	< 12	< 16	< 21	< 16	< 21	< 21
01/20/20	-	01/27/20	< 20	< 13	< 20	< 9	< 14	< 20	< 13	< 14
01/27/20	-	02/03/20	< 29	< 14	< 28	< 11	< 15	< 26	< 15	< 14
02/03/20	-	02/11/20	< 26	< 16	< 10	< 26	< 16	< 27	< 16	< 16
02/11/20	-	02/19/20	< 15	< 8	< 6	< 15	< 10	< 15	< 10	< 10
02/19/20	-	02/27/20	< 25	< 22	< 24	< 24	< 23	< 25	< 23	< 23
02/27/20	-	03/04/20	< 19	< 27	< 18	< 18	< 28	< 19	< 27	< 27
03/04/20	-	03/10/20	< 31	< 20	< 30	< 30	< 20	< 32	< 19	< 20
03/10/20	-	03/16/20	< 25	< 19	< 25	< 25	< 18	< 25	< 20	< 18
03/16/20	-	03/23/20	< 26	< 17	< 25	< 26	< 17	< 26	< 18	< 17
03/23/20	-	03/30/20	< 17	< 31	< 15	< 16	< 32	< 16	< 34	< 36
03/30/20	-	04/06/20	< 29	< 29	< 29	< 30	< 29	< 30	< 30	< 30
04/06/20	-	04/13/20	< 18	< 15	< 8	< 18	< 16	< 18	< 7	< 16
04/13/20	-	04/20/20	< 15	< 16	< 16	< 15	< 7	< 16	< 15	< 15
04/20/20	-	04/27/20	< 17	< 19	< 16	< 17	< 19	< 17	< 20	< 19
04/27/20	-	05/04/20	< 16	< 23	< 16	< 16	< 24	< 13	< 24	< 23
05/04/20	-	05/11/20	< 18	< 19	< 17	< 18	< 15	< 18	< 19	< 20
05/11/20	-	05/18/20	< 26	< 26	< 11	< 29	< 24	< 27	< 25	< 11
05/18/20	-	05/26/20	< 17	< 20	< 9	< 16	< 19	< 17	< 20	< 20
05/26/20	-	06/01/20	< 27	< 30	< 26	< 28	< 12	< 27	< 31	< 30
06/01/20	-	06/08/20	< 15	< 34	< 8	< 16	< 32	< 15	< 33	< 32
06/08/20	-	06/15/20	< 14	< 23	< 8	< 14	< 23	< 14	< 24	< 47
06/15/20	-	06/22/20	< 10	< 19	< 16	< 17	< 20	< 16	< 20	< 22
06/22/20	-	06/29/20	< 27	< 12	< 26	< 26	< 12	< 13	< 10	< 12
06/29/20	-	07/06/20	< 15	< 23	< 15	< 8	< 24	< 15	< 10	< 23
07/06/20	-	07/13/20	< 29	< 14	< 28	< 28	< 15	< 28	< 14	< 14

Table 15, Concentrations of Iodine-131 In Filtered Air, 2020

Results in Units of E-03 pCi/m^3 ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS						
START		STOP	SA-AIO-14G1	SA-AIO-5S1	SA-AIO-7S2	SA-AIO-15S2	SA-AIO-5D1	SA-AIO-16E1	SA-AIO-1F1	SA-AIO-2F6
07/13/20	-	07/20/20	< 23	< 12	< 22	< 21	< 12	< 22	< 12	< 12
07/20/20	-	07/27/20	< 24	< 35	< 23	< 24	< 34	< 10	< 35	< 33
07/27/20	-	08/03/20	< 23	< 32	< 21	< 21	< 33	< 22	< 33	< 34
08/03/20	-	08/10/20	< 19	< 16	< 9	< 19	< 17	< 25	< 17	< 17
08/10/20	-	08/17/20	< 19	< 15	< 17	< 18	< 16	< 20	< 15	< 16
08/17/20	-	08/24/20	< 21	< 18	< 21	< 20	< 8	< 21	< 18	< 19
08/24/20	-	08/31/20	< 21	< 7	< 21	< 21	< 15	< 21	< 15	< 16
08/31/20	-	09/08/20	< 36	< 32	< 35	< 34	< 33	< 56	< 32	< 32
09/08/20	-	09/14/20	< 23	< 31	< 18	< 24	< 32	< 25	< 31	< 31
09/14/20	-	09/21/20	< 10	< 30	< 28	< 28	< 32	< 27	< 30	< 29
09/21/20	-	09/28/20	< 27	< 28	< 26	< 25	< 28	< 26	< 28	< 28
09/28/20	-	10/05/20	< 20	< 31	< 20	< 17	< 33	< 19	< 31	< 30
10/05/20	-	10/12/20	< 18	< 18	< 9	< 18	< 18	< 17	< 18	< 17
10/12/20	-	10/19/20	< 29	< 29	< 31	< 30	< 30	< 29	< 29	< 29
10/19/20	-	10/26/20	< 15	< 18	< 14	< 15	< 18	< 14	< 18	< 17
10/26/20	-	11/02/20	< 27	< 30	< 26	< 26	< 31	< 26	< 12	< 28
11/02/20	-	11/09/20	< 23	< 18	< 11	< 23	< 23	< 23	< 17	< 17
11/09/20	-	11/16/20	< 19	< 18	< 8	< 19	< 20	< 20	< 21	< 19
11/16/20	-	11/23/20	< 46	< 39	< 19	< 45	< 40	< 45	< 39	< 39
11/23/20	-	12/01/20	< 22	< 23	< 22	< 22	< 24	< 22	< 24	< 10
12/01/20	-	12/07/20	< 26	< 14	< 27	< 28	< 34	< 34	< 34	< 32
12/07/20	-	12/14/20	< 16	< 14	< 16	< 7	< 15	< 16	< 15	< 14
12/14/20	-	12/21/20	< 17	< 20	< 17	< 18	< 20	< 20	< 9	< 19
12/21/20	-	12/28/20	< 16	< 18	< 16	< 16	< 18	< 16	< 10	< 18
AVERAGE*			-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING ONLY THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 16, Direct and Immersion Radiation Measurements, 2020

(REMP DOSIMETRY RESULTS*)

STATION ID	ANNUAL NET DOSE (mrem)	GROSS ANNUAL DOSE (mrem)	QUARTERLY NET DOSE AND GROSS DOSE (mrem/StandardQuarter)							
			JAN - MAR		APR - JUN		JUL - SEP		OCT - DEC	
			Net	Gross	Net	Gross	Net	Gross	Net	Gross
SA-IDM-01G3 (C)	ND	60.0	ND	15.1	ND	15.0	ND	14.9	ND	15.1
SA-IDM-03G1 (C)	ND	62.5	ND	15.9	ND	15.3	ND	15.4	ND	15.9
SA-IDM-10G1 (C)	ND	62.8	ND	16.0	ND	15.6	ND	15.5	ND	15.7
SA-IDM-14G1 (C)	ND	62.3	ND	15.8	ND	15.3	ND	15.3	ND	15.8
SA-IDM-16G1 (C)	ND	55.9	ND	13.9	ND	13.9	ND	13.8	ND	14.2
SA-IDM-03H1 (C)	ND	53.9	ND	13.5	ND	13.7	ND	13.2	ND	13.5
SA-IDM-01S1 **	**88.8**	143.0	**21.6**	35.2	**21.6**	35.2	**23.3**	36.9	**22.2**	35.8
SA-IDM-01S2	ND	53.8	ND	13.6	ND	13.3	ND	13.4	ND	13.5
SA-IDM-02S2A	ND	59.4	ND	14.7	ND	14.5	ND	14.6	ND	15.6
SA-IDM-02S4	ND	56.6	ND	14.3	ND	13.6	ND	14.3	ND	14.3
SA-IDM-03S1	ND	53.1	ND	13.3	ND	12.4	ND	13.4	ND	14.0
SA-IDM-04S1	ND	53.2	ND	13.4	ND	12.6	ND	13.2	ND	13.9
SA-IDM-05S1	ND	51.4	ND	13.3	ND	12.2	ND	12.8	ND	13.1
SA-IDM-06S2	ND	69.1	ND	17.0	ND	18.3	ND	16.6	ND	17.2
SA-IDM-07S1	ND	53.4	ND	13.4	ND	12.4	ND	13.9	ND	13.7
SA-IDM-08S1	ND	46.3	ND	11.5	ND	10.9	ND	11.7	ND	12.2
SA-IDM-09S1	ND	46.1	ND	11.7	ND	10.8	ND	11.6	ND	11.9
SA-IDM-10S1	ND	50.8	ND	13.0	ND	12.2	ND	12.5	ND	13.2
SA-IDM-11S1	ND	47.6	ND	12.1	ND	11.0	ND	11.9	ND	12.6
SA-IDM-12S1	ND	61.2	ND	15.5	ND	14.1	ND	15.2	ND	16.5
SA-IDM-13S1	ND	70.2	ND	17.4	ND	16.0	ND	17.6	ND	19.1
SA-IDM-14S1	ND	70.7	ND	17.3	ND	16.8	ND	18.1	ND	18.5

Table 16, Direct and Immersion Radiation Measurements, 2020

(REMP DOSIMETRY RESULTS*)

STATION ID	ANNUAL NET DOSE (mrem)	GROSS ANNUAL DOSE (mrem)	QUARTERLY NET DOSE AND GROSS DOSE (mrem/StandardQuarter)							
			JAN - MAR		APR - JUN		JUL - SEP		OCT - DEC	
			Net	Gross	Net	Gross	Net	Gross	Net	Gross
SA-IDM-15S1	ND	50.6	ND	12.7	ND	12.1	ND	12.7	ND	13.1
SA-IDM-15S2	ND	56.2	ND	14.4	ND	13.4	ND	13.5	ND	14.9
SA-IDM-16S1	ND	59.2	ND	14.7	ND	14.0	ND	15.0	ND	15.6
SA-IDM-16S2 **	**71.7**	126.0	**16.8**	30.4	**16.0**	29.5	**21.2**	34.8	**17.7**	31.3
SA-IDM-16S3	ND	50.6	ND	12.3	ND	12.4	ND	13.0	ND	12.9
SA-IDM-04D2	ND	62.1	ND	15.7	ND	15.2	ND	15.6	ND	15.6
SA-IDM-05D1	ND	57.8	ND	14.9	ND	14.0	ND	14.5	ND	14.4
SA-IDM-10D1	ND	60.1	ND	15.3	ND	14.7	ND	14.9	ND	15.1
SA-IDM-14D1	ND	55.2	ND	14.4	ND	13.4	ND	13.6	ND	13.8
SA-IDM-15D1	ND	59.6	ND	15.2	ND	14.0	ND	15.0	ND	15.4
SA-IDM-02E1	ND	56.5	ND	14.5	ND	13.6	ND	14.1	ND	14.3
SA-IDM-03E1	ND	49.9	ND	12.9	ND	11.9	ND	12.3	ND	12.8
SA-IDM-11E2	ND	63.7	ND	16.1	ND	15.4	ND	15.9	ND	16.3
SA-IDM-12E1	ND	62.0	ND	16.1	ND	15.4	ND	15.3	ND	15.3
SA-IDM-13E1	ND	52.0	ND	13.9	ND	12.3	ND	12.7	ND	13.1
SA-IDM-16E1	ND	57.6	ND	14.6	ND	13.9	ND	14.3	ND	14.8
SA-IDM-01F1	ND	74.8	ND	18.9	ND	18.2	ND	18.7	ND	19.0
SA-IDM-02F2	ND	54.7	ND	13.7	ND	13.0	ND	14.0	ND	13.9
SA-IDM-02F5	ND	60.0	ND	15.4	ND	14.5	ND	15.1	ND	15.1
SA-IDM-02F6	ND	55.6	ND	14.1	ND	13.5	ND	14.0	ND	14.1
SA-IDM-03F2	ND	53.7	ND	13.2	ND	12.8	ND	13.6	ND	14.1
SA-IDM-03F3	ND	52.5	ND	13.2	ND	12.8	ND	13.2	ND	13.3
SA-IDM-04F2	ND	50.2	ND	12.7	ND	12.2	ND	12.5	ND	12.9

Table 16, Direct and Immersion Radiation Measurements, 2020

(REMP DOSIMETRY RESULTS*)

STATION ID	ANNUAL NET DOSE (mrem)	GROSS ANNUAL DOSE (mrem)	QUARTERLY NET DOSE AND GROSS DOSE (mrem/StandardQuarter)							
			JAN - MAR		APR - JUN		JUL - SEP		OCT - DEC	
			Net	Gross	Net	Gross	Net	Gross	Net	Gross
SA-IDM-05F1	ND	54.0	ND	13.9	ND	12.9	ND	13.7	ND	13.5
SA-IDM-06F1	ND	46.2	ND	11.6	ND	11.1	ND	11.6	ND	11.9
SA-IDM-07F2	ND	55.7	ND	14.1	ND	13.6	ND	13.7	ND	14.3
SA-IDM-08F1	ND	51.4	ND	13.0	ND	12.5	ND	12.7	ND	13.3
SA-IDM-09F1	ND	63.8	ND	15.9	ND	15.9	ND	16.0	ND	15.9
SA-IDM-10F2	ND	60.8	ND	15.0	ND	15.4	ND	14.9	ND	15.5
SA-IDM-11F1	ND	63.4	ND	16.2	ND	15.9	ND	15.7	ND	15.7
SA-IDM-12F1	ND	61.1	ND	15.3	ND	15.2	ND	15.1	ND	15.5
SA-IDM-13F2	ND	59.3	ND	15.2	ND	14.7	ND	14.9	ND	14.5
SA-IDM-13F3	ND	62.4	ND	15.6	ND	15.5	ND	15.7	ND	15.5
SA-IDM-13F4	ND	62.9	ND	15.8	ND	15.6	ND	15.8	ND	15.8
SA-IDM-14F2	ND	66.0	ND	16.6	ND	16.3	ND	16.7	ND	16.5
SA-IDM-15F3	ND	64.6	ND	16.1	ND	16.3	ND	16.3	ND	15.9
SA-IDM-16F2	ND	56.9	ND	14.2	ND	14.2	ND	14.1	ND	14.4

ND NOT DETECTABLE ABOVE BACKGROUND

(C) CONTROL LOCATION

* QUARTERLY ELEMENT TLD RESULTS BY VENDOR LABORATORY.

** SAMPLE RESULTS ARE AFFECTED BY THE INDPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)

Table 17, Concentrations of Iodine-131 And Gamma Emitters In Milk, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >					
				I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-2G3 (C)	01/05/20	-	01/06/20	< 0.7	**1,475** ± 171	< 8	< 7	< 9	< 179
	02/02/20	-	02/03/20	< 0.8	**1,216** ± 183	< 8	< 9	< 10	< 192
	03/02/20	-	03/03/20	< 0.9	**1,206** ± 138	< 7	< 7	< 6	< 171
	04/05/20	-	04/06/20	< 0.7	**1,120** ± 168	< 7	< 7	< 7	< 137
	04/19/20	-	04/20/20	< 0.8	**1,270** ± 182	< 9	< 9	< 11	< 191
	05/03/20	-	05/04/20	< 0.8	**1,223** ± 163	< 8	< 7	< 8	< 169
	05/17/20	-	05/18/20	< 0.8	**1,362** ± 156	< 9	< 9	< 10	< 181
	06/07/20	-	06/08/20	< 0.6	**1,481** ± 201	< 9	< 10	< 12	< 200
	06/21/20	-	06/22/20	< 0.6	**1,577** ± 202	< 11	< 8	< 5	< 201
	07/05/20	-	07/06/20	< 0.6	**1,133** ± 165	< 9	< 8	< 9	< 182
	07/19/20	-	07/20/20	< 0.8	**1,180** ± 177	< 8	< 10	< 12	< 205
	08/02/20	-	08/03/20	< 0.8	**1,122** ± 182	< 8	< 7	< 8	< 189
	08/16/20	-	08/17/20	< 0.7	**1,062** ± 194	< 10	< 11	< 9	< 230
	09/07/20	-	09/08/20	< 0.7	**989** ± 196	< 10	< 8	< 8	< 173
	09/21/20	-	09/22/20	< 0.6	**1,267** ± 179	< 8	< 8	< 8	< 158
	10/04/20	-	10/05/20	< 0.7	**1,424** ± 204	< 9	< 8	< 10	< 187
	10/18/20	-	10/19/20	< 0.8	**1,481** ± 203	< 9	< 9	< 10	< 179
	11/01/20	-	11/02/20	< 0.9	**1,277** ± 192	< 11	< 9	< 8	< 180
	11/15/20	-	11/16/20	< 0.9	**1,320** ± 163	< 7	< 8	< 10	< 172
	12/06/20	-	12/07/20	< 0.8	**1,145** ± 171	< 8	< 10	< 8	< 199
	AVERAGE*			-	**1,266** ± 317	-	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 17, Concentrations of Iodine-131 And Gamma Emitters In Milk, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >					
				I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-13E3	01/05/20	-	01/06/20	< 0.5	**1,238** ± 142	< 7	< 7	< 10	< 138
	02/02/20	-	02/03/20	< 0.7	**1,027** ± 182	< 10	< 10	< 9	< 192
	03/02/20	-	03/03/20	< 0.9	**1,211** ± 183	< 8	< 8	< 10	< 157
	07/19/20	-	07/20/20	< 0.7	**1,520** ± 185	< 7	< 8	< 6	< 158
	08/02/20	-	08/03/20	< 0.6	**1,205** ± 194	< 10	< 8	< 10	< 174
	08/16/20	-	08/17/20	< 0.6	**1,462** ± 182	< 9	< 8	< 10	< 201
	09/07/20	-	09/08/20	< 0.7	**1,328** ± 168	< 9	< 7	< 13	< 169
	09/21/20	-	09/22/20	< 0.6	**1,302** ± 191	< 7	< 8	< 10	< 178
	10/04/20	-	10/05/20	< 0.6	**1,528** ± 191	< 9	< 7	< 6	< 193
	10/18/20	-	10/19/20	< 0.9	**1,614** ± 190	< 9	< 9	< 8	< 191
	11/01/20	-	11/02/20	< 0.8	**1,308** ± 172	< 10	< 9	< 7	< 178
	11/15/20	-	11/16/20	< 0.8	**1,177** ± 181	< 11	< 10	< 11	< 191
	12/06/20	-	12/07/20	< 0.9	**1,269** ± 212	< 7	< 7	< 10	< 205
	AVERAGE*			-	**1,322** ± 332	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 17, Concentrations of Iodine-131 And Gamma Emitters In Milk, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >					
				I-131 LL	K-40	Cs-134	Cs-137	BaLa-140	Ra-226
SA-MLK-14F4	01/05/20	-	01/06/20	< 0.4	**1,283** ± 142	< 8	< 8	< 9	< 162
	02/02/20	-	02/03/20	< 0.8	**1,263** ± 195	< 9	< 9	< 6	< 201
	03/02/20	-	03/03/20	< 0.8	**1,250** ± 161	< 6	< 6	< 6	< 133
	07/19/20	-	07/20/20	< 0.6	**1,554** ± 206	< 8	< 9	< 9	< 206
	08/02/20	-	08/03/20	< 0.6	**1,217** ± 176	< 9	< 10	< 10	< 194
	08/16/20	-	08/17/20	< 0.7	**1,423** ± 161	< 8	< 8	< 10	< 172
	09/07/20	-	09/08/20	< 0.8	**1,235** ± 179	< 10	< 9	< 8	< 192
	09/21/20	-	09/22/20	< 0.8	**1,243** ± 192	< 8	< 8	< 8	< 190
	10/04/20	-	10/05/20	< 0.6	**1,434** ± 218	< 9	< 8	< 7	< 175
	10/18/20	-	10/19/20	< 0.7	**1,149** ± 157	< 9	< 9	< 12	< 178
	11/01/20	-	11/02/20	< 0.9	**1,472** ± 229	< 9	< 10	< 13	< 177
	11/15/20	-	11/16/20	< 0.9	**1,327** ± 165	< 8	< 8	< 8	< 185
	12/06/20	-	12/07/20	< 0.8	**1,190** ± 157	< 8	< 9	< 9	< 179
	AVERAGE*			-	**1,311** ± 245	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 18, Concentration of Gross Alpha and Beta Emitters and Tritium in Well Water, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION DATE	Gross Alpha	Gross Beta	H-3
SA-WWA-3E1	01/20/20	< 0.8	**3.2** ± 1.8	< 187
	02/18/20	< 2.0	< 2.6	< 175
	03/16/20	< 0.9	< 2.3	< 178
	04/20/20	< 1.4	< 2.3	< 183
	05/26/20	< 1.1	**4.1** ± 2.2	< 184
	06/22/20	< 1.9	< 2.2	< 188
	07/20/20	< 0.9	< 2.1	< 184
	08/24/20	< 2.3	< 2.4	< 188
	09/21/20	< 0.9	< 2.3	< 178
	10/19/20	< 2.2	< 2.4	< 194
	11/16/20	< 2.2	< 1.9	< 165
	12/21/20	< 2.6	< 2.4	< 197
	AVERAGE*	-	**3.7** ± 1.3	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 19, Concentrations of Iodine-131 And Gamma Emitters In Well Water**, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION DATE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >											
		I-131 LL	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	ZrNb-95	Cs-134	Cs-137	BaLa-140	Ra-226
SA-WWA-3E1	01/20/20	< 0.8	< 121	< 5	< 5	< 14	< 6	< 14	< 10	< 9	< 8	< 8	< 220
	02/18/20	< 0.6	< 75	< 3	< 4	< 6	< 4	< 7	< 4	< 4	< 4	< 4	< 85
	03/16/20	< 0.6	< 52	< 7	< 7	< 14	< 7	< 17	< 7	< 9	< 7	< 8	< 213
	04/20/20	< 0.7	< 123	< 6	< 6	< 14	< 7	< 12	< 6	< 6	< 8	< 8	< 163
	05/26/20	< 0.7	< 87	< 5	< 6	< 11	< 6	< 12	< 6	< 6	< 5	< 8	< 165
	06/22/20	< 0.5	< 138	< 7	< 7	< 13	< 6	< 12	< 10	< 9	< 8	< 8	< 205
	07/20/20	< 0.7	< 67	< 8	< 6	< 13	< 6	< 14	< 8	< 8	< 7	< 9	< 174
	08/24/20	< 0.6	< 42	< 5	< 5	< 11	< 5	< 11	< 6	< 5	< 6	< 6	< 159
	09/21/20	< 0.7	< 94	< 8	< 7	< 13	< 8	< 23	< 8	< 7	< 8	< 11	< 188
	10/19/20	< 0.7	< 139	< 6	< 7	< 12	< 8	< 10	< 7	< 8	< 7	< 7	< 197
	11/16/20	< 0.9	< 78	< 7	< 7	< 14	< 7	< 16	< 9	< 5	< 8	< 7	< 204
	12/21/20	< 0.9	< 40	< 5	< 5	< 9	< 4	< 10	< 5	< 5	< 5	< 10	< 127
	AVERAGE*	-	-	-	-	-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 20, Concentrations of Gross Alpha And Gross Beta Emitters and Tritium in Raw and Treated Potable Water**, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	Gross Alpha	Gross Beta	H-3
SA-PWR-2F3	12/30/19	-	01/27/20	< 0.9	**5.2** ± 2.0	< 180
	01/27/20	-	02/27/20	< 2.7	**7.3** ± 2.2	< 181
	02/27/20	-	03/30/20	< 2.4	**7.7** ± 2.3	< 181
	03/30/20	-	04/27/20	< 2.4	**8.8** ± 2.0	< 182
	04/27/20	-	05/26/20	< 1.8	**7.0** ± 2.6	< 174
	05/26/20	-	06/29/20	< 2.2	**9.4** ± 2.4	< 187
	06/29/20	-	07/27/20	< 2.6	**7.2** ± 1.9	< 197
	07/27/20	-	08/31/20	< 2.8	**10.2** ± 1.4	< 176
	08/31/20	-	09/28/20	< 2.9	**4.6** ± 2.0	< 177
	09/28/20	-	10/26/20	< 1.9	**6.3** ± 2.0	< 186
	10/26/20	-	11/30/20	< 1.8	**8.5** ± 2.1	< 195
	11/30/20	-	12/28/20	< 1.6	**6.0** ± 1.8	< 183
	AVERAGE*			-	**7.3** ± 3.4	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 20, Concentrations of Gross Alpha And Gross Beta Emitters and Tritium in Raw and Treated Potable Water**, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		STOP	Gross Alpha	Gross Beta	H-3
SA-PWT-2F3	12/30/19	-	01/27/20	< 0.9	**7.1** ± 2.1	< 184
	01/27/20	-	02/27/20	< 2.3	**8.1** ± 2.0	< 185
	02/27/20	-	03/30/20	< 0.7	**9.3** ± 2.3	< 177
	03/30/20	-	04/27/20	< 2.4	**10.2** ± 2.2	< 186
	04/27/20	-	05/26/20	< 1.8	**10.0** ± 3.0	< 175
	05/26/20	-	06/29/20	< 2.1	**8.7** ± 2.2	< 185
	06/29/20	-	07/27/20	< 2.6	**6.5** ± 1.9	< 197
	07/27/20	-	08/31/20	< 1.6	**7.6** ± 2.2	< 175
	08/31/20	-	09/28/20	< 1.1	**6.0** ± 2.2	< 180
	09/28/20	-	10/26/20	< 1.8	**5.1** ± 1.9	< 186
	10/26/20	-	11/30/20	< 1.7	**9.1** ± 2.1	< 196
	11/30/20	-	12/28/20	< 1.7	**9.0** ± 2.0	< 189
	AVERAGE*			-	**8.1** ± 3.2	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 21, Concentrations of Iodine-131 and Gamma Emitters in Raw and Treated Potable Water**, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >										
				I-131 LL	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	ZrNb-95	Cs-134	Cs-137	BaLa-140	Ra-226
SA-PWR-2F3	12/30/19	-	01/27/20	< 0.8	< 128	< 8	< 8	< 11	< 6	< 13	< 10	< 9	< 9	< 10	< 191
	01/27/20	-	02/27/20	< 0.4	< 136	< 8	< 7	< 14	< 7	< 10	< 7	< 7	< 8	< 7	< 207
	02/27/20	-	03/30/20	< 0.7	< 56	< 6	< 8	< 9	< 6	< 14	< 7	< 7	< 7	< 6	< 155
	03/30/20	-	04/27/20	< 0.8	< 103	< 6	< 5	< 12	< 6	< 12	< 6	< 5	< 6	< 6	< 140
	04/27/20	-	05/26/20	< 0.9	< 129	< 6	< 5	< 11	< 7	< 13	< 7	< 7	< 7	< 10	< 159
	05/26/20	-	06/29/20	< 0.4	< 125	< 7	< 5	< 14	< 7	< 15	< 7	< 6	< 6	< 7	< 172
	06/29/20	-	07/27/20	< 0.7	< 118	< 5	< 6	< 11	< 6	< 12	< 6	< 7	< 6	< 7	< 147
	07/27/20	-	08/31/20	< 0.9	< 127	< 6	< 6	< 12	< 7	< 15	< 7	< 8	< 6	< 8	< 177
	08/31/20	-	09/28/20	< 0.9	< 131	< 6	< 6	< 11	< 5	< 10	< 6	< 7	< 5	< 6	< 167
	09/28/20	-	10/26/20	< 0.8	< 37	< 3	< 3	< 6	< 3	< 6	< 3	< 4	< 4	< 4	< 95
	10/26/20	-	11/30/20	< 0.7	< 125	< 6	< 7	< 8	< 10	< 15	< 8	< 8	< 7	< 12	< 172
	11/30/20	-	12/28/20	< 0.7	< 96	< 6	< 5	< 11	< 5	< 14	< 7	< 7	< 6	< 6	< 173
	AVERAGE*			-	-	-	-	-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 21, Concentrations of Iodine-131 and Gamma Emitters in Raw and Treated Potable Water**, 2020

Results in Units of pCi/L ± 2σ

STATION ID	COLLECTION PERIOD START		COLLECTION PERIOD STOP	I-131 LL	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - > K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	ZrNb-95	Cs-134	Cs-137	BaLa-140	Ra-226
SA-PWT-2F3	12/30/19	-	01/27/20	< 0.9	< 97	< 6	< 6	< 14	< 7	< 15	< 8	< 7	< 6	< 10	< 171
	01/27/20	-	02/27/20	< 0.5	< 120	< 6	< 8	< 11	< 6	< 13	< 7	< 9	< 6	< 6	< 176
	02/27/20	-	03/30/20	< 0.6	< 111	< 6	< 6	< 16	< 8	< 13	< 7	< 8	< 7	< 10	< 154
	03/30/20	-	04/27/20	< 0.6	< 102	< 5	< 5	< 9	< 5	< 10	< 6	< 5	< 4	< 6	< 146
	04/27/20	-	05/26/20	< 0.7	< 89	< 8	< 7	< 15	< 7	< 14	< 7	< 10	< 9	< 6	< 182
	05/26/20	-	06/29/20	< 0.6	< 104	< 4	< 5	< 11	< 7	< 12	< 6	< 5	< 6	< 7	< 169
	06/29/20	-	07/27/20	< 0.6	< 103	< 6	< 6	< 14	< 7	< 13	< 7	< 6	< 7	< 9	< 140
	07/27/20	-	08/31/20	< 0.9	< 96	< 5	< 6	< 12	< 7	< 10	< 4	< 7	< 7	< 8	< 155
	08/31/20	-	09/28/20	< 0.9	< 135	< 6	< 7	< 13	< 9	< 13	< 7	< 9	< 6	< 9	< 171
	09/28/20	-	10/26/20	< 0.8	**61** ± 38	< 3	< 3	< 7	< 3	< 6	< 3	< 4	< 4	< 4	< 81
	10/26/20	-	11/30/20	< 0.9	< 116	< 7	< 6	< 15	< 10	< 14	< 5	< 6	< 8	< 12	< 166
	11/30/20	-	12/28/20	< 0.6	< 90	< 5	< 6	< 10	< 7	< 11	< 6	< 6	< 5	< 7	< 162
	AVERAGE*			-	**61** ± 38	-	-	-	-	-	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 22, Concentrations of Gamma Emitters in Broadleaf Vegetation (FPL), 2020

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-FPL-3H5 (C)	07/07/20	Cabbage	< 169	**2,220** ± 355	< 23	< 21	< 23	< 394	< 79
SA-FPL-1S1	07/13/20	Broccoli	< 250	**5,735** ± 616	< 28	< 27	< 27	< 550	< 111
SA-FPL-1S1	07/13/20	Hosta	**898** ± 190	**3,638** ± 416	< 28	< 25	< 23	< 410	< 75
SA-FPL-1S1	08/12/20	Broccoli	< 260	**4,714** ± 597	< 24	< 31	< 24	< 543	< 117
SA-FPL-1S1	08/31/20	Broccoli	< 291	**6,842** ± 916	< 36	< 32	< 33	< 641	< 125
SA-FPL-1S1	08/31/20	Lambs Ear	**1,024** ± 355	**5,899** ± 794	< 57	< 34	< 35	< 716	< 147
SA-FPL-7S2	07/29/20	Broccoli	< 485	**8,087** ± 961	< 55	< 58	< 56	< 899	< 236
SA-FPL-7S2	07/29/20	Lambs Ear	**2,697** ± 274	**11,130** ± 751	< 56	< 34	< 33	< 686	< 134
SA-FPL-7S2	08/31/20	Broccoli	< 236	**5,496** ± 675	< 30	< 31	< 29	< 542	< 112
SA-FPL-15S2	07/13/20	Hosta	**766** ± 406	**2,493** ± 893	< 53	< 58	< 45	< 1,238	< 257
SA-FPL-15S2	07/13/20	Lambs Ear	**1,570** ± 181	**5,386** ± 370	< 21	< 18	< 18	< 381	< 70
SA-FPL-15S2	08/31/20	Broccoli	< 303	**4,112** ± 647	< 55	< 33	< 32	< 704	< 124
SA-FPL-15S2	08/31/20	Hosta	**1,033** ± 246	**4,331** ± 410	< 52	< 27	< 26	< 471	< 103
SA-FPL-15S2	08/31/20	Lambs Ear	**1,825** ± 360	**7,293** ± 822	< 34	< 42	< 32	< 816	< 130
SA-FPL-16S1	07/13/20	Broccoli	< 93	**3,501** ± 207	< 19	< 11	< 11	< 247	< 42
SA-FPL-16S1	07/13/20	Hosta	**1,135** ± 246	**3,166** ± 449	< 37	< 33	< 32	< 558	**127** ± 70
SA-FPL-16S1	07/13/20	Lambs Ear	**865** ± 135	**5,399** ± 407	< 23	< 21	< 19	< 323	< 89
SA-FPL-16S1	08/31/20	Broccoli	< 274	**5,398** ± 914	< 36	< 32	< 33	< 617	< 131
SA-FPL-16S1	08/31/20	Lambs Ear	**1,096** ± 300	**7,175** ± 558	< 51	< 28	< 26	< 448	< 109
SA-FPL-10D1	07/13/20	Hosta	**954** ± 347	**3,021** ± 664	< 58	< 47	< 43	< 819	< 183
SA-FPL-10D1	07/13/20	Lambs Ear	< 476	**5,405** ± 811	< 56	< 47	< 42	< 1,059	< 151

Table 22, Concentrations of Gamma Emitters in Broadleaf Vegetation (FPL), 2020

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-FPL-10D1	08/31/20	Broccoli	< 322	**4,727** ± 636	< 57	< 31	< 31	< 637	< 128
SA-FPL-10D1	08/31/20	Hosta	**592** ± 153	**3,234** ± 414	< 45	< 26	< 22	< 417	**89** ± 48
SA-FPL-10D1	08/31/20	Lambs Ear	**2,034** ± 367	**6,251** ± 745	< 40	< 31	< 35	< 519	< 127
	ALL INDICATOR AVERAGE*		**1,268 ± 1,197**	**5,323 ± 3,909**	-	-	-	-	**108 ± 53**

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 23, Concentrations of Gamma Emitters in Vegetables (FPV)**, 2020

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-FPV-2F9**	05/05/20	Asparagus	< 182	**2,299** ± 492	< 30	< 25	< 25	< 490	< 92
SA-FPV-2F9**	07/07/20	Peppers	< 292	**1,869** ± 462	< 45	< 38	< 41	< 900	< 161
SA-FPV-2F9**	07/07/20	Corn	< 176	**2,939** ± 576	< 27	< 28	< 23	< 562	< 99
SA-FPV-2F9**	07/07/20	Tomatoes	< 185	**1,197** ± 334	< 26	< 25	< 23	< 463	< 79
SA-FPV-15F4**	07/29/20	Corn	< 180	**2,338** ± 454	< 32	< 22	< 19	< 472	< 82
SA-FPV-1G1**	05/05/20	Asparagus	< 188	**1,848** ± 348	< 26	< 28	< 22	< 500	< 90
SA-FPV-1G1**	07/07/20	Peppers	< 186	**1,728** ± 376	< 25	< 24	< 23	< 475	< 112
SA-FPV-1G1**	07/29/20	Tomatoes	< 120	**1,615** ± 313	< 23	< 17	< 16	< 394	< 67
SA-FPV-1G1**	07/29/20	Corn	< 208	**2,858** ± 456	< 39	< 30	< 29	< 667	< 108
SA-FPV-1G1**	07/29/20	Peaches	< 209	**2,447** ± 404	< 37	< 20	< 29	< 643	< 97
SA-FPV-2G2**	07/07/20	Peaches	< 116	**1,916** ± 272	< 18	< 16	< 15	< 333	< 60
SA-FPV-2G2**	07/07/20	Peppers	< 167	**1,843** ± 359	< 27	< 24	< 26	< 508	< 84
SA-FPV-2G2**	07/07/20	Tomatoes	< 113	**2,303** ± 331	< 19	< 17	< 16	< 336	< 70
SA-FPV-2G2**	07/07/20	Corn	< 129	**2,057** ± 385	< 19	< 18	< 16	< 323	< 68
SA-FPV-9F1**	07/29/20	Tomatoes	< 168	**2,193** ± 382	< 28	< 21	< 20	< 457	< 69
SA-FPV-3H5**	05/05/20	Asparagus	< 191	**1,983** ± 374	< 24	< 27	< 20	< 466	< 80
SA-FPV-3H5**	07/07/20	Tomatoes	< 159	**1,775** ± 390	< 23	< 21	< 16	< 404	< 73
SA-FPV-3H5**	07/07/20	Corn	< 192	**3,076** ± 423	< 27	< 21	< 22	< 544	< 95
SA-FPV-3H5**	07/07/20	Peaches	< 167	**1,524** ± 363	< 20	< 21	< 17	< 437	< 62
SA-FPV-3H5**	07/07/20	Peppers	< 152	**1,584** ± 352	< 24	< 20	< 21	< 359	< 81
AVERAGE*			-	**2,070** ± 985	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 24, Concentrations of Gamma Emitters in Fodder Crops**, 2020

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	< - - - - - - - - - - - - - - GAMMA EMITTERS - - - - - - - - - - - - - - >						
			Be-7	K-40	I-131	Cs-134	Cs-137	Ra-226	Th-232
SA-VGT-13E3**	10/19/20	Silage	**1,716** ± 269	**7,663** ± 760	< 31	< 31	< 25	< 587	< 121
SA-VGT-14F4**	10/19/20	Silage	**588** ± 162	**2,904** ± 377	< 17	< 18	< 13	< 292	< 65
SA-VGT-2G3**	10/19/20	Silage	**619** ± 141	**3,534** ± 341	< 16	< 13	< 13	< 329	< 57
AVERAGE*			**974** ± 1,285	**4,700** ± 5,170	-	-	-	-	-

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 25, Concentrations of Gamma Emitters in Soil**, 2020

Soil is only sampled every 3 years.
Due again in 2022.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

Table 26, Concentrations of Gamma Emitters in Game**, 2020

Results in Units of pCi/kg (wet) ± 2σ

STATION ID	COLLECTION DATE	SAMPLE TYPE	<----------GAMMA EMITTERS---------->				
			Be-7	K-40	I-131	Cs-134	Cs-137
SA-GAM-3E1	01/27/20	Muskrat	< 86	**2,769** ± 334	< 14	< 11	< 11
SA-GAM-13E3	02/05/20	Muskrat	< 80	**2,611** ± 364	< 17	< 14	< 15
SA-GAM-5C1	01/15/20	Muskrat	< 71	**3,140** ± 308	< 14	< 12	< 11
ALL INDICATOR AVERAGE*			**-**	**2,840 ± 543**	**-**	**-**	**-**

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

** MANAGEMENT AUDIT SAMPLE: NOT REQUIRED BY ODCM.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 27, Concentrations of Tritium in Surface Water, 2020

Results in Units of pCi/L ± 2σ

COLLECTION PERIOD			CONTROL	INDICATORS			
START		STOP	SA-SWA-12C1 (C)	SA-SWA-11A1	SA-SWA-7E1	SA-SWA-1F2	SA-SWA-16F1
01/07/20	-	01/22/20	< 174	< 179	< 180	< 178	< 178
02/03/20	-	02/18/20	< 181	< 180	< 183	< 181	< 183
03/03/20	-	03/17/20	< 191	< 187	< 186	< 184	< 183
04/06/20	-	04/20/20	< 183	**827** ± 157	< 184	< 177	< 183
05/05/20	-	05/21/20	< 176	< 177	< 173	< 176	< 174
06/09/20	-	06/26/20	< 181	< 181	< 182	< 182	< 186
07/07/20	-	07/21/20	< 193	< 192	< 194	< 194	< 192
08/07/20	-	08/17/20	< 155	< 161	< 161	< 159	< 159
09/09/20	-	09/24/20	< 179	< 178	< 180	< 180	< 179
10/08/20	-	10/23/20	< 183	< 185	< 185	< 184	< 185
11/05/20	-	11/19/20	< 190	< 192	< 194	< 192	< 197
12/10/20	-	12/21/20	< 192	< 187	< 187	< 187	< 189
		AVERAGE*	-	**827** ± 157	-	-	-

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

\- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2020

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-12C1 (C)	01/07/20	< 0.9	< 38	< 5	< 5	< 12	< 5	< 8	< 5	< 5	< 6	< 8
	02/03/20	< 0.6	**59** ± 23	< 1	< 1	< 3	< 2	< 3	< 2	< 1	< 1	< 3
	03/03/20	< 0.5	< 43	< 5	< 5	< 9	< 4	< 9	< 5	< 5	< 5	< 8
	04/06/20	< 0.7	< 98	< 4	< 4	< 10	< 5	< 8	< 5	< 5	< 5	< 9
	05/05/20	< 0.6	< 42	< 2	< 2	< 6	< 2	< 5	< 2	< 3	< 2	< 5
	06/09/20	< 0.9	< 52	< 3	< 3	< 6	< 3	< 5	< 3	< 3	< 3	< 5
	07/07/20	< 0.7	< 86	< 5	< 4	< 9	< 5	< 8	< 5	< 4	< 4	< 8
	08/07/20	< 0.6	< 62	< 3	< 3	< 6	< 3	< 6	< 3	< 4	< 3	< 3
	09/09/20	< 0.5	< 45	< 4	< 5	< 11	< 5	< 10	< 5	< 5	< 5	< 7
	10/08/20	< 0.6	**127** ± 50	< 4	< 4	< 10	< 5	< 11	< 5	< 5	< 5	< 7
	11/05/20	< 0.8	**57** ± 31	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 4
	12/10/20	< 0.7	< 46	< 4	< 4	< 8	< 5	< 9	< 5	< 5	< 5	< 7
	AVERAGE*	-	**81** ± 80	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2020

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-11A1	01/07/20	< 0.8	**115** ± 59	< 6	< 5	< 13	< 6	< 12	< 7	< 4	< 6	< 7
	02/03/20	< 0.6	**57** ± 27	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 4
	03/03/20	< 0.7	< 37	< 4	< 3	< 7	< 4	< 8	< 4	< 5	< 4	< 6
	04/06/20	< 0.7	< 93	< 4	< 5	< 9	< 5	< 9	< 4	< 5	< 5	< 7
	05/05/20	< 0.6	< 60	< 3	< 3	< 7	< 3	< 6	< 3	< 4	< 3	< 5
	06/09/20	< 0.7	**79** ± 46	< 3	< 2	< 6	< 3	< 6	< 3	< 3	< 3	< 4
	07/07/20	< 0.8	**96** ± 60	< 5	< 4	< 10	< 4	< 10	< 5	< 5	< 5	< 8
	08/07/20	< 0.6	< 25	< 3	< 3	< 7	< 4	< 6	< 3	< 4	< 4	< 5
	09/09/20	< 0.5	< 131	< 7	< 6	< 13	< 7	< 15	< 6	< 7	< 6	< 9
	10/08/20	< 0.8	**110** ± 50	< 4	< 4	< 7	< 4	< 7	< 4	< 4	< 4	< 5
	11/05/20	< 0.9	**74** ± 29	< 2	< 2	< 5	< 2	< 4	< 2	< 2	< 2	< 4
	12/10/20	< 0.9	< 113	< 6	< 4	< 9	< 5	< 12	< 5	< 5	< 5	< 7
	AVERAGE*	-	**89** ± 45	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2020

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-7E1	01/07/20	< 0.8	**124** ± 55	< 5	< 5	< 9	< 5	< 8	< 4	< 6	< 5	< 7
	02/03/20	< 0.7	**91** ± 25	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 4
	03/03/20	< 0.7	**100** ± 47	< 4	< 4	< 9	< 4	< 8	< 5	< 6	< 5	< 8
	04/06/20	< 0.7	**97** ± 56	< 4	< 5	< 8	< 4	< 10	< 4	< 5	< 4	< 9
	05/05/20	< 0.6	< 60	< 5	< 5	< 12	< 5	< 10	< 5	< 5	< 5	< 8
	06/09/20	< 0.6	**59** ± 34	< 3	< 3	< 5	< 2	< 6	< 3	< 2	< 3	< 5
	07/07/20	< 0.8	**126** ± 61	< 4	< 4	< 9	< 5	< 10	< 4	< 4	< 4	< 7
	08/07/20	< 0.8	< 29	< 3	< 3	< 6	< 3	< 6	< 3	< 4	< 3	< 4
	09/09/20	< 0.6	**110** ± 60	< 5	< 5	< 10	< 5	< 9	< 5	< 6	< 5	< 6
	10/08/20	< 0.7	< 40	< 4	< 4	< 10	< 4	< 9	< 4	< 4	< 5	< 6
	11/05/20	< 0.9	**93** ± 26	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 4
	12/10/20	< 0.9	< 42	< 5	< 6	< 14	< 7	< 14	< 6	< 8	< 7	< 8
	AVERAGE*	-	**100** ± 42	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2020

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-1F2	01/07/20	< 0.8	< 31	< 6	< 6	< 14	< 6	< 12	< 6	< 6	< 6	< 11
	02/03/20	< 0.9	< 21	< 2	< 2	< 4	< 2	< 4	< 2	< 2	< 2	< 5
	03/03/20	< 0.8	< 45	< 3	< 5	< 9	< 5	< 8	< 5	< 5	< 4	< 8
	04/06/20	< 0.7	< 85	< 4	< 4	< 10	< 4	< 10	< 5	< 6	< 4	< 9
	05/05/20	< 0.5	< 52	< 5	< 5	< 11	< 5	< 12	< 5	< 6	< 5	< 11
	06/09/20	< 0.5	< 23	< 3	< 3	< 6	< 3	< 5	< 3	< 3	< 3	< 3
	07/07/20	< 0.7	< 106	< 5	< 5	< 14	< 5	< 10	< 5	< 7	< 6	< 9
	08/07/20	< 0.6	< 54	< 3	< 3	< 7	< 5	< 7	< 3	< 4	< 4	< 4
	09/09/20	< 0.9	< 106	< 5	< 6	< 11	< 7	< 11	< 5	< 5	< 7	< 7
	10/08/20	< 0.9	< 42	< 4	< 5	< 10	< 4	< 9	< 5	< 5	< 5	< 7
	11/05/20	< 0.9	< 16	< 2	< 2	< 5	< 2	< 4	< 2	< 2	< 2	< 5
	12/10/20	< 0.9	< 104	< 5	< 4	< 9	< 6	< 8	< 6	< 6	< 6	< 9
	AVERAGE*	-	-	-	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 28, Concentrations of Iodine-131 and Gamma Emitters in Surface Water, 2020

Results in Units of pCi/L ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	**Collection Date**	**I-131 LL**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**ZrNb-95**	**Cs-134**	**Cs-137**	**BaLa-140**
SA-SWA-16F1	01/07/20	< 0.9	**96 ± 47**	< 3	< 4	< 10	< 5	< 7	< 4	< 5	< 5	< 5
	02/03/20	< 0.7	**42 ± 26**	< 2	< 2	< 3	< 2	< 3	< 2	< 2	< 2	< 3
	03/03/20	< 0.7	< 83	< 4	< 4	< 8	< 5	< 11	< 4	< 5	< 5	< 9
	04/06/20	< 0.8	< 87	< 4	< 4	< 10	< 4	< 9	< 3	< 5	< 5	< 8
	05/05/20	< 0.5	< 44	< 2	< 3	< 5	< 2	< 5	< 2	< 2	< 3	< 4
	06/09/20	< 0.6	< 53	< 3	< 3	< 6	< 3	< 6	< 3	< 3	< 3	< 4
	07/07/20	< 0.7	< 61	< 5	< 5	< 10	< 4	< 9	< 5	< 6	< 4	< 10
	08/07/20	< 0.6	< 65	< 3	< 3	< 7	< 3	< 7	< 3	< 3	< 3	< 4
	09/09/20	< 0.5	< 57	< 6	< 5	< 12	< 6	< 10	< 6	< 6	< 6	< 7
	10/08/20	< 0.9	< 53	< 5	< 5	< 12	< 7	< 11	< 5	< 6	< 5	< 8
	11/05/20	< 0.9	< 70	< 3	< 3	< 7	< 3	< 6	< 4	< 4	< 3	< 8
	12/10/20	< 0.8	< 100	< 5	< 7	< 14	< 7	< 15	< 6	< 7	< 6	< 12
	AVERAGE*	-	**69 ± 77**	-	-	-	-	-	-	-	-	-

ALL INDICATOR AVERAGE* **92 ± 48**

(C) CONTROL LOCATION.

***** THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 29, Concentrations of Gamma Emitters in Edible Fish, 2020

Results in Units of pCi/kg (wet) ± 2σ

		<----------GAMMA EMITTERS---------->										
STATION ID	Collection Date	K-40			Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137	Ra-226
SA-ESF-12C1 (C)	04/28/20	**2,656**	±	1,028	< 69	< 60	< 127	< 61	< 167	< 93	< 54	< 1511
	04/28/20	**5,259**	±	865	< 47	< 47	< 92	< 46	< 99	< 53	< 47	< 855
	04/28/20	**4,296**	±	487	< 27	< 27	< 54	< 29	< 54	< 30	< 27	< 434
	09/24/20	**4,512**	±	1,102	< 45	< 83	< 132	< 63	< 153	< 60	< 68	< 1280
	10/13/20	**2,961**	±	1,390	< 107	< 89	< 155	< 117	< 239	< 86	< 94	< 1970
	10/13/20	**3,459**	±	601	< 36	< 35	< 67	< 37	< 75	< 33	< 35	< 694
	AVERAGE*	**3,857**	±	1,998	-	-	-	-	-	-	-	-
SA-ESF-11A1	05/01/20	**4,049**	±	634	< 28	< 29	< 63	< 38	< 70	< 37	< 36	< 575
	05/01/20	**3,254**	±	506	< 29	< 28	< 55	< 28	< 60	< 32	< 29	< 596
	05/01/20	**4,477**	±	590	< 33	< 30	< 64	< 35	< 67	< 32	< 35	< 593
	10/14/20	**3,384**	±	941	< 49	< 62	< 104	< 65	< 75	< 46	< 58	< 812
	10/19/20	**3,516**	±	571	< 31	< 27	< 62	< 30	< 63	< 31	< 30	< 595
	AVERAGE*	**3,736**	±	1,026	-	-	-	-	-	-	-	-
SA-ESF-7E1	04/28/20 ***	**4,954**	±	936	< 44	< 47	< 109	< 52	< 100	< 44	< 50	< 1003
	10/14/20	**2,865**	±	999	< 64	< 63	< 144	< 63	< 62	< 53	< 53	< 1196
	10/19/20	**4,132**	±	1,256	< 72	< 71	< 143	< 77	< 154	< 70	< 72	< 1255
	AVERAGE*	**3,984**	±	2,105	-	-	-	-	-	-	-	-
	ALL INDICATOR AVERAGE*	**3,829**	±	1,390								

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

*** SEE 'SAMPLE ANOMOLIES AND PROGRAM EXCEPTIONS' SECTION OF THIS REPORT.

Table 30, **Concentrations of Gamma Emitters in Crabs, 2020**

Results in Units of pCi/kg (wet) ± 2σ

		<----------GAMMA EMITTERS---------->								
STATION ID	**Collection Date**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**Cs-134**	**Cs-137**	**Ra-226**
SA-ECH-12C1 (C)	07/15/20	**3,402** ± 928	< 60	< 68	< 150	< 60	< 151	< 87	< 66	< 1,414
	08/26/20	**2,546** ± 857	< 65	< 63	< 158	< 57	< 109	< 57	< 61	< 855
	AVERAGE*	**2,974** ± 1211	-	-	-	-	-	-	-	-
STATION ID	**Collection Date**	**K-40**	**Mn-54**	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**	**Cs-134**	**Cs-137**	**Ra-226**
SA-ECH-11A1	07/15/20	**3,178** ± 838	< 58	< 46	< 100	< 54	< 94	< 52	< 60	< 992
	08/26/20	**2,857** ± 996	< 57	< 73	< 140	< 68	< 146	< 66	< 65	< 1,277
	AVERAGE*	**3,018** ± 454	-	-	-	-	-	-	-	-

(C) CONTROL LOCATION.

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- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Table 31, Concentrations of Gamma Emitters in Sediment, 2020

Results in Units of pCi/kg (dry) ± 2σ

		<----------GAMMA EMITTERS---------->					
STATION ID	Collection Date	Be-7	K-40	Cs-134	Cs-137	Ra-226	Th-232
SA-ESS-12C1 (C)	07/21/20	< 703	**17,440** ± 1,820	< 109	< 79	< 1,804	**770** ± 269
	11/19/20	< 583	**16,730** ± 1,775	< 83	< 78	< 1,598	**756** ± 213
	AVERAGE*	-	**17,085** ± 1,004	-	-	-	**763** ± 21
SA-ESS-6A1	07/28/20	< 378	**6,777** ± 1,007	< 56	< 54	< 1,257	< 369
	11/23/20	< 468	**5,401** ± 1,168	< 60	< 53	< 1,025	< 289
	AVERAGE*	-	**6,089** ± 1,946	-	-	-	-
SA-ESS-11A1	07/21/20	< 398	**2,713** ± 884	< 60	< 39	< 1,141	< 257
	11/19/20	< 317	**3,028** ± 757	< 46	< 40	< 829	< 225
	AVERAGE*	-	**2,871** ± 445	-	-	-	-
SA-ESS-15A1	07/21/20	< 475	**6,587** ± 1,168	< 74	< 65	< 1,347	**408** ± 157
	11/19/20	< 464	**4,200** ± 863	< 66	< 62	< 1,214	**340** ± 108
	AVERAGE*	-	**5,394** ± 3,376	-	-	-	**374** ± 97
SA-ESS-16A1	07/21/20	< 623	**2,479** ± 948	< 75	< 75	**2,492** ± 1,565	**565** ± 170
	11/19/20	< 400	**3,567** ± 847	< 66	< 54	**1,442** ± 866	**644** ± 142
	AVERAGE*	-	**3,023** ± 1,539	-	-	**1,967** ± 1,485	**605** ± 112
SA-ESS-7E1	07/21/20	< 618	**10,900** ± 1,438	< 90	< 80	< 1,688	**837** ± 184
	11/13/20	< 520	**12,550** ± 1,610	< 78	< 67	< 1,108	< 434
	AVERAGE*	-	**11,725** ± 2,333	-	-	-	**837** ± 184
SA-ESS-16F1	07/21/20	< 466	**7,082** ± 1,090	< 58	< 52	< 1,055	**458** ± 158
	11/19/20	< 575	**17,790** ± 1,863	< 85	< 66	< 1,782	< 583

Table 31, Concentrations of Gamma Emitters in Sediment, 2020

Results in Units of pCi/kg (dry) ± 2σ

		<----------GAMMA EMITTERS---------->					
STATION ID	Collection Date	Be-7	K-40	Cs-134	Cs-137	Ra-226	Th-232
	AVERAGE*	-	**12,436** ± 15,143	-	-	-	**458** ± 158
	ALL INDICATOR AVERAGE*	-	**6,923** ± 9,330	-	-	**1,967** ± 1,485	**542** ± 362

(C) CONTROL LOCATION.

* THE AVERAGE AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES. IF THERE IS ONLY 1 POSITIVE VALUE, THE AVERAGE AND THE ERROR ARE DISPLAYED.

- INDICATES AVERAGE WAS NOT CALCULATED DUE TO NO POSITIVE VALUES FOR THE REPORTING PERIOD.

Attachment 3, Cross Check Intercomparison Program

Participation in cross check intercomparison studies is mandatory for laboratories performing analyses of REMP samples satisfying the requirements in the Offsite Site Dose Calculation Manual. Intercomparison studies provide a consistent and effective means to evaluate the accuracy and precision of analyses performed by a laboratory. Study results should fall within specified control limits and results that fall outside the control limits are investigated and corrected.

Teledyne Brown Engineering (TBE) and GEL Analytical Services (GEL) participated in the following proficiency testing studies provided by Environmental Resource Associates (ERA), Eckert Ziegler Analytics and DOE Mixed Analyte Performance Evaluation in 2020. The Laboratory's intercomparison program results for 2020 are shown in Table 32 to Table 37.

Teledyne Brown Engineering Summary of Results

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

A. Analytics Evaluation Criteria

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

B. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the 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. Evaluation Criteria

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

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

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

For the TBE laboratory, 126 out of 133 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program. A summary is found below:

1. The MAPEP February 2020 AP U-233/234 and U-238 results were evaluated as Not Acceptable. The reported value for U-233/234 was 0.0416 ± 0.0102 Bq/sample and the known result was 0.075 Bq/sample (acceptance range 0.053 - 0.098). The reported value for U-238 was 0.0388 ± 0.00991 Bq/sample and the known result was 0.078 Bq/sample (acceptance range 0.055 - 0.101). This sample was run as the workgroup duplicate and had RPD's of 10.4% (U-234) and 11.7% (U-238). After the known results were obtained, the sample was relogged. The filter was completely digested with tracer added originally; the R1 results were almost identical. It was concluded that the recorded tracer amount was actually double, causing the results to be skewed. Lab worksheets have been modified to verify actual tracer amount vs. LIMS data. TBE changed vendors for this cross-check to ERA MRAD during the 2nd half of 2020. Results were acceptable at 97.8% for U-234 and 106% for U-238. (NCR 20-13)

2. The Analytics September 2020 milk Sr-89 result was evaluated as Not Acceptable. The reported value was 62.8 pCi/L and the known result was 95.4 (66%). All QC data was reviewed and there were no anomalies. This was the first failure for milk Sr-89 since 2013 and there have only been 3 upper/lower boundary warnings since that time. It is believed that there may have been some loss during the sample prep (ashing). The December 2020 result was at 92% of the known. (NCR 20-19)

3. The ERA October 2020 water I-131 result was evaluated as Not Acceptable. The reported value was 22.9 pCi/L and the known result was 28.2 (acceptance range 23.5 - 33.1). The reported result was 81% of the known, which passes TBE QC criteria. This was the first failure for water I-131. (NCR 20-17)

4. The ERA October 2020 water Gross Alpha and Gross Beta results were evaluated as Not Acceptable. The reported/acceptable values and ranges are as follows:

Reported	Known		Range
Gross Alpha	40.0	26.2	13.3 - 34.7
Gross Beta	47.5	69.1	48.0 - 76.0

   All QC data was reviewed with no anomalies and a cause for failure could not be determined. This was the first failure for water Gross Beta. A Quick Response follow-up cross-check was analyzed as soon as possible with acceptable results at 96.8% for Gross Alpha and 102% for Gross Beta. (NCR 20-18)

5. The MAPEP August 2020 soil Ni-63 result was evaluated as Not Acceptable. The reported value was 438 ± 21.1 Bq/kg and the known result was 980 Bq/kg (acceptance range 686 - 1274). It is believed that some Ni-63 loss may have occurred during the sample prep. This investigation is still on-going at this time. (NCR 20-20)

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

GEL Laboratories Summary of Results

During 2020, forty-five (45) radioisotopes associated with seven (7) matrix types were analyzed under GEL's Performance Evaluation program in participation with ERA, MAPEP, and Eckert & Ziegler Analytics. Matrix types were representative of client analyses performed during 2020. Of the four hundred fifty-six (456) total results, 97.1% (443 of 456) were found to be acceptable within the PT providers three sigma or other statistical criteria. The list below contains the type of matrix evaluated by GEL.

- Air Filter
- Cartridge
- Water
- Milk
- Soil
- Liquid
- Vegetation

Graphs are provided in Figures 1-9 of this report to allow for the evaluation of trends or biases. These graphs include radioisotopes Cobalt-60, Cesium-137, Tritium, Strontium-90, Gross Alpha, Gross Beta, Iodine-131, Americium-241, and Plutonium-238.

Summary of Participation in the Eckert & Ziegler Analytics Environmental Cross-Check Program

Eckert & Ziegler Analytics provided samples for ninety-one (91) individual environmental analyses. The accuracy of each result reported to Eckert & Ziegler Analytics, Inc. is measured by the ratio of GEL's result to the known value. All results fell within GEL's acceptance criteria (100% within acceptance).

Summary of Participation in the MAPEP Monitoring Program

MAPEP Series 42 and 43 were analyzed by the laboratory. Of the one hundred twenty-eight (128) analyses, 99% (127 out of 128) fell within the PT provider's acceptance criteria.

Summary of Participation in the ERA MRaD PT Program

The ERA MRad program provided samples (MRAD-32 and MRAD-33) for one hundred ninety-eight (198) individual environmental analyses. Of the 198 analyses, 98% (194 out of 198) fell within the PT provider's acceptance criteria.

Summary of Participation in the ERA PT Program

The ERA program provided samples (RAD-120, RAD-121, and RAD-122) for forty (40) individual environmental analyses. Of the 40 analyses, 80% (32 out of 40) fell within the PT provider's acceptance criteria.

All corrective actions are summarized in the Table below.

Corrective Action Request and Report (CARR)

There are two categories of corrective action at GEL. One is corrective action implemented at the analytical and data review level in accordance with the analytical SOP. The other is formal corrective action documented by the Quality Systems Team in accordance with GL-QS-E-002. A formal corrective action is initiated when a nonconformance reoccurs or is so significant that permanent elimination or prevention of the problem is required. Formal corrective action investigations include root cause analysis.

GEL includes quality requirements in most analytical standard operating procedures to ensure that data are reported only if the quality control criteria are met or the quality control measures that did not meet the acceptance criteria are documented. A formal corrective action is implemented according to GL-QS-E-002 for Conducting Corrective/Preventive Action and Identifying Opportunities for Improvement. Recording and documentation is performed following guidelines stated in GL-QS-E-012 for Client NCR Database Operation.

Any employee at GEL can identify and report a nonconformance and request that corrective action be taken. Any GEL employee can participate on a corrective action team as requested by the QS team or Group Leaders. The steps for conducting corrective action are detailed in GL-QS-E-002. In the event that correctness or validity of the laboratory's test results in doubt, the laboratory will take corrective action. If investigations show that the results have been impacted, affected clients will be informed of the issue in writing within five (5) calendar days of the discovery.

The table below provides the status of CARRs for radiological performance testing during 2020. **It has been determined that causes of the unacceptable results did not impact any data reported to our clients.**

- CARR200224-1274 of PT Failures in RAD-120 for Drinking Water Sr-89, H-3, I-131
- CARR 200902-1278 of PT Failure in MRAD – 32 for: U-238 filter, Total U (mass) filter, U-234 water, Total U water

- CARR 200902-1287 of PT Failure in RAD-122 in drinking water for: Ba-133 and Co-60
- CARR 201214-1296 of PT Failure in MAPEP 43: Fe-55 in soil

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
CARR 201214-1296 ISO Documentation of PT Failure in MAPEP 43: • Fe-55 in soil	Root Cause Analysis Upon receipt of the PT report, an investigation was initiated by the Quality Department and a Corrective Action (CARR) team assembled. The team consisted of representatives from the affected areas. The sample preparation and analytical processes were reviewed. This included review of reagents and standards used in the sample preparation steps, calibration records, process control samples, and interviews with the analysts. The investigation determined that the laboratory met all quality control criteria specified in the method. Additionally, all internal procedures and policies were performed as required. These failures were tracked through GEL's internal non-conformance system. Iron-55: The laboratory reviewed the data and noted that the tracer recoveries for this analysis were lower than typical soil tracer recoveries. The lower tracer recoveries contributed to an uncertainty of approximately 25%. **The sample was recounted and recovered at 97% of the known value**. Permanent Corrective/Preventive Actions or Improvements None at this time. The laboratory will continue to monitor the recoveries of these parameters to ensure that there are no continued issues in the processes.
CARR 200902-1287 ISO Documentation of PT Failure in RAD-122 in drinking water for:	Root Cause Analysis The data was reviewed and no anomalies were noted. The batch duplicate result from the original analysis met the acceptance criteria of the study and replication criteria of the laboratory with

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
• Ba-133 • Co-60	RPDs of <10% for both isotopes. Laboratory processes were evaluated and no gross errors were found. The other reported analytes for this method were within the limits of the study. A definitive contributor to the slightly high bias could not be identified concluding that this was an isolated occurrence for these isotopes. Permanent Corrective/Preventive Actions or Improvements None at this time. The laboratory will continue to monitor the recoveries of these parameters to ensure that there are no continued issues in the processes
CARR 200902-1278 ISO Documentation of PT Failure in MRAD – 32 for: • U-238 filter • Total U (mass) filter • U-234 water • Total U water	Root Cause Analysis Filter: The sample was analyzed at 20X. As part of the investigation, the sample was reanalyzed at 5X and the results were within acceptance limits. Water: The samples were reanalyzed, and the results were within the acceptance limits. In reviewing the data, the laboratory suspects a possible bias in the lower end of the calibration. Permanent Corrective/Preventive Actions or Improvements Filter: The laboratory will be analyzing the sample without dilutions. The dilutions will only be performed when necessary. Water: The laboratory will be adding another point to the lower end of the calibration to remove potential bias in that section of the calibration. **The laboratory successfully analyzed these isotopes during the next round of MRAD samples**.
CARR 200224-1274 ISO Documentation of PT failures in drinking water of RAD-120 for • Sr-89 • Tritium • I - 131	Root Cause Analysis Strontium-89-A review of the data and the preparation processes did not reveal any errors or possible contributors to the high bias. In addition, the reported values are 117% and 114% of the reference value which are with the laboratory's standard acceptance criteria of +/- 25% for Laboratory Control Samples. Tritium-All data and laboratory processes were evaluated, and no errors were found. The Laboratory has concluded that this low bias was an isolated occurrence and that the overall process is within control.

CORRECTIVE ACTION ID# & PE FAILURE	DISPOSITION
	Iodine-131- The laboratory has reviewed the data and found no errors. All batch QC samples including a duplicate, met acceptability criteria. The laboratory will continue to investigate all steps of the analytical process. Permanent Corrective/Preventive Actions or Improvements None needed at this time. The laboratory must assume unidentified random errors caused the biases because all quality control criteria were met in the batch. Subsequent analyses of these isotopes for drinking water were acceptable in other PT samples during the year.

Summary of Results: Split Sample Comparison Program

In order to meet the requirement of ODCM 3/4.12.3, INTERLABORATORY COMPARISON PROGRAM, several duplicate environmental samples each year are sent to a second independent laboratory to compare results. The laboratory chosen for these Quality Control Analyses is General Engineering Laboratories (GEL).

Duplicate samples were obtained for some samples of weekly air iodine and particulates, quarterly air particulate, sediment, broad leaf vegetation, milk, and surface water. These samples were analyzed by GEL as comparison and quality assurance of TBE results. The GEL duplicate analysis results are shown in below.

Agreement between TBE and GEL is based on criteria for accepting measurements in NRC Inspection Procedure 84525.

Air Iodine

I-131 was not detected (less than MDC) by both TBE and GEL for all 52 air samples.

Air Particulates

Gross beta was detected by GEL and TBE in all 52 of the duplicate weekly APT samples. GEL detects significantly higher gross beta results. The variance between the lab results is due to different calibration energy sources used by each lab.

Air Particulate TBE / GEL Comparison

TBE					GEL			RPD
CRS #	Collection Date	Nuclide	Activity	1 Sigma Error	CRS #	Nuclide	Activity	
L85736-1	01/06/20	Gross β	8.60E-03	1.39E-03	500663001	Gross β	2.75E-02	157%
L85842-1	01/13/20	Gross β	9.20E-03	1.32E-03	501140001	Gross β	2.99E-02	159%
L85944-1	01/20/20	Gross β	1.79E-02	1.59E-03	501952001	Gross β	2.57E-02	54%
L85985-1	01/27/20	Gross β	1.40E-02	1.50E-03	502471001	Gross β	2.18E-02	65%
L86075-1	02/03/20	Gross β	8.62E-03	1.35E-03	503334001	Gross β	3.06E-02	168%
L86175-1	02/11/20	Gross β	1.14E-02	1.27E-03	504186001	Gross β	2.33E-02	103%
L86251-1	02/19/20	Gross β	1.11E-02	1.36E-03	505044001	Gross β	2.29E-02	104%
L86320-1	02/27/20	Gross β	1.06E-02	1.25E-03	505569001	Gross β	2.63E-02	128%
L86402-1	03/04/20	Gross β	1.29E-02	1.69E-03	506303001	Gross β	2.68E-02	105%
L86458-1	03/10/20	Gross β	7.16E-03	1.59E-03	506741001	Gross β	2.57E-02	169%
L86543-1	03/16/20	Gross β	9.47E-03	1.68E-03	507205001	Gross β	3.06E-02	158%
L86617-1	03/23/20	Gross β	1.27E-02	1.44E-03	507783001	Gross β	3.63E-02	144%
L86705-1C1	03/30/20	Gross β	8.15E-03	1.30E-03	508643001	Gross β	1.70E-02	106%
L86832-1	04/06/20	Gross β	9.24E-03	1.46E-03	509125001	Gross β	1.83E-02	99%
L86918-1	04/13/20	Gross β	1.12E-02	1.48E-03	509447001	Gross β	1.82E-02	71%
L87005-1	04/20/20	Gross β	1.52E-02	1.56E-03	509882001	Gross β	1.61E-02	9%
L87080-1	04/27/20	Gross β	9.17E-03	1.37E-03	510312001	Gross β	1.84E-02	100%
L87191-1	05/04/20	Gross β	1.30E-02	1.55E-03	510843001	Gross β	1.82E-02	50%
L87254-1	05/11/20	Gross β	8.43E-03	1.38E-03	511146001	Gross β	1.73E-02	103%
L87355-1	05/18/20	Gross β	1.26E-02	1.44E-03	511546001	Gross β	1.61E-02	37%
L87458-1	05/26/20	Gross β	5.37E-03	1.05E-03	512066001	Gross β	2.19E-02	182%
L87563-1	06/01/20	Gross β	7.16E-03	1.37E-03	512707001	Gross β	2.03E-02	144%
L87632-1	06/08/20	Gross β	1.81E-02	1.72E-03	513183001	Gross β	1.64E-02	15%
L87728-1	06/15/20	Gross β	9.99E-03	1.38E-03	513749001	Gross β	2.26E-02	116%
L87825-1	06/22/20	Gross β	7.39E-03	1.38E-03	514487001	Gross β	2.24E-02	151%
L87885-1	06/29/20	Gross β	1.67E-02	1.76E-03	514890001	Gross β	1.64E-02	3%
L88032-1	07/06/20	Gross β	1.15E-02	1.62E-03	515405001	Gross β	2.68E-02	120%
L88154-1	07/13/20	Gross β	1.08E-02	1.47E-03	515880001	Gross β	2.19E-02	102%
L88249-1	07/20/20	Gross β	1.23E-02	1.51E-03	516383001	Gross β	2.51E-02	103%
L88347-1	07/27/20	Gross β	1.01E-02	1.51E-03	516938001	Gross β	3.00E-02	149%
L88467-1	08/03/20	Gross β	1.55E-02	1.48E-03	517657001	Gross β	2.36E-02	62%
L88539-1	08/10/20	Gross β	1.09E-02	1.45E-03	518164001	Gross β	3.82E-02	167%
L88639-1	08/17/20	Gross β	1.33E-02	1.46E-03	519045001	Gross β	3.28E-02	127%
L88731-1	08/24/20	Gross β	1.73E-02	1.67E-03	519677001	Gross β	3.46E-02	100%
L88823-1	08/31/20	Gross β	1.66E-02	1.69E-03	520409001	Gross β	2.70E-02	72%
L88940-1	09/08/20	Gross β	1.19E-02	1.38E-03	521127001	Gross β	2.53E-02	108%
L89117-1	09/21/20	Gross β	1.28E-02	1.53E-03	522247001	Gross β	1.39E-02	12%
L89173-1	09/28/20	Gross β	2.52E-02	1.92E-03	522795001	Gross β	4.27E-02	77%
L89344-1	10/05/20	Gross β	1.13E-02	1.40E-03	523692001	Gross β	2.26E-02	100%
L89403-1	10/12/20	Gross β	1.71E-02	1.54E-03	524206001	Gross β	3.62E-02	108%
L89517-1	10/19/20	Gross β	9.81E-03	1.25E-03	524937001	Gross β	2.12E-02	110%

Air Particulate TBE / GEL Comparison								
TBE					GEL			RPD
CRS #	Collection Date	Nuclide	Activity	1 Sigma Error	CRS #	Nuclide	Activity	
L89621-1	10/26/20	Gross β	6.53E-03	1.32E-03	525664001	Gross β	1.53E-02	121%
L89736-1	11/02/20	Gross β	1.16E-02	1.40E-03	526485001	Gross β	1.88E-02	71%
L89807-1	11/09/20	Gross β	2.00E-02	1.84E-03	527082001	Gross β	3.96E-02	99%
L89922-1	11/16/20	Gross β	1.50E-02	1.53E-03	527959001	Gross β	3.20E-02	109%
L89973-1	11/23/20	Gross β	1.08E-02	1.42E-03	528701001	Gross β	2.41E-02	114%
L90041-1	12/01/20	Gross β	1.20E-02	1.23E-03	529117001	Gross β	2.99E-02	128%
L90130-1	12/07/20	Gross β	1.07E-02	1.60E-03	529563001	Gross β	2.55E-02	123%
L90243-1	12/14/20	Gross β	2.43E-02	1.83E-03	530188001	Gross β	4.45E-02	88%
L90306-1	12/21/20	Gross β	8.54E-03	1.25E-03	530822001	Gross β	2.03E-02	122%
L90339-1	12/28/20	Gross β	8.60E-03	1.40E-03	531004001	Gross β	2.88E-02	162%

All four duplicate quarterly composite samples analyzed had positive results for Be-7.

AIR PARTICULATE COMPOSITES												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L86966-1	Q1 2020	Be-7	6.11E-02	6.92E-03	9	509999	Be-7	5.55E-02	0.91	0.60	1.66	YES
L88068-1	Q2 2020	Be-7	6.18E-02	7.57E-03	8	515900	Be-7	7.77E-02	1.26	0.60	1.66	YES
L89416-1	Q3 2020	Be-7	7.56E-02	8.72E-03	9	525800	Be-7	8.36E-02	1.11	0.60	1.66	YES
L90500-1	Q4 2020	Be-7	5.01E-02	5.94E-03	8	532025	Be-7	6.06E-02	1.21	0.60	1.66	YES

Surface Water

Naturally occurring K-40 was detected by GEL and TBE in 1 out of 4 duplicate samples analyzed. The one detection was in agreement.

SURFACE WATER												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L86616-2	3/17/20	K-40	<DL			507813	K-40	** No comparison result < MDL **				
L87881-2	6/26/20	K-40	79.33	2.32E+01	3	514889	K-40	4.40E+01	0.55	0.40	2.25	YES
L89171-2	9/24/20	K-40	<DL			522797	K-40	** No comparison result < MDL **				
L90302-2	12/21/20	K-40	<DL			530824	K-40	** No comparison result < MDL **				

Milk

Naturally occurring K-40 was detected in 9 duplicate samples and are all in agreement.

MILK												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L85749-3	1/6/2020	K-40	1.28E+03	7.10E+01	18	500675	K-40	1.57E+03	1.22	0.75	1.33	YES
L86099-3	2/3/2020	K-40	1.26E+03	9.76E+01	13	503530	K-40	1.85E+03	1.46	0.60	1.66	YES
L86403-3	3/3/2020	K-40	1.25E+03	8.05E+01	16	506305	K-40	1.41E+03	1.13	0.60	1.66	YES
L88261-3	7/20/2020	K-40	1.55E+03	1.03E+02	15	516517	K-40	2.01E+03	1.29	0.60	1.66	YES
L88458-3	8/3/2020	K-40	1.22E+03	8.81E+01	14	517656	K-40	1.30E+03	1.07	0.60	1.66	YES
L88951-3	9/8/2020	K-40	1.24E+03	8.95E+01	14	521131	K-40	1.43E+03	1.16	0.60	1.66	YES
L89326-3	10/5/2020	K-40	1.43E+03	1.09E+02	13	523690	K-40	1.34E+03	0.93	0.60	1.66	YES
L89737-3	11/2/2020	K-40	1.47E+03	1.15E+02	13	526487	K-40	1.37E+03	0.93	0.60	1.66	YES
L90145-3	12/7/2020	K-40	1.19E+03	7.87E+01	15	529695	K-41	1.50E+03	1.26	0.60	1.66	YES

Broad Leaf Vegetation

Naturally occurring K-40 was detected by GEL and TBE in all 19 duplicate samples analyzed. All results are in agreement.

VEGETATION												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L87203-1	5/5/20	K-40	2.30E+03	2.46E+02	9	510835	K-40	2.33E+03	1.01	0.60	1.66	YES
L87203-2	5/5/20	K-40	1.85E+03	1.74E+02	11	510835	K-40	2.61E+03	1.41	0.60	1.66	YES
L87203-3	5/5/20	K-40	1.98E+03	1.87E+02	11	510835	K-40	2.70E+03	1.36	0.60	1.66	YES
L88033-13	7/7/20	K-40	2.22E+03	1.77E+02	13	515410	K-40	2.59E+03	1.17	0.60	1.66	YES
L88033-12	7/7/20	K-40	1.52E+03	1.82E+02	8	515410	K-40	1.18E+03	0.77	0.60	1.66	YES
L88033-10	7/7/20	K-40	1.58E+03	1.76E+02	9	515410	K-40	1.78E+03	1.12	0.60	1.66	YES
L88033-9	7/7/20	K-40	3.08E+03	2.12E+02	15	515410	K-40	2.34E+03	0.76	0.60	1.66	YES
L88033-11	7/7/20	K-40	1.78E+03	1.95E+02	9	515410	K-40	1.86E+03	1.05	0.60	1.66	YES
L88033-8	7/7/20	K-40	2.30E+03	1.66E+02	14	515410	K-40	1.64E+03	0.71	0.60	1.66	YES
L88033-7	7/7/20	K-40	1.92E+03	1.36E+02	14	515410	K-40	1.64E+03	0.86	0.60	1.66	YES
L88033-6	7/7/20	K-40	2.06E+03	1.93E+02	11	515410	K-40	2.21E+03	1.07	0.60	1.66	YES
L88033-4	7/7/20	K-40	1.87E+03	2.31E+02	8	515410	K-40	1.87E+03	1.00	0.60	1.66	YES
L88033-2	7/7/20	K-40	1.20E+03	1.67E+02	7	515410	K-40	1.96E+03	1.64	0.50	2.00	YES
L88033-3	7/7/20	K-40	2.94E+03	2.88E+02	10	515410	K-40	2.45E+03	0.83	0.60	1.66	YES
L88389-5	7/29/20	K-40	2.34E+03	2.27E+02	10	517195	K-40	2.78E+03	1.19	0.60	1.66	YES
L88389-4	7/29/20	K-40	2.19E+03	1.91E+02	11	517195	K-40	1.96E+03	0.89	0.60	1.66	YES
L88389-3	7/29/20	K-40	2.86E+03	2.28E+02	13	517195	K-40	2.47E+03	0.86	0.60	1.66	YES
L88389-2	7/29/20	K-40	1.62E+03	1.56E+02	10	517195	K-40	1.95E+03	1.21	0.60	1.66	YES
L88389-1	7/29/20	K-40	2.45E+03	2.02E+02	12	517195	K-40	1.87E+03	0.76	0.60	1.66	YES

Fish

Naturally occurring K-40 was detected in the sample by both GEL and TBE. Results are in agreement.

FISH												
TBE						GEL			TBE / GEL Comparison			
CRS #	Collection Date	Nuclide	Decay Corrected Activity	1 Sigma Error	Resolution	CRS #	Nuclide	Decay Corrected Activity	Ratio	Acceptance Critera		Agreement
L87202-4	5/1/2020	K-40	4.05E+03	3.17E+02	13	510841	K-40	3.87E+03	0.96	0.60	1.66	YES

Table 32, Analytics Environmental Radioactivity Cross Check Program (TBE)

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Ratio of TBE to Known Result	Evaluation [b]
September 2020	E13247	Milk	Sr-89	pCi/L	62.8	95.4	0.66	N[1]
			Sr-90	pCi/L	12.0	12.8	0.94	A
	E13248	Milk	Ce-141	pCi/L	156	150	1.04	A
			Co-58	pCi/L	172	180	0.96	A
			Co-60	pCi/L	369	379	0.97	A
			Cr-51	pCi/L	372	372	1.00	A
			Cs-134	pCi/L	171	200	0.85	A
			Cs-137	pCi/L	241	250	0.96	A
			Fe-59	pCi/L	217	200	1.08	A
			I-131	pCi/L	84.6	95.0	0.89	A
			Mn-54	pCi/L	175	180	0.97	A
			Zn-65	pCi/L	252	270	0.93	A
	E13249	Charcoal	I-131	pCi	70.2	75.8	0.93	A
	E13250	AP	Ce-141	pCi	101	101	1.00	A
			Co-58	pCi	111	120	0.92	A
			Co-60	pCi	249	254	0.98	A
			Cr-51	pCi	287	249	1.15	A
			Cs-134	pCi	114	134	0.85	A
			Cs-137	pCi	159	168	0.95	A
			Fe-59	pCi	127	134	0.95	A
			Mn-54	pCi	114	121	0.94	A
			Zn-65	pCi	168	181	0.93	A
	E13251	Soil	Ce-141	pCi/g	0.241	0.191	1.26	W
			Co-58	pCi/g	0.211	0.228	0.93	A
			Co-60	pCi/g	0.466	0.481	0.97	A
			Cr-51	pCi/g	0.450	0.472	0.95	A
			Cs-134	pCi/g	0.273	0.254	1.07	A
			Cs-137	pCi/g	0.370	0.390	0.95	A
			Fe-59	pCi/g	0.233	0.254	0.92	A
			Mn-54	pCi/g	0.217	0.229	0.95	A
			Zn-65	pCi/g	0.368	0.343	1.07	A
	E13252	AP	Sr-89	pCi	79.9	100.0	0.80	A
			Sr-90	pCi	12.1	13.4	0.90	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 20-19***

December 2020	E13254	Milk	Sr-89	pCi/L	82.2	89.7	0.92	A
			Sr-90	pCi/L	12.4	13.0	0.96	A

Table 32, Analytics Environmental Radioactivity Cross Check Program (TBE)

Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Ratio of TBE to Known Result	Evaluation [b]
	E13255	Milk	Ce-141	pCi/L	91.1	100	0.91	A
			Co-58	pCi/L	77.5	84.3	0.92	A
			Co-60	pCi/L	147	152	0.97	A
			Cr-51	pCi/L	259	253	1.02	A
			Cs-134	pCi/L	97.1	108	0.90	A
			Cs-137	pCi/L	117	127	0.92	A
			Fe-59	pCi/L	114	112	1.02	A
			I-131	pCi/L	84.3	91.9	0.92	A
			Mn-54	pCi/L	137	143	0.96	A
			Zn-65	pCi/L	175	190	0.92	A
	E13256	Charcoal	I-131	pCi	70.2	78.2	0.90	A
	E13257A	AP	Ce-141	pCi	67.4	74.6	0.90	A
			Co-58	pCi	57.9	62.9	0.92	A
			Co-60	pCi	108	113	0.95	A
			Cr-51	pCi	162	189	0.86	A
			Cs-134	pCi	68.1	80.4	0.85	A
			Cs-137	pCi	82.4	95.0	0.87	A
			Fe-59	pCi	80.5	83.7	0.96	A
			Mn-54	pCi	102	107	0.95	A
			Zn-65	pCi	115	142	0.81	A
	E13258	Soil	Ce-141	pCi/g	0.167	0.170	0.98	A
			Co-58	pCi/g	0.125	0.143	0.87	A
			Co-60	pCi/g	0.245	0.257	0.95	A
			Cr-51	pCi/g	0.393	0.429	0.92	A
			Cs-134	pCi/g	0.147	0.183	0.80	A
			Cs-137	pCi/g	0.260	0.288	0.90	A
			Fe-59	pCi/g	0.199	0.190	1.05	A
			Mn-54	pCi/g	0.229	0.243	0.94	A
			Zn-65	pCi/g	0.320	0.322	0.99	A
	E13259	AP	Sr-89	pCi	85.0	78.6	1.08	A
			Sr-90	pCi	13.1	11.4	1.15	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

Table 33, **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)(TBE)**
Teledyne Brown Engineering Environmental Services

Month/Year	IdentificationNumber	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2020	20-GrF42	AP	Gross Alpha	Bq/sample	0.676	1.24	0.37 - 2.11	A
			Gross Beta	Bq/sample	2.03	2.00	1.00 - 3.00	A
	20-MaS42	Soil	Ni-63	Bq/kg	0.01		*(1)*	A
			Sr-90	Bq/kg	348	340	238 - 442	A
	20-MaW42	Water	Ni-63	Bq/L	11.6	11.1	7.8 - 14.4	A
			Pu-238	Bq/L	0.926	0.94	0.66 - 1.22	A
			Pu-239/240	Bq/L	0.712	0.737	0.516 - 0.958	A
	20-RdF42	AP	U-234/233	Bq/sample	0.0416	0.075	0.053 - 0.098	N[3]
			U-238	Bq/sample	0.0388	0.078	0.055 - 0.101	N[3]
	20-RdV42	Vegetation	Cs-134	Bq/sample	3.23	3.82	2.67 - 4.97	A
			Cs-137	Bq/sample	2.64	2.77	1.94 - 3.60	A
			Co-57	Bq/sample	0.0281		*(1)*	A
			Co-60	Bq/sample	2.62	2.79	1.95 - 3.63	A
			Mn-54	Bq/sample	4.3	4.58	3.21 - 5.95	A
			Sr-90	Bq/sample	0.396	0.492	0.344 - 0.640	A
			Zn-65	Bq/sample	3.93	3.79	2.65 - 4.93	A
August 2020	20-GrF43	AP	Gross Alpha	Bq/sample	0.267	0.528	0.158 - 0.989	A
			Gross Beta	Bq/sample	0.939	0.915	0.458 - 1.373	A
	20-MaS43	Soil	Ni-63	Bq/kg	438	980	686 - 1274	N[4]
			Tc-99	Bq/kg	1.11		*(1)*	A
	20-MaW43	Water	Ni-63	Bq/L	0.175		*(1)*	A
			Tc-99	Bq/L	8.8	9.4	6.6 - 12.2	A
	20-RdV43	Vegetation	Cs-134	Bq/sample	3.635	4.94	3.46 - 6.42	W
			Cs-137	Bq/sample	0.0341		*(1)*	A
			Co-57	Bq/sample	5.855	6.67	4.67 - 8.67	W
			Co-60	Bq/sample	3.122	4.13	2.89 - 5.37	W
			Mn-54	Bq/sample	4.524	5.84	4.09 - 7.59	A
			Sr-90	Bq/sample	1.01	1.39	0.97 - 1.81	W
			Zn-65	Bq/sample	4.706	6.38	4.47 - 8.29	W

(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

Table 33, **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)(TBE)**
Teledyne Brown Engineering Environmental Services

Month/Year	IdentificationNumber	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Acceptance Range	Evaluation [b]

(2) Sensitivity evaluation

*(3) See **NCR 20-13***

*(4) See **NCR 20-20***

Table 34, **ERA Environmental Radioactivity Cross Check Program (TBE)**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2020	MRAD-32	Water	Am-241	pCi/L	52.5	45.3	31.1 - 57.9	A
			Fe-55	pCi/L	155	152	89.3 - 221	A
			Pu-238	pCi/L	34.0	36.4	21.9 - 47.2	A
			Pu-239	pCi/L	30.9	33.6	20.8 - 41.4	A
April 2020	RAD-121	Water	Ba-133	pCi/L	41.8	41.8	34.0- 46.7	A
			Cs-134	pCi/L	42.9	46.3	37.1 - 50.9	A
			Cs-137	pCi/L	226	234	211 - 259	A
			Co-60	pCi/L	52.4	50.3	45.3 - 57.9	A
			Zn-65	pCi/L	83.3	86.8	78.1 - 104	A
			GR-A	pCi/L	20.1	23.6	11.9 - 31.6	A
			GR-B	pCi/L	45.6	60.5	41.7 - 67.2	A
			U-Nat	pCi/L	18.45	18.6	14.9 - 20.9	A
			H-3	pCi/L	14200	14100	12300 - 15500	A
			Sr-89	pCi/L	58.0	60.1	48.3 - 67.9	A
			Sr-90	pCi/L	34.1	44.7	33.0 - 51.2	A
			I-131	pCi/L	27.4	28.9	24.1 - 33.8	A
September 2020	MRAD-33	Soil	Sr-90	pCi/Kg	4360	4980	1550 - 7760	A
		AP	Fe-55	pCi/Filter	189	407	149 - 649	A
			U-234	pCi/Filter	17.9	18.3	13.6 - 21.4	A
			U-238	pCi/Filter	19.1	18.1	13.7 - 21.6	A
		Water	Am-241	pCi/L	160	176	121 - 225	A
			Fe-55	pCi/L	299	298	175 - 433	A
			Pu-238	pCi/L	200	191	115 - 247	A
			Pu-239	pCi/L	105	100	61.9 - 123	A
October 2020	RAD-123	Water	Ba-133	pCi/L	37.1	37.0	29.8 - 41.6	A
			Cs-134	pCi/L	50.6	52.7	42.5 - 58.0	A
			Cs-137	pCi/L	131	131	118 - 146	A
			Co-60	pCi/L	62.9	60.5	54.4 - 69.1	A
			Zn-65	pCi/L	167	162	146 - 191	A
			GR-A	pCi/L	40.0	26.2	13.3 - 34.7	N(1)
			GR-B	pCi/L	47.5	69.1	48.0 - 76.0	N(1)
			U-Nat	pCi/L	17.2	20.3	16.3 - 22.7	A
			H-3	pCi/L	23800	23200	20,300 - 25,500	A
			Sr-89	pCi/L	41.1	43.3	33.4 - 50.5	A
			Sr-90	pCi/L	28.5	30.2	22.0 - 35.0	A

			I-131	pCi/L	22.9	28.2	23.5 - 33.1	N(2)
November 2020	QR111920K	Water	GR-A	pCi/L	50.7	52.4	27.3 - 65.6	A
			GR-B	pCi/L	24.9	24.3	15.0 - 32.3	A

(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 20-18***

*(2) See **NCR 20-17***

Table 35, 2020 Eckert & Ziegler Analytics Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	1st/2020	05/08/20	E13167	Cartridge	pCi	Iodine-131	9.37E+01	9.12E+01	1.03	Acceptable
EZA	1st/2020	05/08/20	E13168	Milk	pCi/L	Strontium-89	9.15E+01	9.55E+01	0.96	Acceptable
EZA	1st/2020	05/08/20	E13168	Milk	pCi/L	Strontium-90	1.51E+02	1.43E+02	0.62	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Cerium-141	1.99E+02	1.84E+02	1.08	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Cobalt-58	1.96E+02	1.89E+02	1.03	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Cobalt-60	2.33E+02	2.29E+02	1.02	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Chromium-51	3.84E+02	3.76E+02	1.02	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Cesium-134	1.36E+02	1.49E+02	0.91	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Cesium-137	1.91E+02	1.80E+02	1.06	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Manganese-54	2.31E+02	2.10E+02	1.1	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Iron-59	1.82E+02	1.63E+02	1.12	Acceptable
EZA	1st/2020	05/08/20	E13169	Milk	pCi/L	Zinc-65	2.69E+02	2.52E+02	1.07	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Cerium-141	2.11E+02	1.90E+02	1.11	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Cesium-134	1.53E+02	1.54E+02	0.99	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Cesium-137	2.08E+02	1.85E+02	1.12	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Chromium-51	4.34E+02	3.88E+02	1.12	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Cobalt-58	2.21E+02	1.96E+02	1.13	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Cobalt-60	2.59E+02	2.36E+02	1.10	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Iodine-131	1.02E+02	9.29E+01	1.1	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Iron-59	1.79E+02	1.68E+02	1.06	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Manganese-54	2.48E+02	2.16E+02	1.15	Acceptable
EZA	1st/2020	05/08/20	E13170	Water	pCi/L	Zinc-65	3.05E+02	2.61E+02	1.17	Acceptable
EZA	2nd/2020	07/31/20	E13171	Cartridge	pCi	Iodine-131	9.68E+01	9.19E+01	1.05	Acceptable
EZA	2nd/2020	07/31/20	E13172	Milk	pCi/L	Strontium-89	8.67E+01	8.81E+01	0.98	Acceptable
EZA	2nd/2020	07/31/20	E13172	Milk	pCi/L	Strontium-90	1.06E+01	1.27E+01	0.83	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Cerium-141	1.29E+02	1.16E+02	1.11	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Cobalt-58	1.04E+02	1.00E+02	1.03	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Cobalt-60	2.00E+02	1.95E+02	1.02	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Chromium-51	2.91E+02	2.56E+02	1.14	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Cesium-134	1.40E+02	1.46E+02	0.96	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Cesium-137	1.09E+02	1.04E+02	1.05	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Iron-59	1.09E+02	1.01E+02	1.08	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Iodine-131	8.31E+01	8.15E+01	1.02	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Manganese-54	1.41E+02	1.34E+02	1.05	Acceptable
EZA	2nd/2020	07/31/20	E13173	Milk	pCi/L	Zinc-65	2.48E+02	2.25E+02	1.10	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Cerium-141	1.23E+02	1.17E+02	1.05	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Cobalt-58	1.05E+02	1.02E+02	1.03	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Cobalt-60	2.05E+02	1.98E+02	1.04	Acceptable

Table 35, 2020 Eckert & Ziegler Analytics Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Chromium-51	2.76E+02	2.59E+02	1.06	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Cesium-134	1.36E+02	1.48E+02	0.92	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Cesium-137	1.04E+02	1.05E+02	0.99	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Iron-59	1.05E+02	1.02E+02	1.03	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Iodine-131	9.10E+01	8.05E+01	1.13	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Manganese-54	1.47E+02	1.35E+02	1.09	Acceptable
EZA	2nd/2020	07/31/20	E13174	Water	pCi/L	Zinc-65	2.49E+02	2.27E+02	1.10	Acceptable
EZA	3rd/2020	11/10/20	E13175	Cartridge	pCi	Iodine-131	7.96E+01	7.67E+01	1.04	Acceptable
EZA	3rd/2020	11/10/20	E13176	Milk	pCi/L	Strontium-89	1.13E+02	9.54E+01	1.18	Acceptable
EZA	3rd/2020	11/10/20	E13176	Milk	pCi/L	Strontium-90	9.47E+01	1.28E+02	0.74	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Cerium-141	1.47E+02	1.50E+02	0.98	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Cobalt-58	1.81E+02	1.80E+02	1.01	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Cobalt-60	3.85E+02	3.79E+02	1.02	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Chromium-51	4.11E+02	3.72E+02	1.10	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Cesium-134	1.82E+02	2.00E+02	0.91	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Cesium-137	2.58E+02	2.50E+02	1.03	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Iron-59	2.29E+02	2.00E+02	1.14	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Iodine-131	9.49E+01	9.50E+01	1.00	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Manganese-54	1.96E+02	1.80E+02	1.09	Acceptable
EZA	3rd/2020	11/10/20	E13177	Milk	pCi/L	Zinc-65	3.04E+02	2.70E+02	1.13	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Cerium-141	1.58E+02	1.51E+02	1.05	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Cobalt-58	1.90E+02	1.80E+02	1.05	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Cobalt-60	4.04E+02	3.80E+02	1.06	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Chromium-51	3.45E+02	3.73E+02	0.92	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Cesium-134	1.81E+02	2.01E+02	0.9	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Cesium-137	2.63E+02	2.51E+02	1.05	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Iron-59	2.26E+02	2.01E+02	1.12	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Iodine-131	9.80E+01	9.82E+01	1.00	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Manganese-54	2.06E+02	1.81E+02	1.14	Acceptable
EZA	3rd/2020	11/10/20	E13178	Water	pCi/L	Zinc-65	3.02E+02	2.71E+02	1.12	Acceptable
EZA	4th/2020	2/1/2021	E13179	Cartridge	pCi	Iodine-131	7.58E+01	7.81E+01	0.97	Acceptable
EZA	4th/2020	2/1/2021	E13180	Milk	pCi/L	Strontium-89	8.41E+01	8.97E+01	0.94	Acceptable
EZA	4th/2020	2/1/2021	E13180	Milk	pCi/L	Strontium-90	1.13E+01	1.30E+01	0.87	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Cerium-141	9.76E+01	1.00E+01	0.98	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Cobalt-58	8.58E+01	8.43E+01	1.02	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Cobalt-60	1.66E+02	1.52E+02	1.09	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Chromium-51	2.68E+02	2.53E+02	1.06	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Cesium-134	1.03E+02	1.08E+02	0.96	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Cesium-137	1.33E+02	1.27E+02	1.04	Acceptable

Table 35, 2020 Eckert & Ziegler Analytics Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Iron-59	1.28E+02	1.12E+02	1.14	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Iodine-131	9.44E+01	9.19E+01	1.08	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Manganese-54	1.49E+02	1.43E+02	1.04	Acceptable
EZA	4th/2020	2/1/2021	E13181	Milk	pCi/L	Zinc-65	2.17E+02	1.90E+02	1.14	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Cerium-141	1.18E+02	1.06E+02	1.11	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Cobalt-58	9.54E+01	8.92E+01	1.07	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Cobalt-60	1.74E+02	1.61E+02	1.08	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Chromium-51	3.05E+02	2.68E+02	1.14	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Cesium-134	1.14E+02	1.14E+02	1.00	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Cesium-137	1.37E+02	1.35E+02	1.02	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Iron-59	1.37E+02	1.19E+02	1.16	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Iodine-131	9.72E+01	9.57E+01	1.02	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Manganese-54	1.65E+02	1.51E+02	1.09	Acceptable
EZA	4th/2020	2/1/2021	E13182	Water	pCi/L	Zinc-65	2.29E+02	2.01E+02	1.14	Acceptable

Table 36, 2020 ERA Program (MRAD) Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Actinium-228	3200	3170	2090 - 3990	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Actinium-228	3200	3170	2090 - 3990	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Americium-241	1410	1730	934 - 2450	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Bismuth-212	3160	3280	939 - 4890	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Bismuth-212	3160	3280	939 - 4890	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Bismuth-214	1870	2270	1090 - 3380	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Bismuth-214	1870	2270	1090 - 3380	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cesium-134	5040	6200	4240 - 7410	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cesium-134	5040	6200	4240 - 7410	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cesium-137	6830	7280	5510 - 9210	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cesium-137	6830	7280	5510 - 9210	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cobalt-60	4840	5170	4070 - 6380	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Cobalt-60	4840	5170	4070 - 6380	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Lead-212	3580	3280	2290 - 4150	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Lead-212	3580	3280	2290 - 4150	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Lead-214	2380	2330	979 - 3660	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Lead-214	2380	2330	979 - 3660	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Manganese-54	<25.4	<1000	<1000	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Manganese-54	<25.4	<1000	<1000	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Plutonium-238	951	1010	504 - 1540	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Plutonium-239	1020	1240	676 - 1780	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Potassium-40	26000	24700	17000 - 29500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Potassium-40	26000	24700	17000 - 29500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Strontium-90	1980	2550	794 - 3970	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Strontium-90	1980	2550	794 - 3970	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Strontium-90	1980	2550	794 - 3970	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Thorium-234	5090	4010	1510 - 6870	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Thorium-234	5090	4010	1510 - 6870	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-234	3330	3600	1690 - 4720	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-234	3910	3600	1690 - 4720	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-238	3490	3570	1960 - 4790	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-238	2950	3570	1960 - 4790	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-Total	6980	7340	4070 - 9490	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Uranium-Total	6995	7340	4070 - 9490	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	µg/kg	Uranium-Total (mass)	10500	10700	4830 - 14400	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	µg/kg	Uranium-Total (mass)	8830	10700	4830 - 14400	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Zinc-65	1070	1100	879 - 1500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Soil	pCi/kg	Zinc-65	1070	1100	879 - 1500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Americium-241	3470	3950	2440 - 5580	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cesium-134	1780	2150	1430 - 2860	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cesium-134	1780	2150	1430 - 2860	Acceptable

Table 36, 2020 ERA Program (MRAD) Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cesium-137	942	1030	792 - 1390	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cesium-137	942	1030	792 - 1390	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cobalt-60	987	997	783 - 1300	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Cobalt-60	987	997	783 - 1300	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Curium-244	881	1050	592 - 1310	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Manganese-54	<39.6	<300	<300	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Manganese-54	<39.6	<300	<300	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Plutonium-238	1070	1150	796 - 1480	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Plutonium-239	227	232	160 - 294	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Potassium-40	35700	39300	29500 - 49800	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Potassium-40	35700	39300	29500 - 49800	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Strontium-90	1720	1720	970 - 2240	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Strontium-90	1720	1720	970 - 2240	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Strontium-90	1720	1720	970 - 2240	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Uranium-234	1750	1900	1330 - 2420	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Uranium-238	1780	1880	1330 - 2350	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Uranium-Total	3620	3870	2470 - 5220	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	µg/kg	Uranium-Total (mass)	5330	5640	4330 - 6990	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Zinc-65	2740	2750	2050 - 4080	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Vegetation	pCi/kg	Zinc-65	2740	2750	2050 - 4080	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Americium-241	64.9	74.7	53.3 - 99.6	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cesium-134	1360	1390	902 - 1700	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cesium-134	1360	1390	902 - 1700	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cesium-137	370	351	288 - 460	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cesium-137	370	351	288 - 460	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cobalt-60	459	422	359 - 536	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Cobalt-60	459	422	359 - 536	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Iron-55	1150	1260	460 - 2010	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Manganese-54	<3.87	<50.0	<50.0	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Manganese-54	<3.87	<50.0	<50.0	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Plutonium-238	21.9	28	21.1 - 34.4	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Plutonium-239	30.6	40.1	30.0 - 48.4	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Strontium-90	181	175	111 - 238	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-234	45.7	56.2	41.7 - 65.9	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-234	46.7	56.2	41.7 - 65.9	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-238	46	55.7	42.1 - 66.5	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-238	39.6	55.7	42.1 - 66.5	Not Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-Total	94.5	114	83.2 - 135	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Uranium-Total	88.1	114	83.2 - 135	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	µg/Filter	Uranium-Total (mass)	138	167	134 - 196	Acceptable

Table 36, 2020 ERA Program (MRAD) Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	µg/Filter	Uranium-Total (mass)	118	167	134 - 196	Not Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Zinc-65	798	694	569 - 1060	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Zinc-65	798	694	569 - 1060	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Gross Alpha	34.4	29.3	15.3 - 48.3	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Air Filter	pCi/Filter	Gross Beta	61.1	66.4	40.3 - 100	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Americium-241	47.9	45.3	31.1 - 57.9	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-134	1420	1520	1150 - 1670	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-134	1420	1520	1150 - 1670	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-134	1420	1520	1150 - 1670	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-137	2440	2390	2050 - 2720	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-137	2440	2390	2050 - 2720	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cesium-137	2440	2390	2050 - 2720	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cobalt-60	2890	2760	2380 - 3170	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cobalt-60	2890	2760	2380 - 3170	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Cobalt-60	2890	2760	2380 - 3170	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Iron-55	140	152	89.3 - 221	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Manganese-54	<6.25	<100	<100	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Manganese-54	<6.25	<100	<100	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Manganese-54	<6.25	<100	<100	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Plutonium-238	32.5	36.4	21.9 - 47.2	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Plutonium-239	29.7	33.6	20.8 - 41.4	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Strontium-90	426	447	322 - 552	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-234	187	186	142 - 213	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-234	226*	186	142 - 213	Not Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-238	191	184	143 - 217	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-238	199	184	143 - 217	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-Total	387	378	295 - 431	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Uranium-Total	434.3*	378	295 - 431	Not Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	µg/L	Uranium-Total (mass)	572	551	446 - 625	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	µg/L	Uranium-Total (mass)	595	551	446 - 625	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Zinc-65	1330	1190	1060 - 1500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Zinc-65	1330	1190	1060 - 1500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Zinc-65	1330	1190	1060 - 1500	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Gross Alpha	67.6	165	60.2 - 228	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Gross Alpha	67.6	165	60.2 - 228	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Gross Beta	143	158	79.0 - 217	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Gross Beta	143	158	79.0 - 217	Acceptable
ERA	2nd/2020	05/19/20	MRAD-32	Water	pCi/L	Tritium	5990	6280	4730 - 7640	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Actinium-228	3530	3290	2170 - 4150	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Americium-241	780	677	366 - 959	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Bismuth-212	3780	3290	942 - 4900	Acceptable

Table 36, 2020 ERA Program (MRAD) Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Bismuth-214	2970	3790	1820 - 5640	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Cesium-134	3760	4180	2860 - 5000	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Cesium-137	6890	6940	5250 - 8780	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Cobalt-60	2280	2520	1980 - 3110	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Lead-214	3680	4080	1710 - 6410	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Lead-214	3720	4080	1710 - 6410	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Manganese-54	<23.9	<1000	<1000	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Plutonium-238	1460	1670	833 - 2540	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Potassium-40	24600	24700	17000 - 29500	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Strontium-90	5110	4980	1550 - 7760	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Thorium-234	5370	4740	1790 - 8120	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-234	4550	4780	2240 - 6260	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-234	5100	4780	2240 - 6260	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-238	4800	4740	2600 - 6360	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-238	4870	4740	2600 - 6360	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-Total	9590	9730	5400 - 12600	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Uranium-Total	10189	9730	5400 - 12600	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	µg/kg	Uranium-Total (mass)	14400	14200	6410 - 19200	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	µg/kg	Uranium-Total (mass)	14600	14200	6410 - 19200	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Soil	pCi/kg	Zinc-65	1220	1120	895 - 1530	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Americium-241	2680	2940	1820 - 4150	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Cesium-134	862	945	627 - 1260	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Cesium-137	735	823	633 - 1110	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Cobalt-60	663	691	542 - 903	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Curium-244	3100	3400	1920 - 4230	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Manganese-54	<47.5	<300	<300	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Plutonium-238	4470	4590	3180 - 5920	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Plutonium-239	838	768	531 - 972	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Potassium-40	33500	34500	25900 - 43700	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Strontium-90	8790	8690	4900 - 11300	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Uranium-234	2650	2920	2050 - 3720	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Uranium-238	2720	2900	2050 - 3630	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Uranium-Total	5510	5950	3800 - 8020	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	µg/kg	Uranium-Total (mass)	8150	8680	6660 - 10800	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Vegetation	pCi/kg	Zinc-65	1640	1580	1180 - 2340	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Americium-241	22.3	22.2	15.8 - 29.6	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Cesium-134	268	296	192 - 363	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Cesium-137	407	413	339 - 542	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Cobalt-60	507	497	422 - 631	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Iron-55	361	407	149 - 649	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Manganese-54	<3.82	<50.0	<50.0	Acceptable

Table 36, 2020 ERA Program (MRAD) Performance Evaluation Results (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Plutonium-238	25.3	28.8	21.7 - 35.4	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Plutonium-239	31	33.7	25.2 - 40.7	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Strontium-90	30.5	36.2	22.9 - 49.3	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Uranium-234	16.5	18.3	13.6 - 21.4	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Uranium-234	19.5	18.3	13.6 - 21.4	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Uranium-238	18.5	18.1	13.7 - 21.6	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Uranium-238	18.2	18.1	13.7 - 21.6	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Uranium-Total	35.8	37.2	27.2 - 44.1	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	µg/Filter	Uranium-Total (mass)	55.3	54.3	43.6 - 63.6	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	µg/Filter	Uranium-Total (mass)	54.4	54.3	43.6 - 63.6	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Zinc-65	540	500	410 - 764	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Gross Alpha	32.2	26.1	13.6 - 43.0	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Air Filter	pCi/Filter	Gross Beta	94.2	85.9	52.1 - 130	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Americium-241	185	176	121 - 225	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Cesium-134	849	911	688 - 1000	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Cesium-137	1540	1510	1290 - 1720	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Cobalt-60	1660	1560	1350 - 1790	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Iron-55	267	298	175 - 433	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Manganese-54	<4.61	<100	<100	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Plutonium-238	160	191	115 - 247	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Plutonium-239	81.7	100	61.9 - 123	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Strontium-90	917	787	567 - 973	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-234	33.8	35.2	26.8 - 40.3	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-234	39.2	35.2	26.8 - 40.3	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-238	34.7	34.9	27.0 - 41.1	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-238	32.7	34.9	27.0 - 41.1	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-238	37.3	34.9	27.0 - 41.1	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-Total	70.4	71.8	56.0 - 81.9	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Uranium-Total	78.2	71.8	56.0 - 81.9	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	µg/L	Uranium-Total (mass)	104	105	85.0 - 119	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	µg/L	Uranium-Total (mass)	112	105	85.0 - 119	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Zinc-65	1010	917	816 - 1160	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Gross Alpha	100	111	40.5 - 153	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Gross Beta	181	194	97.0 - 267	Acceptable
ERA	4th/2020	11/16/20	MRAD-33	Water	pCi/L	Tritium	11600	12000	9040 - 14600	Acceptable

Table 37, 2020 Department Of Energy Mixed Analyte Performance Evaluation Program

(MAPEP) RESULTS (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	2nd/2020	07/02/20	MAPEP-20-GrF42	Filter	Bq/sample	Gross alpha	0.79	1.24	0.37-2.11	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-GrF42	Filter	Bq/sample	Gross beta	1.84	2.00	1.00-3.00	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-GrW42	Water	Bq/L	Gross alpha	1.01	1.03	0.31-1.75	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-GrW42	Water	Bq/L	Gross beta	4.18	4.24	2.12-6.36	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Americium-241	43.0	40.9	28.6-53.2	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Cesium-134	984	1114	780-1448	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Cesium-137	1060	1020	714-1326	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Cobalt-57	1200.000	1071	750-1392	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Cobalt-60	0.366		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Iron-55	950.0	1096	767-1425	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Manganese-54	961	945	662-1229	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Nickel-63	-0.727		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Plutonium-238	38.0	41.8	29.3-54.3	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Plutonium-239/240	38.0	41.8	29.3-54.3	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Potassium-40	618	625	438-813	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Strontium-90	286	340	238-442	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Technetium-99	728	706	494-918	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	U-234/233	43.2	40.3	28.2-52.4	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Uranium-238	64.6	68.0	48-88	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaS42	Soil	Bq/Kg	Zinc-65	784	751	526-976	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Americium-241	0.545	0.547	0.383-0.711	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Cesium-134	17.0	18.5	13.0-24.1	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Cesium-137	12.0	11.3	7.9-14.7	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Cobalt-57	19.7	19.7	13.8-25.6	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Cobalt-60	11.0	10.6	7.4-13.8	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Hydrogen-3	193	196	137-255	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Iron-55	18.2	17.8	12.5-23.1	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Manganese-54	20.6	19.6	13.7-25.5	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Nickel-63	14.1	11.1	7.8-14.4	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Plutonium-238	0.822	0.940	0.66-1.22	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Plutonium-239/240	0.686	0.737	0.516-0.958	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Potassium-40	-0.0485		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Radium-226	0.366	0.365	0.256-0.475	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Strontium-90	0.0122		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Technetium-99	3.72	3.63	2.54-4.72	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Uranium-234	1.02	0.97	0.68-1.26	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Uranium-238	0.98	0.95	0.67-1.24	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-MaW42	Water	Bq/L	Zinc-65	23.9	22.2	15.5-28.9	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-XaW42	Alk. Water	Bq/L	Iodine-129	1.01	1.001	0.701-1.301	Acceptable

Table 37, 2020 Department Of Energy Mixed Analyte Performance Evaluation Program

(MAPEP) RESULTS (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	ug/sample	Uranium-235	0.0438	0.0460	0.0322-0.0598	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	ug/sample	Uranium-238	6.39	6.3	4.4-8.2	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	ug/sample	Uranium-Total	6.43	6.3	4.4-8.2	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Americium-241	0.0671	0.0675	0.0473-0.0878	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Cesium-134	0.626	0.600	0.420-0.780	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Cesium-137	0.802	0.735	0.515-0.956	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Cobalt-57	1.54	1.50	1.05-1.95	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Cobalt-60	1.29	1.23	0.86-1.60	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Manganese-54	0.0065		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Plutonium-238	0.0341	0.0348	0.0244-0.0452	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Plutonium-239/240	0.0395	0.0379	0.0265-0.0493	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Strontium-90	0.884	0.97	0.68-1.26	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Uranium-234	0.0788	0.075	0.053-0.098	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Uranium-238	0.0801	0.078	0.055-0.101	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdF42	Filter	Bq/sample	Zinc-65	1.43	1.18	0.83-1.53	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Americium-241	0.0761	0.075	0.053-0.098	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Cesium-134	3.55	3.82	2.67-4.97	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Cesium-137	2.83	2.77	1.94-3.60	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Cobalt-57	0.00561		False Pos Test	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Cobalt-60	2.84	2.79	1.95-3.63	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Manganese-54	4.74	4.58	3.21-5.95	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Plutonium-238	0.0447	0.0472	0.0330-0.0614	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Plutonium-239/240	0.06950	0.0772	0.0540-0.1004	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Strontium-90	0.361	0.492	0.344-0.640	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Uranium-234	0.1070	0.102	0.071-0.133	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Uranium-238	0.1150	0.103	0.072-0.134	Acceptable
MAPEP	2nd/2020	07/02/20	MAPEP-20-RdV42	Vegetation	Bq/sample	Zinc-65	4.14	3.79	2.65-4.93	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Americium-241	1.2		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Cesium-134	625	710	497-923	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Cesium-137	0.87		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Cobalt-57	1260	1100	770-1430	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Cobalt-60	998	1000	700-1300	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Iron-55	811	577	404-750	Not Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Manganese-54	661	610	427-793	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Nickel-63	840	980	686-1274	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Plutonium-238	53.1	57.7	40.4-75	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Plutonium-239/240	68.1	79.0	55-103	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Potassium-40	704	622	435-809	Acceptable

Table 37, 2020 Department Of Energy Mixed Analyte Performance Evaluation Program

(MAPEP) RESULTS (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Strontium-90	434	487	341-633	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Technetium-99	5		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	U-234/233	51	48	33.7-62.5	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Uranium-238	126	128	90-166	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaS43	Soil	Bq/Kg	Zinc-65	531	470	329-611	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Americium-241	0.942	0.922	0.645-1.199	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Cesium-134	13.9	15.2	10.6-19.8	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Cesium-137	15.10	14.3	10.0-18.6	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Cobalt-57	-0.0072		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Cobalt-60	12.90	12.2	8.5-15.9	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Hydrogen-3	330	360	252-468	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Iron-55	29.20	32.9	23.0-42.8	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Manganese-54	-0.0032		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Nickel-63	-0.93		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Plutonium-238	0.6430	0.7040	0.493-0.915	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Plutonium-239/240	0.001	0.009	Sens. Evaluation	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Potassium-40	-0.763		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Radium-226	1.020	1.250	0.88-1.63	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Strontium-90	9.97	11.60	8.1-15.1	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Technetium-99	8.720	9.40	6.6-12.2	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Uranium-234/233	1.27	1.26	0.88-1.64	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Uranium-238	1.31	1.30	0.9-1.7	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-MaW43	Water	Bq/L	Zinc-65	18.9	16.9	11.8-22	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	ug/sample	Uranium-235	0.0920	0.1020	0.071-0.133	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	ug/sample	Uranium-238	13.1	14.6	10.2-19	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	ug/sample	Uranium-Total	13.2	14.7	10.3-19.1	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Americium-241	0.129	0.134	0.094-0.174	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Cesium-134	1.72	1.83	1.28-2.38	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Cesium-137	1.04	0.996	0.697-1.295	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Cobalt-57	0.00126		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Cobalt-60	1.85	1.73	1.21-2.25	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Manganese-54	1.64	1.40	0.98-1.82	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Plutonium-238	0.0917	0.0867	0.0607-0.1127	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Plutonium-239/240	0.0019	0.0017	Sens. Evaluation	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Strontium-90	1.790	2.080	1.46-2.70	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Uranium-234/233	0.1820	0.175	0.123-0.228	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Uranium-238	0.1860	0.182	0.127-0.237	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdF43	Filter	Bq/sample	Zinc-65	2.29	2.00	1.40-2.60	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Americium-241	0.1040	0.103	0.072-0.134	Acceptable

Table 37, 2020 Department Of Energy Mixed Analyte Performance Evaluation Program (MAPEP) RESULTS (GEL)

PT Provider	Quarter / Year	Report Received Date	Sample Number	Sample Media	Unit	Analyte / Nuclide	GEL Value	Known value	Acceptance Range/ Ratio	Evaluation
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Cesium-134	4.5	4.94	3.46-6.42	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Cesium-137	0.0134		False Pos Test	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Cobalt-57	6.70	6.67	4.67-8.67	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Cobalt-60	4.27	4.13	2.89-5.37	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Manganese-54	6.04	5.84	4.09-7.59	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Plutonium-238	0.0002	0.001	Sens. Evaluation	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Plutonium-239/240	0.05370	0.0624	0.0437-0.0811	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Strontium-90	1.07	1.39	0.97-1.81	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Uranium-234/233	0.1270	0.1150	0.081-0.150	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Uranium-238	0.1260	0.1200	0.084-0.156	Acceptable
MAPEP	4th/2020	12/14/20	MAPEP-20-RdV43	Vegetation	Bq/sample	Zinc-65	7.04	6.38	4.47-8.29	Acceptable

Attachment 4, Annual Quality Assurance Status Report

January - December 2020

Environmental Dosimetry Company
10 Ashton Lane
Sterling, MA 01564

TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

Routine quality control (QC) testing was performed for dosimeters issued by the Environmental Dosimetry Company (EDC) .

During this annual period100% (72/72) of the individual dosimeters, evaluated against the EDC internal performance acceptance criteria (high-energy photons only), met the criterion for accuracy and 100% (72/72) met the criterion for precision (Table 1). In addition, 100% (12/12) of the dosimeter sets evaluated against the internal tolerance limits met EDC acceptance criteria (Table 2) and 100% (6/6) of independent testing passed the performance criteria (Table 3). Trending graphs, which evaluate performance statistic for high-energy photon irradiations and co-located stations are given in Appendix A.

One internal assessment and one external audit were performed in 2020.There was one deficiency issued in the external audit.

I. INTRODUCTION

The TLD systems at the Environmental Dosimetry Company (EDC) are calibrated and operated to ensure consistent and accurate evaluation of TLDs. The quality of the dosimetric results reported to EDC clients is ensured by in-house performance testing and independent performance testing by EDC clients, and both internal and client directed program assessments.

The purpose of the dosimetry quality assurance program is to provide performance documentation of the routine processing of EDC dosimeters. Performance testing provides a statistical measure of the bias and precision of dosimetry processing against a reliable standard, which in turn points out any trends or performance changes. Two programs are used:

A. QC Program

Dosimetry quality control tests are performed on EDC Panasonic 814 Environmental dosimeters. These tests include: (1) the in-house testing program coordinated by the EDC QA Officer and (2) independent test perform by EDC clients. In-house test are performed using six pairs of 814 dosimeters, a pair is reported as an individual result and six pairs are reported as the mean result.Results of these tests are described in this report.

Excluded from this report are instrumentation checks. Although instrumentation checks represent an important aspect of the quality assurance program, they are not included as process checks in this report. Instrumentation checks represent between 5-10% of the TLDs processed.

B. QA Program

An internal assessment of dosimetry activities is conducted annually by the Quality Assurance Officer (Reference 1). The purpose of the assessment is to review procedures, results, materials or components to identify opportunities to improve or enhance processes and/or services.

II. PERFORMANCE EVALUATION CRITERIA

A. Acceptance Criteria for Internal Evaluations

1. Bias

For each dosimeter tested, the measure of bias is the percent deviation of the reported result relative to the delivered exposure. The percent deviation relative to the delivered exposure is calculated as follows:

$$\frac{(H_i' - H_i)}{H_i} 100$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated dosimeter (i.e., the delivered exposure)

1. Mean Bias

For each group of test dosimeters, the mean bias is the average percent deviation of the reported result relative to the delivered exposure. The mean percent deviation relative to the delivered exposure is calculated as follows:

$$\sum\left(\frac{(H_i' - H_i)}{H_i}\right)100\left(\frac{1}{n}\right)$$

where:

H_i' = the corresponding reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

H_i = the exposure delivered to the i^{th} irradiated test dosimeter (i.e., the delivered exposure)

n = the number of dosimeters in the test group

2. Precision

For a group of test dosimeters irradiated to a given exposure, the measure of precision is the percent deviation of individual results relative to the mean reported exposure. At least two values are required for the determination of precision. The measure of precision for the i^{th} dosimeter is:

$$\left(\frac{(H_i' - \bar{H})}{\bar{H}}\right)100$$

where:

H_i' = the reported exposure for the i^{th} dosimeter (i.e., the reported exposure)

$\bar{H}$= the mean reported exposure; i.e., $\bar{H} = \sum H_i'\left(\frac{1}{n}\right)$

n = the number of dosimeters in the test group

3. EDC Internal Tolerance Limits

All evaluation criteria are taken from the "EDC Quality System Manual," (Reference 2). These criteria are only applied to individual test dosimeters irradiated with high-energy photons (Cs-137) and are as follows for Panasonic Environmental dosimeters: ± 15% for bias and ± 12.8% for precision.

A. QC Investigation Criteria and Result Reporting

EDC Quality System Manual (Reference 2) specifies when an investigation is required due to a QC analysis that has failed the EDC bias criteria. The criteria are as follows:

1. No investigation is necessary when an individual QC result falls outside the QC performance criteria for accuracy.

2. Investigations are initiated when the mean of a QC processing batch is outside the performance criterion for bias.

B. Reporting of Environmental Dosimetry Results to EDC Customers

All results are to be reported in a timely fashion.

1. If the QA Officer determines that an investigation is required for a process, the results shall be issued as normal. If the QC results prompting the investigation have a mean bias from the known of greater than ±20%, the results shall be issued with a note indicating that they may be updated in the future, pending resolution of a QA issue.

2. Environmental dosimetry results do not require updating if the investigation has shown that the mean bias between the original results and the corrected results, based on applicable correction factors from the investigation, does not exceed ±20%.

II. DATA SUMMARY FOR ISSUANCE PERIOD JANUARY-DECEMBER 2020

A. General Discussion

Results of performance tests conducted are summarized and discussed in the following sections. Summaries of the performance tests for the reporting period are given in Tables 1 through 3 and Figures 1 through 4.

Table 1 provides a summary of individual dosimeter results evaluated against the EDC internal acceptance criteria for high-energy photons only. During this period100% (72/72) of the individual dosimeters, evaluated against these criteria, met the tolerance limits for accuracy and 100% (72/72) met the criterion for precision. A graphical interpretation is provided in Figures 1 and 2.

Table 2 provides the bias and standard deviation results for each group (N=6) of dosimeters evaluated against the internal tolerance criteria. Overall,100% (12/12) of the dosimeter sets, evaluated against the internal tolerance performance criteria, met these criteria. A graphical interpretation is provided in Figure 3.

Table 3 presents the independent blind spike results for dosimeters processed during this annual period. All results passed the performance acceptance criterion. Figure 4 is a graphical interpretation of Seabrook Station blind co-located station results.

A. Result Trending

One of the main benefits of performing quality control tests on a routine basis is to identify trends or performance changes. The results of the Panasonic environmental dosimeter performance tests are presented in Appendix A. The results are evaluated against each of the performance criteria listed in Section II, namely: individual dosimeter accuracy, individual dosimeter precision, and mean bias.

All of the results presented in Appendix A are plotted sequentially by processing date.

II. STATUS OF EDC CONDITION REPORTS (CR)

During this annual period, one EDC Condition Report was issued. CR 1-2020 was issued to document the deficiency from the DTE Energy Audit 20-003.

III. STATUS OF AUDITS/ASSESSMENTS

1. Internal

EDC Internal Quality Assurance Assessment was conducted during the fourth quarter 2020. There were no findings identified.

2. External

DTE Energy Audit 20-003 was conducted on July 28-30, 2020. There was one deficiency identified.

IV. PROCEDURES AND MANUALS REVISED DURING JANUARY - DECEMBER 2020

Manual 1 was revised on September 28, 2020.

Several procedures were reissued with no changes as part of the 5 year review cycle.

V. CONCLUSION AND RECOMMENDATIONS

The quality control evaluations continue to indicate the dosimetry processing programs at the EDC satisfy the criteria specified in the Quality System Manual. The EDC demonstrated the ability to meet all applicable acceptance criteria.

VI. REFERENCES

1. EDC Quality Control and Audit Assessment Schedule, 2020.

2. EDC Manual 1, Quality System Manual, Rev. 4, September 28, 2020.

TABLE 1

PERCENTAGE OF INDIVIDUAL DOSIMETERS THAT PASSED EDC INTERNAL CRITERIA
JANUARY – DECEMBER 2020[1], [2]

Dosimeter Type	Number Tested	% Passed Bias Criteria	% Passed Precision Criteria
Panasonic Environmental	72	100	100

[1]This table summarizes results of tests conducted by EDC.
[2]Environmental dosimeter results are free in air.

TABLE 2

MEAN DOSIMETER ANALYSES (N=6)
JANUARY – DECEMBER 2020[1], [2]

Process Date	Exposure Level	Mean Bias %	Standard Deviation %	Tolerance Limit +/- 15%
4/28/2020	37	1.8	1.2	Pass
5/02/2020	94	2.9	1.4	Pass
5/20/2020	56	-0.5	1.4	Pass
7/28/2020	72	4.1	0.6	Pass
8/07/2020	111	4.0	1.3	Pass
9/24/2020	25	-4.6	1.2	Pass
10/24/2020	35	5.2	1.6	Pass
10/28/2020	60	1.6	0.7	Pass
11/18/2020	91	0.5	1.6	Pass
01/21/2021	31	3.8	1.7	Pass
02/09/2021	83	0.3	0.8	Pass
02/16/2021	46	5.3	1,5	Pass

[1]This table summarizes results of tests conducted by EDC for TLDs issued in 2020.
[2]Environmental dosimeter results are free in air.

TABLE 3
SUMMARY OF INDEPENDENT DOSIMETER TESTING
JANUARY – DECEMBER 2020[1], [2]

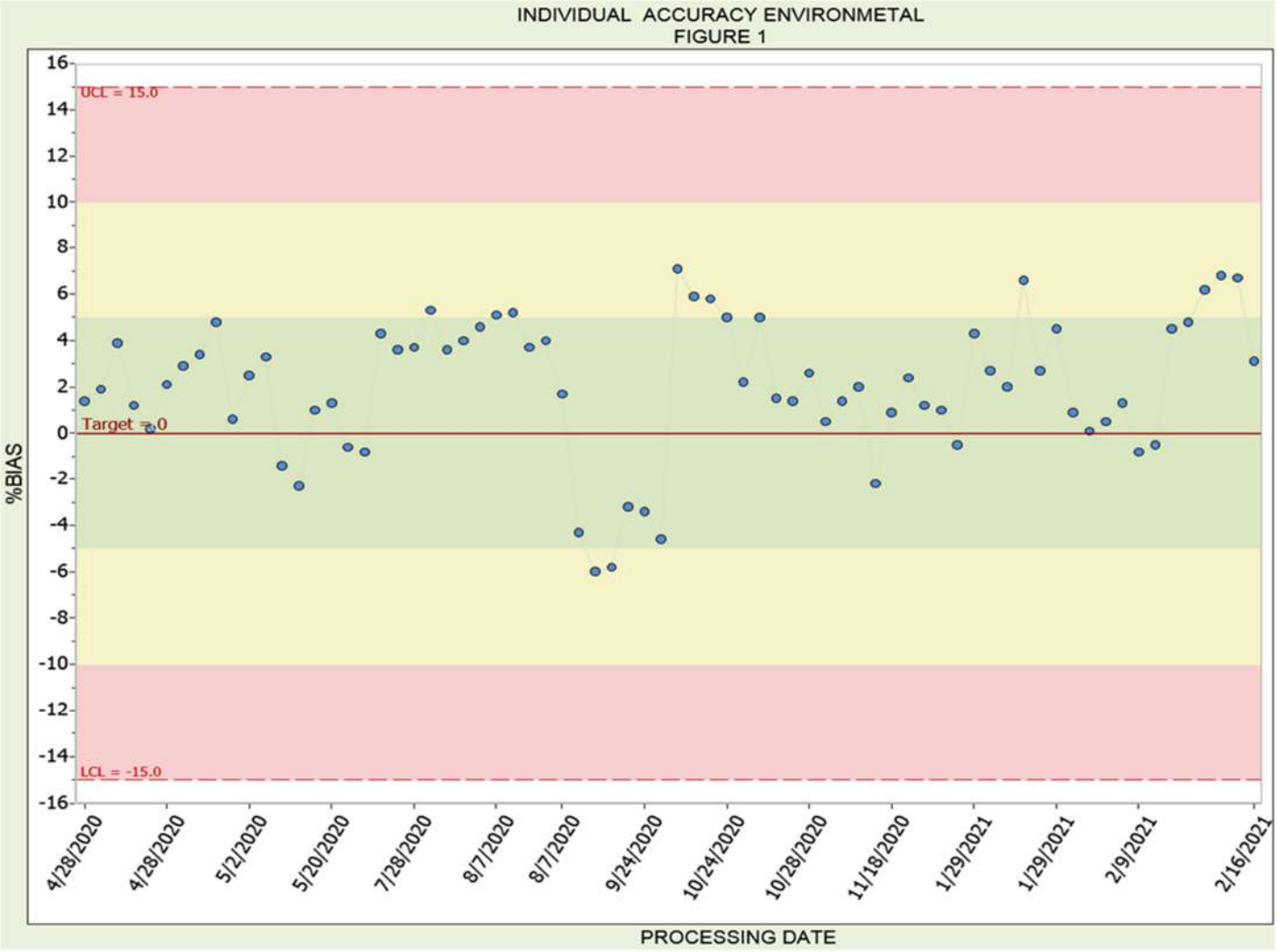
Issuance Period	Client	Mean Bias %	Standard Deviation %	Pass / Fail
1st Qtr. 2020	Millstone	-3.8	3.0	Pass
2nd Qtr.2020	Seabrook	0.5	1.4	Pass
2nd Qtr.2020	Millstone	-3.0	1.6	Pass
3rd Qtr. 2020	Millstone	0.4	2.6	Pass
4th Qtr.2020	PSEG(PNNL)	-3.2	0.9	Pass
4th Qtr.2020	Seabrook	6.9	1.9	Pass
4th Qtr.2020	SONGS	-8.4	1.3	Pass
4th Qtr.2020	Millstone	3.0	1.9	Pass

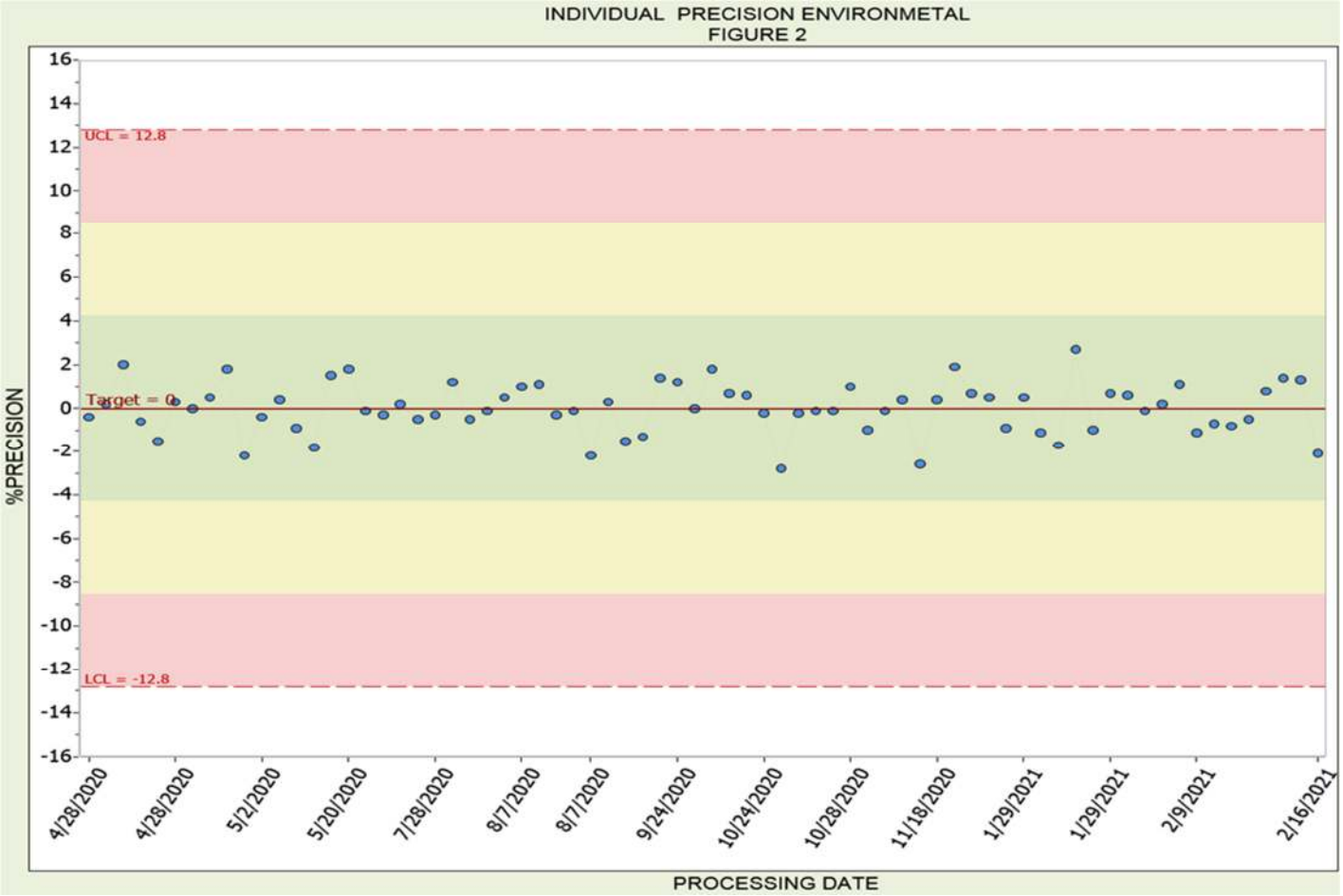
[1]Performance criteria are +/- 15%.
[2]Blind spike irradiations using Cs-137

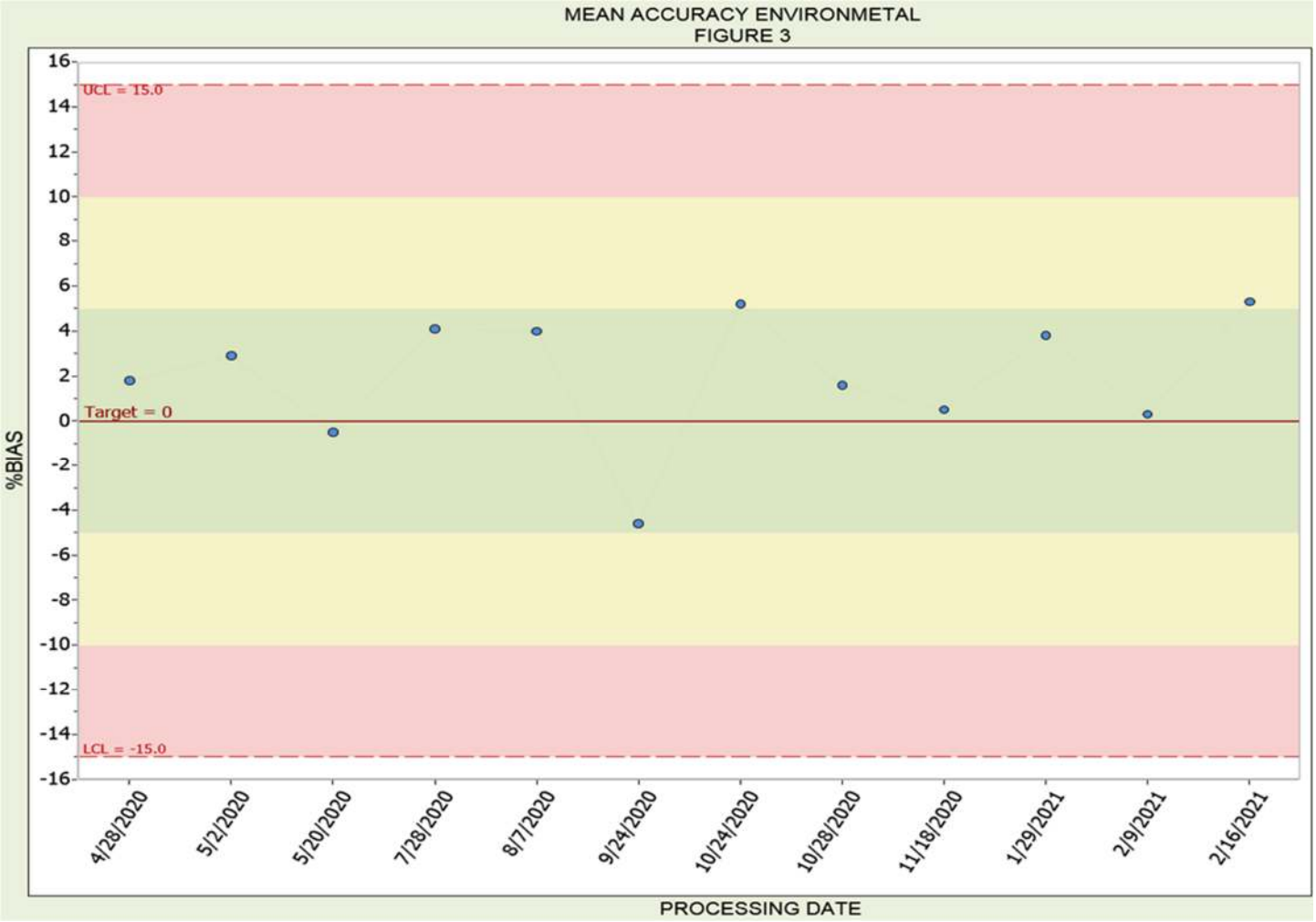
APPENDIX A

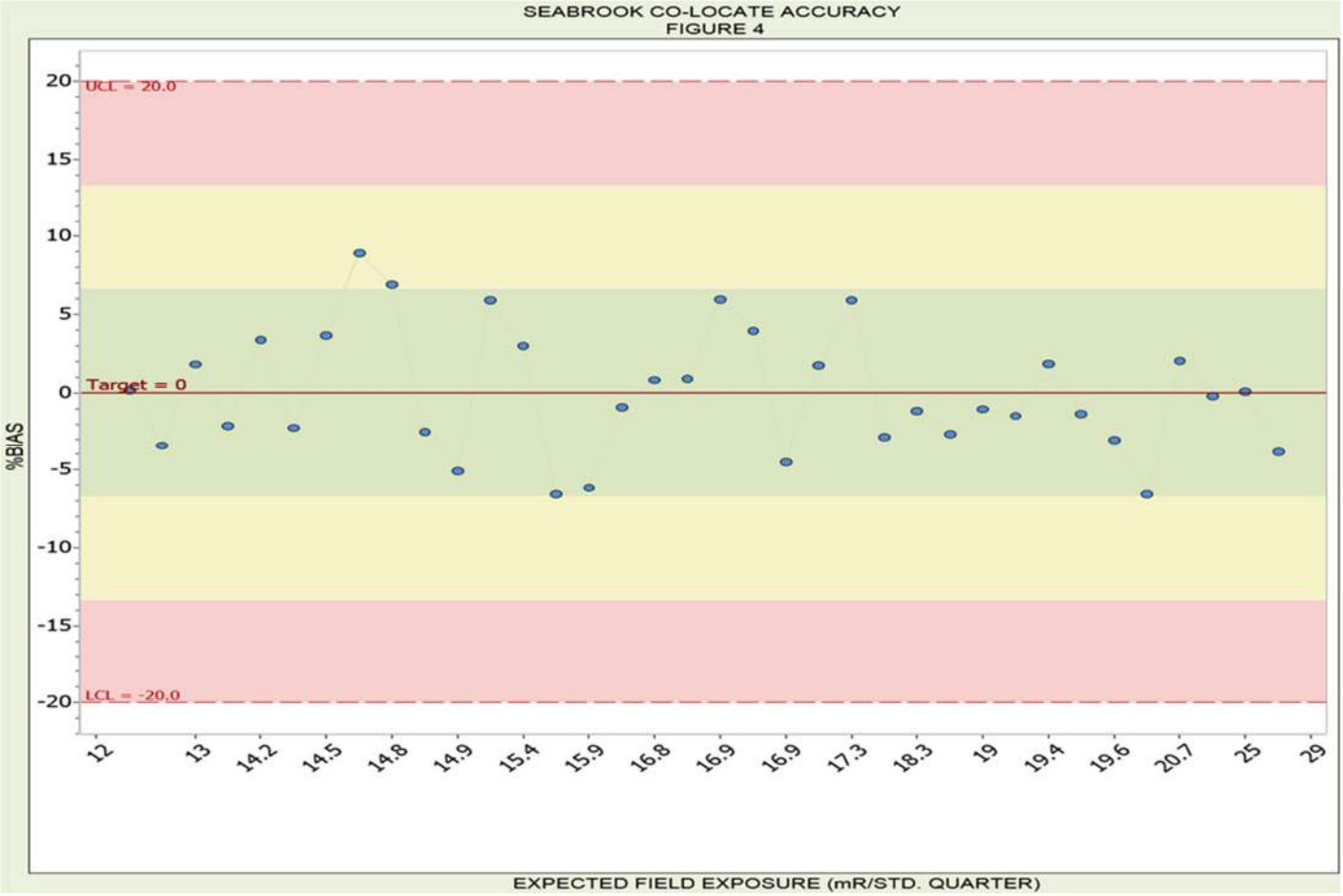
DOSIMETRY QUALITY CONTROL TRENDING GRAPHS

ISSUE PERIOD JANAURY - DECEMBER 2020


INDIVIDUAL ACCURACY ENVIRONMETAL
FIGURE 1
UCL = 15.0
Target = 0
LCL = -15.0
%BIAS
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
4/28/2020
4/28/2020
5/2/2020
5/20/2020
7/28/2020
8/7/2020
8/7/2020
9/24/2020
10/24/2020
10/28/2020
11/18/2020
1/29/2021
1/29/2021
2/9/2021
2/16/2021
PROCESSING DATE


INDIVIDUAL PRECISION ENVIRONMETAL
FIGURE 2
UCL = 12.8
Target = 0
LCL = -12.8
%PRECISION
PROCESSING DATE
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
4/28/2020
4/28/2020
5/2/2020
5/20/2020
7/28/2020
8/7/2020
8/7/2020
9/24/2020
10/24/2020
10/28/2020
11/18/2020
1/29/2021
1/29/2021
2/9/2021
2/16/2021


MEAN ACCURACY ENVIRONMETAL
FIGURE 3
UCL = 15.0
Target = 0
LCL = -15.0
%BIAS
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
4/28/2020
5/2/2020
5/20/2020
7/28/2020
8/7/2020
9/24/2020
10/24/2020
10/28/2020
11/18/2020
1/29/2021
2/9/2021
2/16/2021
PROCESSING DATE


SEABROOK CO-LOCATE ACCURACY
FIGURE 4
UCL = 20.0
Target = 0
LCL = -20.0
%BIAS
20
15
10
5
0
-5
-10
-15
-20
12
13
14.2
14.5
14.8
14.9
15.4
15.9
16.8
16.9
16.9
17.3
18.3
19
19.4
19.6
20.7
25
29
EXPECTED FIELD EXPOSURE (mR/STD. QUARTER)

Attachment 5, 2019 AREOR Errata

deviations of the averaged data represent sample and not analytical variability. Averages are calculated using positive values. Results are considered positive if the activity exceeds the MDC and exceeds 3 sigma uncertainty. Additionally, for gamma analysis, the peak must be identified in the gamma spectrum.

B. Program Anomalies and Exceptions.

For the purpose of this report, a **Program Exception** is considered when a sample is missed; meaning that no scientifically valid data can be obtained (i.e. a forgotten or lost sample). Conversely, **Sample Anomalies** are instances where a partial sample was obtained, and despite potentially not meeting all the data objectives it still represents scientifically valid data (failed sample pump, defective TLD element, etc.). During the reporting period, anomalies and exceptions to REMP sampling requirements involved Air Sample weekly run times and Direct Radiation Monitoring dosimeters. In all but one air sampling instances, sufficient sample was collected during the week to meet the required LLD. One dosimeter was damaged and could not be read, and two dosimeters were identified as being placed on inner fences (closer to the site) than is described in the ODCM.

Air Sampling Locations

- **Sample Anomaly (Notification 20824370):** During the weekly air sampler collection on 04/01/2019 it was discovered that the air sampler at location 15S2 was not running. Upon inspecting the air sampler it was determined the GFCI had tripped. The GFCI was reset and the pump for 15S2 began running normal. The air sampler was verified to be running without issue the following week on 04/08/2019.

  The total time the sampler was in operation was 122.8 hours. The total outage duration was 45.0 hours. A total of 11,000 Cubic feet were determined to have been collected in that amount of time, which will meet the LLD requirement for the sample.

  In this instance, adequate sample volume was achieved and the LLD for I-131 was met. A sample that misses the LLD requirement still represents a valid scientific observation, which is why it is not considered a missed sample. It simply has not met the Data Quality Objectives (DQO) set forth in the REMP.

- **Sample Anomaly (Notification 20830535):** During the weekly air sampler collection on 07/29/2019 it was discovered that air sampler at location 01F1 had an apparent power failure based on the hour meter and flow through the totalizer. The air sampler was verified to be running without issue.

  The total time the sampler was in operation was 165.5 hours. The total outage duration was 4.2 hours. A total of 15,420 Cubic feet were determined to have been collected in that amount of time, which met the LLD requirement for the sample. A sample that misses the LLD requirement still represents a valid scientific observation, which is why it is not considered a missed sample. It simply has not met the DQO set forth in the REMP.

- **Sample Anomaly (Notification 20837715):** There was a power outage due to a Ground Fault Circuit Interrupter (GFCI) trip that caused a 22.1 hour period of non-sampling at air sampling location 05S2 the week of 10/21/2019 through 10/25/2019. The GFCI was reset and sampler began running as expected.

  The total flow was 13,300 cubic feet over 142.5 hours. In this instance, adequate sample volume was achieved and the LLD for I-131 was met. A sample that misses

analysis (Tables C-1, C-2 and C-20).

Gamma Spectroscopy

Gamma spectroscopy was performed on each of the 32 quarterly composite samples. Naturally occurring Be-7 was detected and no other gamma emitters were detected in any of the samples.

Naturally occurring Be-7, attributed to cosmic ray activity in the atmosphere, was detected in all 28 indicator location composites at concentrations ranging from 37E-03 pCi/m^3 to 79E-03 pCi/m^3 with an average concentration of 59E-03 pCi/m^3, and in the four control location composites ranging in concentration from 40E-03 pCi/m^3 to 61E-03 pCi/m^3 with an average concentration of 53E-03 pCi/m^3. The maximum preoperational level detected was 330E-03 pCi/m^3 with an average concentration of 109E-03 pCi/m^3 (Table C-1 and Reference [1] RMC-TR-77-03).

Gross Beta

Gross beta activity was detected in all 364 of the indicator location samples at concentrations ranging from 5E-03 pCi/m^3 to 25E-03 pCi/m^3 with an average concentration of 12E-03 pCi/m^3, and in 52 of 52 of the control location samples at concentrations ranging from 7E-03 pCi/m^3 to 23E-03 pCi/m^3 with an average of 13E-03 pCi/m^3. Gross beta activity was less than ten times the yearly mean of control samples. Therefore, per the ODCM gamma isotopic analysis was not required to be performed on the individual samples. The maximum preoperational level detected was 920E-03 pCi/m^3 with an average concentration of 74E-03 pCi/m^3 (Table C-2 and Reference [1] RMC-TR-77-03). See Figures 1 and 1a (Appendix C).

2. Air Iodine

AIO were collected weekly at seven indicator locations (05S1, 07S2, 15S2, 05D1, 16E1, 01F1, and 02F6), one duplicate location (05S2) and one control location (14G1). The duplicate air location sample was shipped to GEL for analysis. Each sample was analyzed by TBE for I-131, and all 416 samples were less than the MDC for both indicator and control samples during the Reporting Period. The maximum preoperational level detected was 42E-03 pCi/m^3 (Table C-3 and Reference [1] RMC-TR-77-03).

B. Direct Radiation

Ambient radiation levels in the environment were monitored at locations on the Site and in the surrounding areas with pairs of passive dosimeters (PD) supplied and analyzed by Stamford Dosimetry/Environmental Dosimetry Co. Packets containing the PDs were placed in the owner-controlled area, around the Site at various distances, and in each land based meteorological sector. Six were placed in control locations and the balance of measurement locations were placed at areas of interest such as population centers, nearby residences, and schools.

A total of 58 Immersion Dose Monitor (IDM) locations were established to monitor for direct radiation during 2019, including:

- 21 on-site locations:

  01S1, 01S2, 02S2a, 02S4, 03S1, 04S1, 05S1, 06S2, 07S1, 08S1, 09S1, 10S1, 11S1, 12S1, 13S1, 14S1, 15S1, 15S2, 16S1, 16S2, and 16S3

- 32 off-site locations within the 10 mile zone:

TABLE B-2 (cont'd)
SAMPLING LOCATIONS

All sample types are not required to be collected at all possible sites every year.

LOCATION CODE	STATION LOCATION	LATITUDINAL DEG. MIN.	LONGITUDINAL DEG. MIN.	MEDIA SAMPLED
16F2	8.1 mi. NNW; Delaware City Public School, DE	39 – 34.314	75 – 35.429	IDM
01G1	10.9 mi. NNE; Route 49, South Broadway, NJ	39 – 37.113	75 – 30.178	FPV, FPL
01G3	19 mi. N; N. Church Street Wilmington, DE	39 – 44.287	75 – 32.512	IDM
02G2	13.5 mi. NNE; Local Farm; Pointers Auburn Road (Route 540), Salem, NJ	39 – 38.19	75 – 26.10	FPV
02G3	11.8 mi. NNE; Local Milk Farm, NJ	39 – 36.21	75 – 24.53	MLK, VGT, SOL
03G1	17 mi. NE; local farm, NJ	39 – 35.913	75 – 16.804	IDM, SOL
10G1	12 mi. SSW; Smyrna, DE	39 – 18.223	75 – 36.095	IDM
14G1	11.8 mi. WNW; Route 286, Bethel Church Road, DE	39 – 31.290	75 – 46.495	AIO,APT,IDM
16G1	15 mi. NNW; Wilmington Airport, DE	39 – 40.637	75 – 35.570	IDM
03H1	32 mi. NE; National Park, NJ	39 – 51.599	75 – 11.96	IDM
03H5	25 mi. NE; Farm Market, Route 77, NJ	39 – 41.040	75 – 12.380	FPV, FPL
07C1*	2 mi SE; Hope Creek Bed, near mouth of Hope Creek	39 – 26.611	75 – 30.328	EOY
07H1*	19 mi SE; Bennies Oyster Bed, near Nantuxent Cove	39 – 15.500	75 – 17.500	EOY

TABLE B-2 NOTATIONS:

All locations are referenced to the midpoint of the two SGS Units' Containments. The coordinates of this location are: Latitude N 39° - 27' - 46.5" and Longitude W 75° - 32' - 10.6".

Vegetable samples are not always collected in consecutive years from the same farmer due to crop rotation.

* Oysters were added as a management audit sample in 2015. As such they are not required by the program, nor are they listed in the ODCM. The oysters from the indicator location (7C1) are impacted by bacteria and are considered too small to be sold to the public. In 2018 the oyster management audit program was terminated because the hope creek oyster bed suffered a high mortality rate due to low salinity water from excessive rain (as reported by Rutgers University), and to date the study concluded there is no impact from the station.