Nebraska Public Power District

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NLS2021029
May 13, 2021

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Subject: Annual Radiological Environmental Report
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Dear Sir or Madam:

The purpose of this letter is to transmit to the Nuclear Regulatory Commission (NRC) the Cooper Nuclear Station (CNS) Annual Radiological Environmental Report for the period January 1, 2020 through December 31, 2020. This report is included as an Enclosure. This document is being submitted for NRC use per the requirements of Technical Specification 5.6.2 and CNS Offsite Dose Assessment Manual Section D 5.2.

This letter contains no regulatory commitments.

Should you have any questions or require additional information, please contact me at (402) 825-5416.

Sincerely,

David W VanKampen for L. Dewhirst

Linda Dewhirst
Regulatory Affairs and Compliance Manager

/tf

Enclosure - Radiological Environmental Monitoring Program 2020 Annual Report January 1, 2020 through December 31, 2020

cc: Regional Administrator w/ enclosure
USNRC - Region IV

Senior Resident Inspector w/ enclosure
USNRC - CNS

Cooper Project Manager w/ enclosure
USNRC - NRR Plant Licensing Branch IV

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NLS2021029
Enclosure

Enclosure

Radiological Environmental Monitoring Program
2020 Annual Report
January 1, 2020 through December 31, 2020

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

Radiological Environmental Monitoring Program

2020 Annual Report

January 1, 2020 to December 31, 2020

Prepared by
Teledyne Brown Engineering
2508 Quality Lane
Knoxville, TN 37931-3133

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Preface

This report covers the period of January 1 through December 31, 2020. Personnel of Nebraska Public Power District made all sample collections. Analyses were performed and reports of analyses were prepared by Teledyne Brown Engineering – Environmental Services and forwarded to Nebraska Public Power District. Environmental Thermoluminescent Dosimeter (TLD) analyses were performed and reports of analyses were prepared by Mirion Technologies.

SECTION I. INTRODUCTION

I. INTRODUCTION

This report contains a complete tabulation of data collected during the period January 1 through December 31 2020, for the operational Radiological Environmental Monitoring Program (REMP) performed for Cooper Nuclear Station (CNS) of Nebraska Public Power District (NPPD) by Teledyne Brown Engineering - Environmental Services.

Cooper Nuclear Station is located in Nemaha County in the southeast corner of Nebraska on the Missouri River. A portion of the site extends into Missouri. The reactor is an 830-megawatt (net electrical) boiling water reactor. Initial criticality was attained on February 21, 1974.

Radiological environmental monitoring began in 1971 before the plant became operational and has continued to the present. The program monitors radiation levels in air, terrestrial and aquatic environments. All samples are collected by NPPD personnel. All samples are shipped for analysis to a contractor's laboratory where there exists special facilities required for measurements of extremely low levels of radioactivity. Teledyne Brown Engineering - Environmental Services has the responsibility for the analyses for Cooper Nuclear Station.

The United States Nuclear Regulatory Commission (USNRC) regulations (10CFR50.34a) require that nuclear power plants be designed, constructed, and operated to keep levels of radioactive material in effluents to unrestricted areas as low as is reasonably achievable (ALARA). Inplant monitoring is used to ensure that release limits are not exceeded. As a precaution against unexpected or undefined environmental processes, which might allow undue accumulation of radioactivity in the environment, a program for monitoring the plant environs is included in NPPD's CNS Offsite Dose Assessment Manual (ODAM).

A. Atmospheric Nuclear Tests and Nuclear Incidents

Three atmospheric nuclear detonations in the People's Republic of China influenced program results significantly in late 1976 and in 1977. Two of these detonations occurred in late 1976 (September 26 and November 17) and one in late 1977 (September 17). As a consequence of these tests elevated activities of gross beta in air particulate filters and iodine-131 in milk were observed throughout most of the United States. No atmospheric nuclear tests have been conducted since 1980, thus no short-lived fission products were detected in air particulate samples.

On April 26, 1986 the fire and explosion of Chernobyl Reactor No. 4 in the Soviet Union resulted in the release of fission products to the atmosphere and worldwide fallout. Following the explosion, elevated levels of gross beta activities in air particulates and iodine-131 in charcoal filters and milk samples were measured. Additionally, in 1986, cesium-137 and the short-lived radionuclides iodine-131, ruthenium-106, and cesium-134 were detected in broadleaf vegetation. Similar results occurred in other areas of the United States and the entire Northern Hemisphere.

B. Monitoring Program Objectives and Data Interpretation

The objective of the monitoring program is to detect and assess the impact of possible releases to the environs of radionuclides from the operations of Cooper Nuclear Station. This objective requires measurements of low levels of radioactivity equal to or lower than pre-determined limits of detection. In addition the source of the environmental radiation must be established. Sources of environmental radiation include:

(1) Natural background radiation from cosmic rays (beryllium-7).

(2) Terrestrial, primordial radionuclides from the environment (potassium-40, radium-226, thorium-228).

(3) Fallout from atmospheric nuclear tests such as the September 1977 detonation by the Peoples' Republic of China and the atmospheric weapons test of October 16, 1980 (fission products and fusion products).

(4) Releases from nuclear power plants such as CNS (fission products and neutron activation products).

(5) Fallout from the Chernobyl nuclear reactor accident.

Radiation levels measured in the vicinity of an operating power station are compared with preoperational measurements at the same locations to distinguish power plant effects from other sources. Also, results of the monitoring program are related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations or abnormal plant releases.

SECTION II. SUMMARY

II. SUMMARY

Presented in this report are summaries and discussions of the data generated for the Radiological Environmental Monitoring Program (REMP) for Cooper Nuclear Station (CNS) of Nebraska Public Power District (NPPD) for 2020.

The sampling and analyses program is described in Section III. It contains the sampling schedule and required analyses in Table 1 and Table 2 and the site map.

A discussion of each type of sample analyzed and its impact, if any, on the environment is presented in Section IV. Included are graphs of the radionuclides of interest for the past several years and the statistical results for each quarter of the year.

Section V presents the yearly conclusions of the program.

Section VI is the Radiological Environmental Monitoring Program Summary. It contains the yearly summary of the program with the total number of samples of each type analyzed. It lists the yearly average and range for the control locations versus the indicator locations and the number of detections per total number of samples. It identifies the station with the highest yearly average, the distance and location of that station and provides the range of detection.

Section VII contains the complete data tables for the period.

References are presented in Section VIII.

SECTION III. SAMPLING AND ANALYSIS PROGRAM

III. SAMPLING AND ANALYSES PROGRAM

The 2020 sampling and analyses program is described in Table 1 and Table 2. Teledyne Brown Engineering - Environmental Services has a comprehensive quality assurance/quality control program designed to assure the reliability of data obtained. The results for the 2020 Interlaboratory Comparison Program conducted by Analytics, Inc., the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) and Environmental Resource Associates (ERA) are contained in Appendix B.

Sampling locations are indicated in the map labeled Figure 1, Figure 2, and Figure 3. Further description of the location and sample types collected at each location are listed in Appendix G.

The annual land use census for 2020 is described in Appendix A. There were no milk animals found within three miles of CNS in 2020 and no evidence of potable water use from the river. The nearest garden to CNS is in sector D, 1.7 miles from CNS. From year to year there is a slight variation in the number of gardens tended. The nearest resident to CNS is in sector Q, 0.9 miles from CNS.

All of the required 2020 environmental monitoring, including sampling and analyses, were conducted as specified in Table D4.1-1 of the CNS Offsite Dose Assessment Manual (ODAM), except as noted in Appendix E, REMP Sampling and Analytical Exceptions table.

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

Environmental Radiation Surveillance Program Sampling Schedule and Analyses

TABLE 1: Sampling Frequencies and Minimum Numbers

SAMPLE MEDIUM	ODAM SAMPLE STATIONS	NON-ODAM SAMPLE STATIONS	MINIMUM SAMPLES PER ODAM (PER SAMPLE PERIOD)	SAMPLE COLLECTION FREQUENCY (AT LEAST ONCE PER)	MAXIMUM INTERVAL
Radioiodine	1-10, 111	SOL 2	5	7 Days	8.75 Days
Particulates	1-10,111	SOL 2	5	7 Days	8.75 Days
Milk (nearest producer)	99	-	1	15 Days in Peak Pasture (June 1 - Sep 30)	18.75 Days
				31 Days in Non-Peak Pasture (Oct 1 - May 31)	38.75 Days
River Water	12 or 35, 28	-	2	31 Days	38.75 Days
Food Products[1] (Broadleaf Vegetation)	35, 96, 101	-	3	Monthly when available[2]	N/A
Direct Radiation	1-10, 20, 44, 56, 58, 59, 66, 67, 71, 79-91, 94, 111, N01-N25	-	32[3]	92 Days	115 Days
Ground Water	11, 47	-	2	92 Days	115 Days
Sediment from Shoreline	28	35	1	Once in Spring (March 1 - May 31), Once in Fall (Sep 1 - Nov 30)	
Fish	28, 35	-	2	Once in Summer (June 1 - Aug 31), Once in Fall (Sep 1 - Nov 30)	

[1] Broadleaf vegetation required (when available) due to absence of "Milk (other producers)" (LBDCR 2018-001).

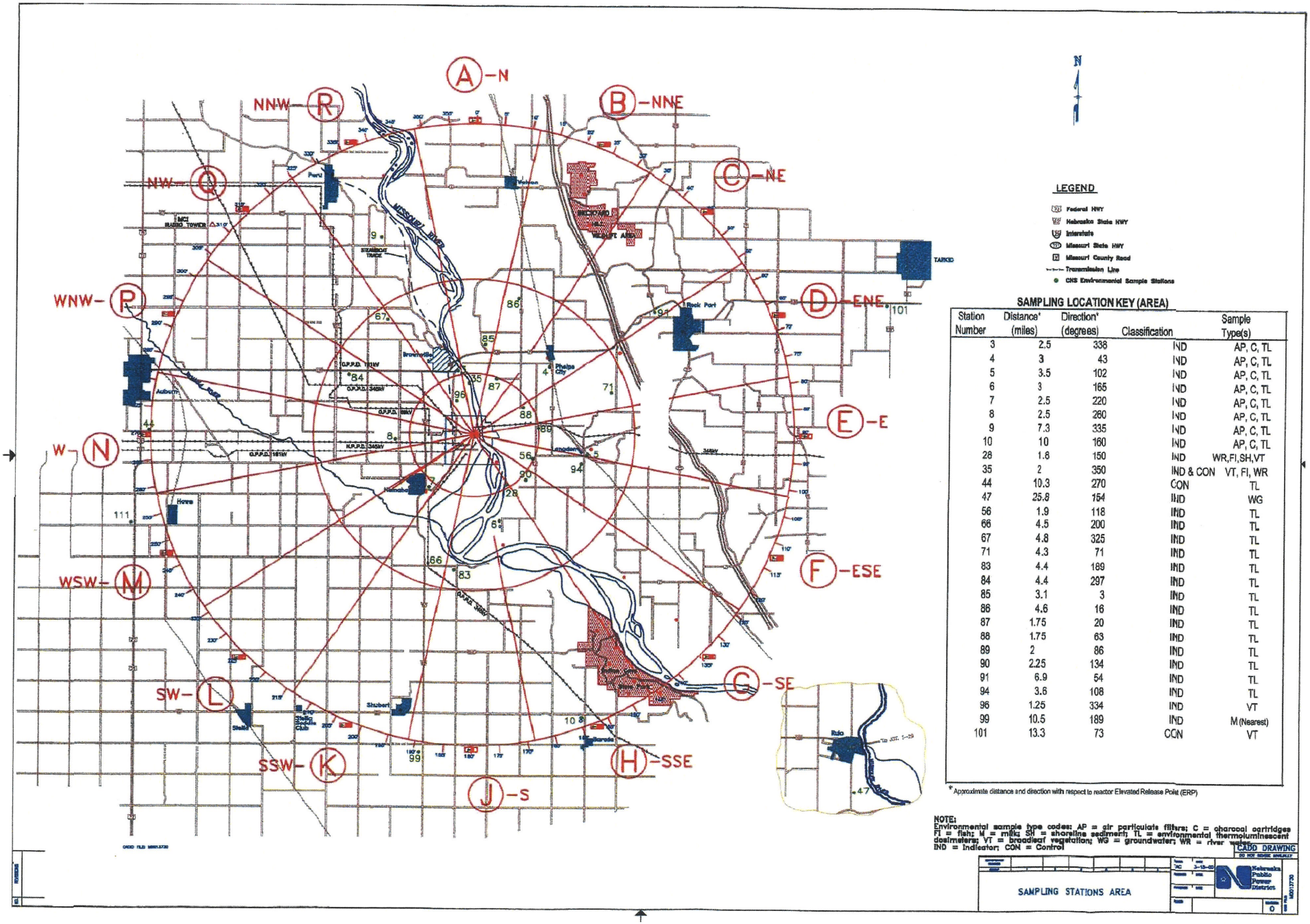
[2] Don't need to physically go to Sample Station in attempt to obtain sample if based on season/weather its obvious vegetation is unavailable (e.g., January).

[3] TLD is single phosphore. ≥ 2 phosphores in one package are considered ≥ 2 dosimeters.

TABLE 2: Analysis Frequencies

MEDIUM	ODAM STATIONS	NON-ODAM STATIONS	ANALYSIS TYPE	ANALYSIS FREQUENCY (AT LEAST ONCE PER)	MAXIMUM INTERVAL
Radioiodine	1-10, 111	SOL 2	I-131	7 Days	8.75 Days
Particulate	1-10, 111	SOL 2	Gross Beta[a]	-	-
			Gamma Isotopic	Only each sample in which gross beta > 10 times yearly mean of control samples	-
			Gamma Isotopic of Composite (by location)	92 Days	115 Days
Milk[1] (nearest producer)	99	-	Gamma Isotopic, I-131	-	-
River Water	12 or 35, 28	-	Gamma Isotopic	-	-
			Tritium on Composite	92 Days	115 Days
Food Products (broadleaf vegetation)	35, 96, 101	-	Gamma Isotopic, I-131	-	-
Direct Radiation	1-10, 20, 44, 56, 58, 59, 66, 67, 71, 79-91, 94, 111, N01-N25	-	Gamma	92 Days	115 Days
Ground Water	11, 47	-	Gamma Isotopic, Tritium	-	-
Sediment from Shoreline	28	35	Gamma Isotopic	-	-
Fish (edible portions)	28, 35	-	Gamma Isotopic	-	-

[a] Analyze for gross beta radioactivity ≥ 24 hours following filter change.



SAMPLING LOCATION KEY (AREA)

Station Number	Distance* (miles)	Direction* (degrees)	Classification	Sample Type(s)
3	2.5	338	IND	AP, C, TL
4	3	43	IND	AP, C, TL
5	3.5	102	IND	AP, C, TL
6	3	165	IND	AP, C, TL
7	2.5	220	IND	AP, C, TL
8	2.5	260	IND	AP, C, TL
9	7.3	335	IND	AP, C, TL
10	10	160	IND	AP, C, TL
28	1.8	150	IND	WR,FI,SH,VT
35	2	350	IND & CON	VT, FI, WR
44	10.3	270	CON	TL
47	25.8	154	IND	WG
56	1.9	118	IND	TL
66	4.5	200	IND	TL
67	4.8	325	IND	TL
71	4.3	71	IND	TL
83	4.4	189	IND	TL
84	4.4	297	IND	TL
85	3.1	3	IND	TL
86	4.6	16	IND	TL
87	1.75	20	IND	TL
88	1.75	63	IND	TL
89	2	86	IND	TL
90	2.25	134	IND	TL
91	6.9	54	IND	TL
94	3.6	108	IND	TL
96	1.25	334	IND	VT
99	10.5	189	IND	M (Nearest)
101	13.3	73	CON	VT

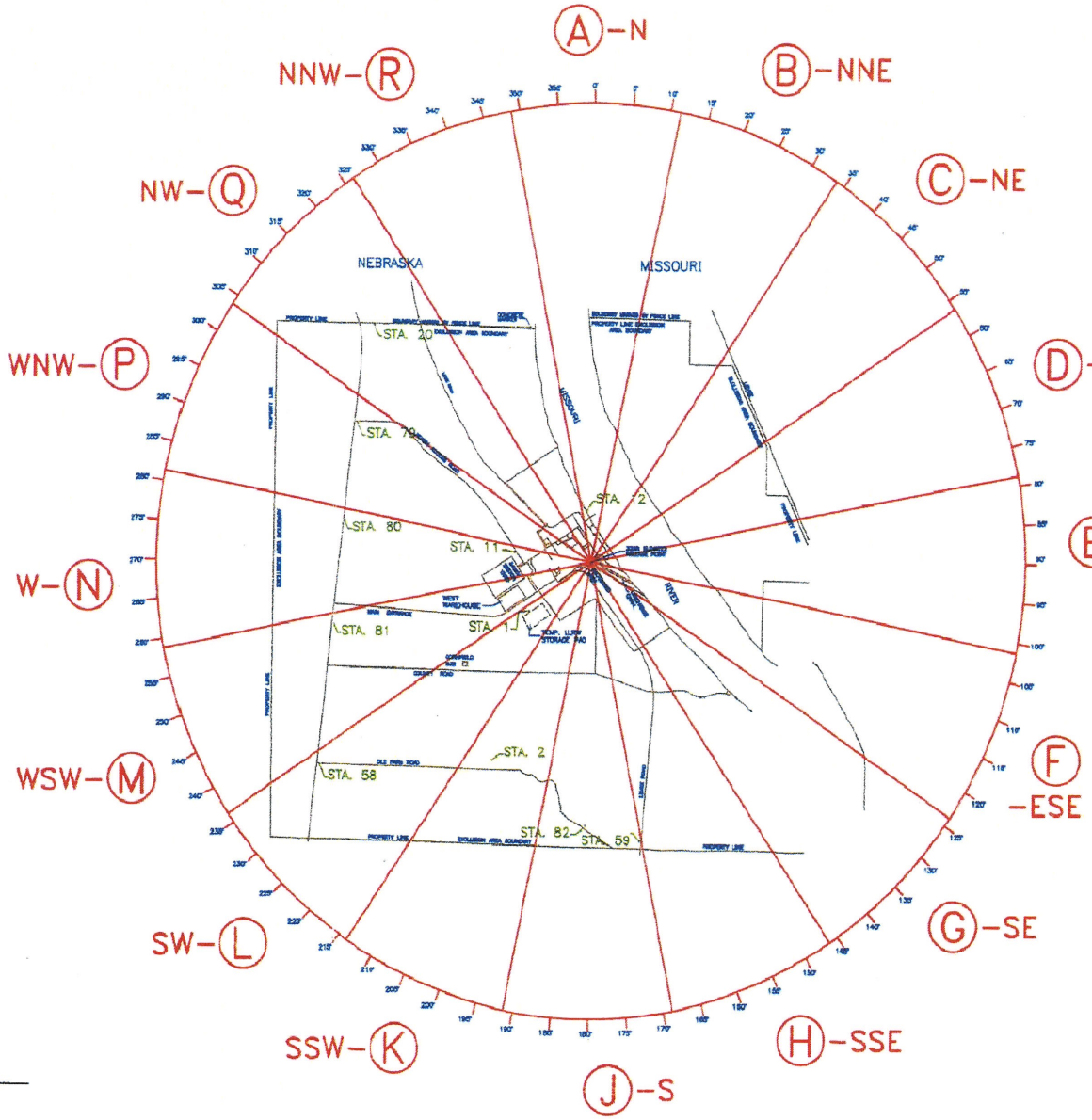
*Approximate distance and direction with respect to reactor Elevated Release Point (ERP)

NOTE:
Environmental sample type codes: AP = air particulate filters; C = charcoal cartridges FI = fish; M = milk; SH = shoreline sediment; TL = environmental thermoluminescent dosimeters; VT = broadleaf vegetation; WG = groundwater; WR = river water
IND = Indicator; CON = Control

CADD DRAWING
DO NOT REVISE MANUALLY

SAMPLING STATIONS AREA

Nebraska Public Power District



LEGEND

- 73 Federal HWY
- 62 Nebraska State HWY
- 29 Interstate
- 111 Missouri State HWY
- Missouri County Road
- Transmission Line
- CNS Environmental Sample Stations

SAMPLING LOCATION KEY (SITE)

Station Number	Distance* (miles)	Direction* (degrees)	Classification	Sample Type(s)
1	0.1	230	IND	AP, C, TL
2	0.75	210	IND	AP, C, TL
11	0.15	275	IND	WG
12	0.1	355	CON	WR
20	0.96	315	IND	TL
58	1.1	234	IND	TL
59	1	170	IND	TL
79	0.85	299	IND	TL
80	0.75	280	IND	TL
81	0.8	255	IND	TL
82	0.8	185	IND	TL

* Approximate distance and direction with respect to reactor Elevated Release Point (ERP)

NOTE:
Environmental sample type codes: AP = air particulate filters; C = charcoal cartridges FI = fish; M = milk; SH = shoreline sediment; TL = environmental thermoluminescent dosimeters; VT = broadleaf vegetation; WG = groundwater; WR = river water.

CADD DRAWING
DO NOT REVISE MANUALLY

SIGNATURE NUMBER								
SHEET	1	2	3	4	5	6	7	8

DRAWN TAC 3-15-00
CHECKED
APPROVED
FILED

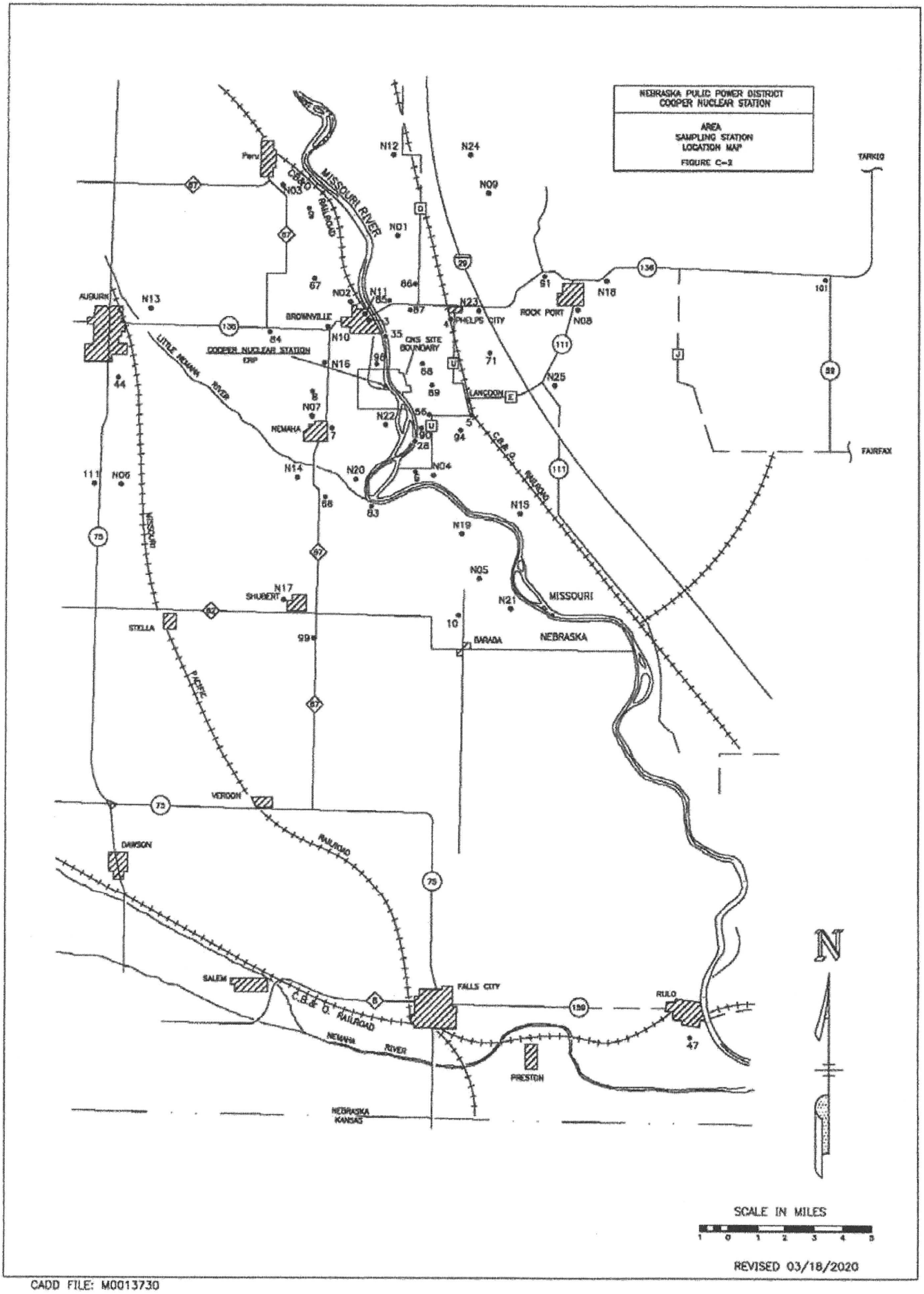
Nebraska Public Power District

MAP OF SAMPLING STATIONS SITE

DWG. NO. M001.37.29
REVISION 0

REVISIONS
NO.

16



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SECTION IV. SUMMARY AND DISCUSSION OF 2020 ANALYTICAL RESULTS

IV. SUMMARY AND DISCUSSION OF 2020 ANALYTICAL RESULTS

Data from the radiological analyses of environmental media collected during 2020 are tabulated and discussed in section A through H. The procedures and specifications followed in the laboratory for these analyses are as required in the Teledyne Brown Engineering Quality Assurance manual and are explained in the Teledyne Brown Engineering Analytical Procedures. A synopsis of analytical procedures used for the environmental samples is provided in Appendix C. In addition to internal quality control measures performed by Teledyne Brown Engineering, the laboratory also participates in an Interlaboratory Comparison Program. Participation in this program ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison are provided in Appendix B.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The "less than" values in the data tables were calculated from each specific analysis and are dependent on sample size, detector efficiency, length of counting time, chemical yield (when appropriate) and the radioactive decay factor from time of counting to time of collection. Teledyne Brown Engineering's analytical methods meet or are below the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, Radiological Monitoring Acceptable Program (November 1979, Revision 1). Appendix C contains a discussion of the LLD formulas.

The following is a discussion and summary of the results of the environmental measurements taken during the 2020 reporting period:

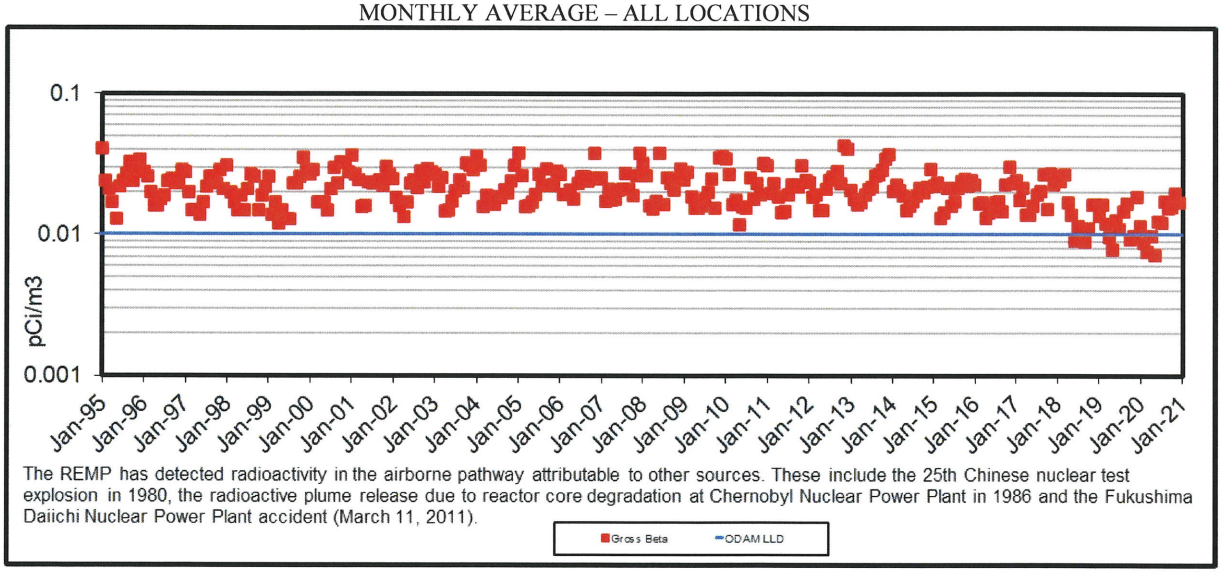
A. Airborne Particulates

Gross beta activity was observed in 433 of the 464 indicator samples collected during 2020. The average concentration was 0.014 pCi/m^3 with a range of 0.003 to 0.037 pCi/m^3. Gross beta activity was observed in 49 of the 52 control samples with an average concentration of 0.012 pCi/m^3 with a range of 0.004 to 0.022 pCi/m^3. The results of the gross beta activities are presented in Section VII-1 and Trending Graph 1. The gross beta activities for 2020 were comparable to levels measured in the previous several years. Prior to that period the gross beta activities were higher due to atmospheric nuclear weapons testing performed in other countries. The preoperational period of 1971 through 1974 averaged 0.098 pCi/m^3 gross beta.

Air particulate filters were collected weekly and composited by locations on a quarterly basis, unless otherwise specified in Section VII-2. They were analyzed by gamma ray spectroscopy. The results are presented in Section VII-2. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation, was measured in 42 of the 42 composite samples. The indicator locations had an average concentration of 0.092 pCi/m^3 with a range of 0.050 to 0.155 pCi/m^3. The control location had an average concentration of 0.084 pCi/m^3 with a range of 0.048 to 0.133 pCi/m^3. During the preoperational period, beryllium-7 was measured at comparable levels. All other gamma emitters were below the detection limits. The operation of Cooper Nuclear Station has no discernable impact on Airborne Particulate samples.

TRENDING GRAPH 1

GROSS BETA IN AIR PARTICULATES
MONTHLY AVERAGE – ALL LOCATIONS

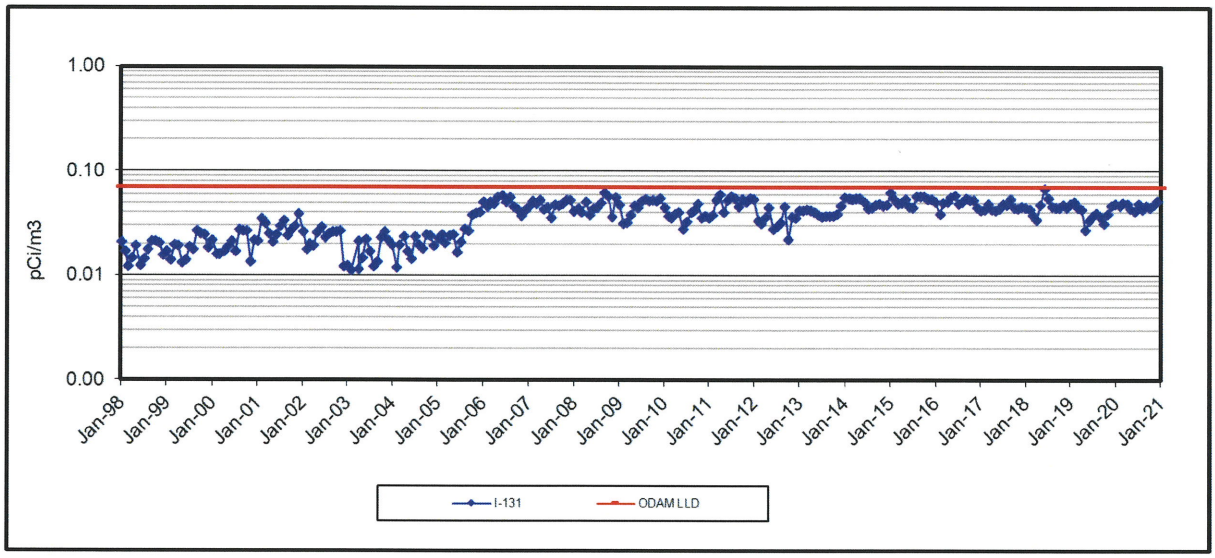


B. Airborne Iodine

Charcoal cartridges used to collect airborne iodine were collected weekly and analyzed by gamma spectrometry for iodine-131, unless otherwise specified in Section VII-1. The results are presented in Section VII-1 and Trending Graph 2. Iodine-131 was below the lower limit of detection in all 516 samples. The operation of Cooper Nuclear has no discernable impact on charcoal cartridge samples.

TRENDING GRAPH 2

IODINE-131 IN CHARCOAL FILTERS
MONTHLY AVERAGE – ALL LOCATIONS



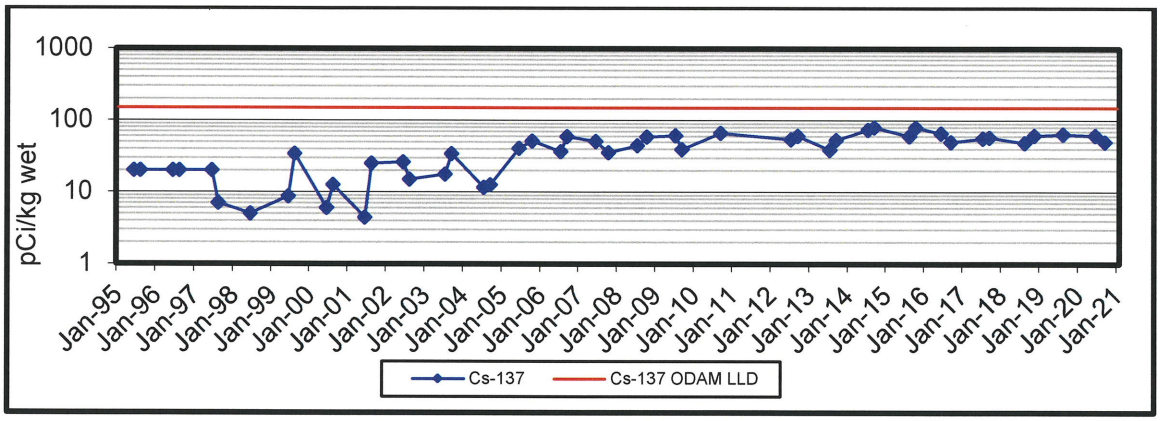
Trending Graph 2 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day and is not an indication that the trend will continue to increase above the LLD limit.

C. Fish

Aquatic biota can be sensitive indicators of radionuclide accumulation in the environment because of their ability to concentrate certain chemical elements, which have radioisotopes. The results are presented in Table VII-3 and Trending Graph 3. Two samples of fish were collected during the summer and fall of 2020. Middle-top feeding fish (carp) and bottom feeding fish (catfish) were collected in June and September. These samples were analyzed by gamma ray spectroscopy. Naturally occurring potassium-40 was detected in all samples. The average concentration at the upstream control location was 2,489 pCi/kg (wet weight) with a range of 1,879 to 2,963 pCi/kg (wet weight). The average concentration for the indicator samples was 3,075 pCi/kg (wet weight) with a range of 2,234 to 3,582 pCi/kg (wet weight). The preoperational period of 1971 through 1974 averaged 2,400 pCi/kg potassium-40. All other gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has had no discernable impact on fish samples.

TRENDING GRAPH 3

CESIUM-137 IN FISH
ALL LOCATIONS



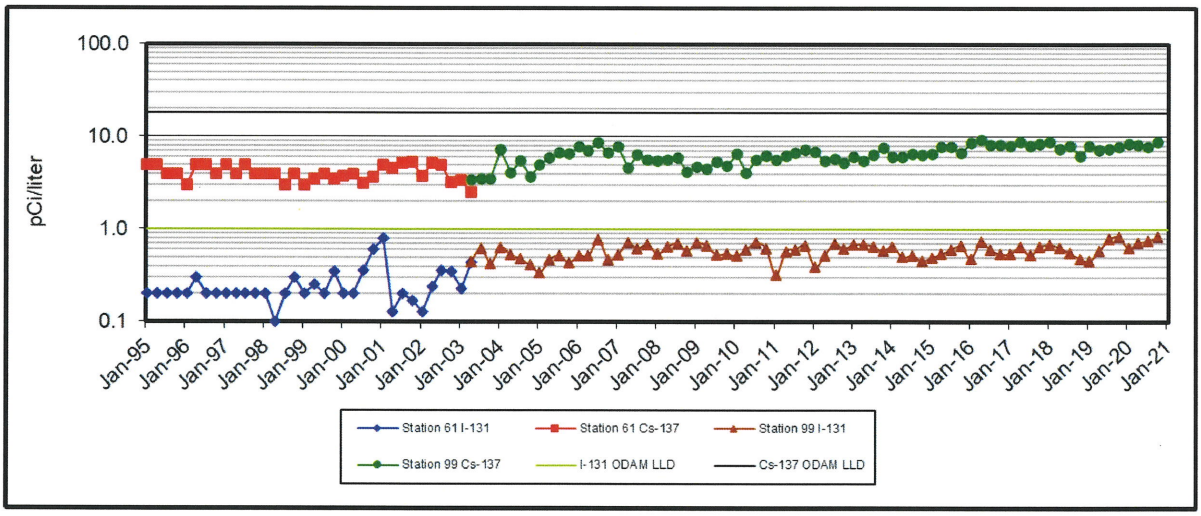
Trending Graph 3 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward LLD trend indicates that detector count times were gradually shortened to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.
Samples were not collected in Summer 2010.
Flooding of the Missouri River prevented collection of fish in Summer or Fall 2011.
Flooding of the Missouri River prevented collection of fish in Fall 2019.

D. Milk – Nearest Producer

Milk samples are collected once every 15 days in peak pasture season and once every 31 days the rest of the year from Station 99. The results are presented in Table VII-4 and Trending Graph 4. Seventeen samples were analyzed by gamma ray spectroscopy and for low-level iodine-131 by radiochemical separation. All iodine-131 results were below the lower limit of detection. Naturally occurring potassium-40 was measured in all samples with an average concentration of 1,200 pCi/L and a range of 971 to 1,498 pCi/L. All other gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has no discernable impact on milk samples.

TRENDING GRAPH 4

IODINE-131 AND CESIUM-137 IN MILK – NEAREST PRODUCER
STATIONS 61 & 99



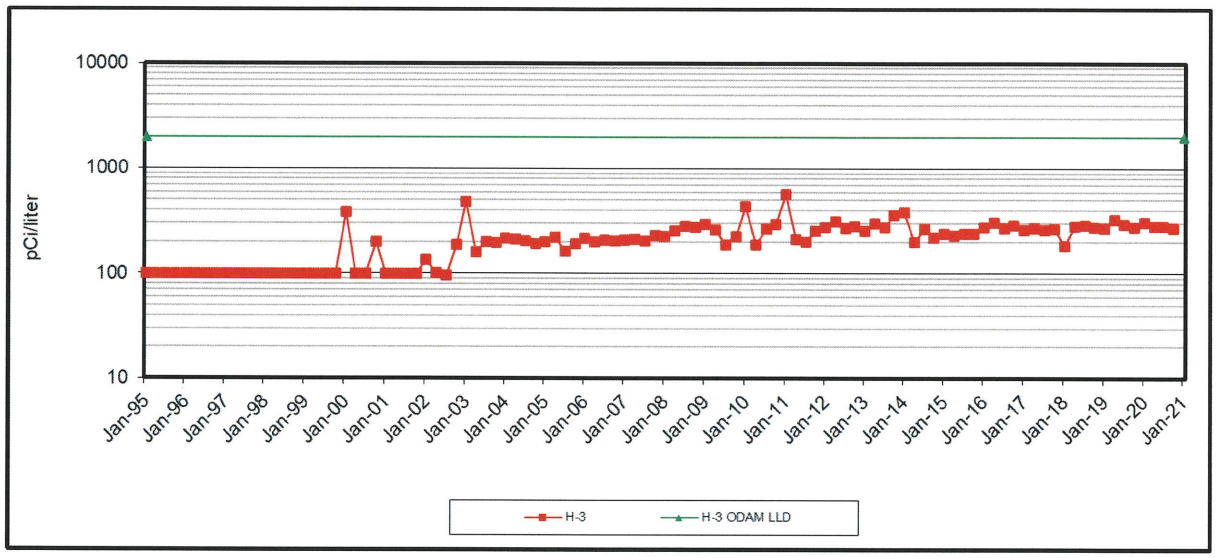
Station 61 went out of business in May of 2003. Station 99 replaced station 61 in May of 2003.
Trending Graph 4 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

E. Ground Water

Groundwater was collected from two stations quarterly and analyzed for tritium, low level iodine-131 and for gamma emitting radionuclides. Station 11 is located 0.15 miles from the plant and station 47 is 25.8 miles from the plant. The results are presented in Table VII-5 and Trending Graph 5. All tritium and low level iodine results were below the lower limit of detection. All gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has no discernable impact on groundwater samples.

TRENDING GRAPH 5

TRITIUM IN GROUND WATER
QUARTERLY AVERAGE – ALL LOCATIONS



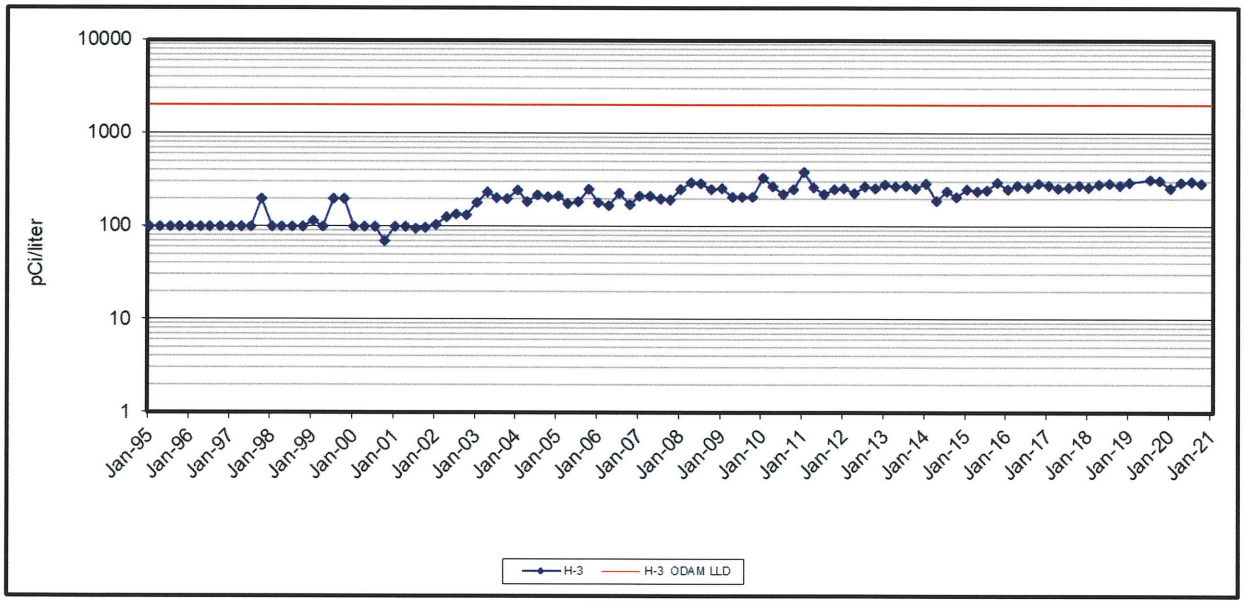
Trending Graph 5 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward LLD trend indicates that detector count times were gradually shortened to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

F. River Water

River water was collected monthly and monitored for gamma emitting radionuclides and tritium. The monthly samples are composited quarterly and analyzed for tritium. The results are presented in Table VII-6 and Trending Graph 6. All tritium results were below the lower limit of detection. Naturally occurring potassium-40 was measured in one control sample with an average concentration of 99.5 pCi/L. All other the gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has no discernable impact on river water samples.

TRENDING GRAPH 6

TRITIUM IN RIVER WATER
QUARTERLY AVERAGE – ALL LOCATIONS



Trending Graph 6 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward LLD trend indicates that detector count times were gradually shortened to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

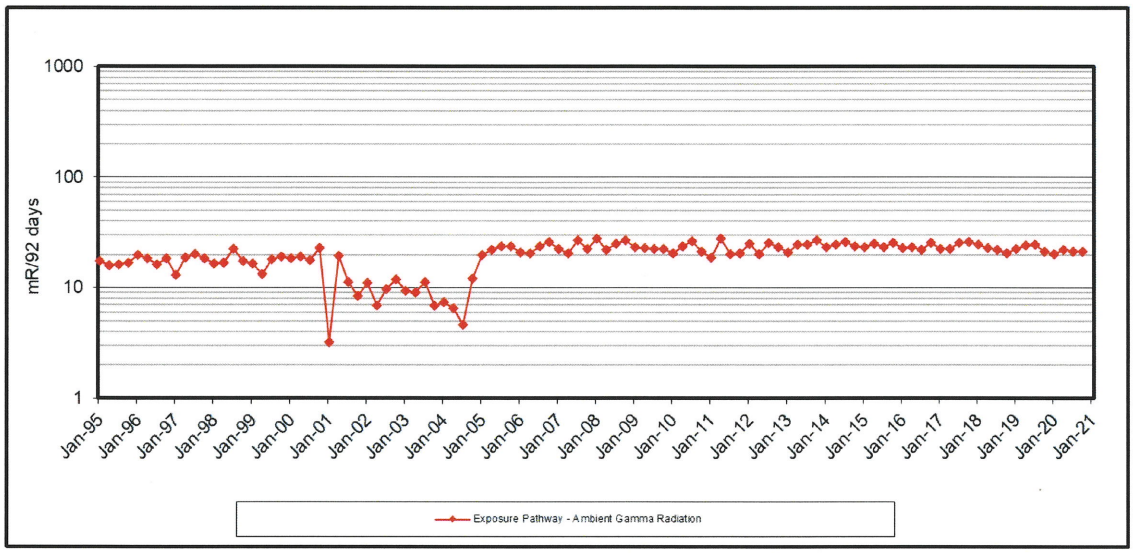
G. *Thermoluminescent Dosimeters*

Thermoluminescent dosimeters (TLDs) determine environmental radiation doses and the results are presented in Table VII-7 and Trending Graph 7. Ambient radiation was monitored at 58 locations within an 11 mile radius of Cooper Nuclear Station and collected quarterly. The average concentration for the indictor locations was 21.2 millirem/quarter and a range from 18.0 to 26.0 millirem/quarter. The highest indicator station N20, which is located 2.9 miles, 200 degrees, had an average of 23.3 millirem/quarter and a range from 22.0 to 25.0 millirem/quarter. The control stations were Station 44 and Station 111 with an average of 22.3 millirem/quarter and a range from 20.0 to 24.0 millirem/quarter. The preoperational period of 1971 through 1974 averaged 37.0 millirem/quarter; which is the preoperational four year average. Current year TLD averages deviate from the preoperational averages due to instrument variations from previous vendors.

The data from year to year is in good agreement and indicates no adverse changes in radiation exposure to the population near Cooper Nuclear Station.

TRENDING GRAPH 7

THERMOLUMINESCENT DOSIMETRY
QUARTERLY AVERAGE – ALL LOCATIONS



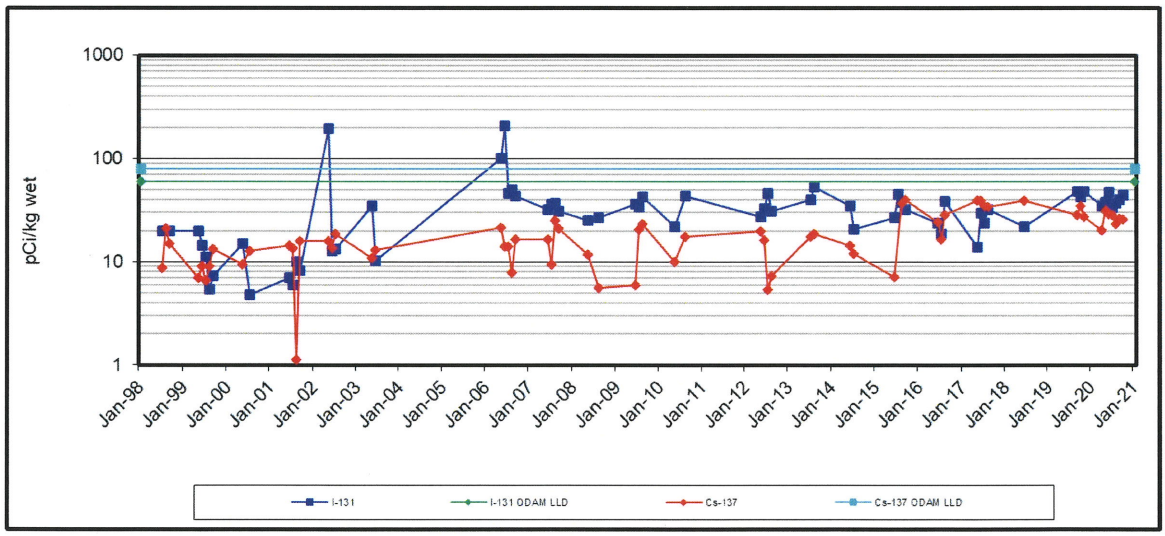
First quarter 2001 TLD data low but still within acceptable limits due to possible dry conditions.

H. Food – Broadleaf Vegetation

Broadleaf vegetation samples were collected from two indicator locations and one control location monthly from April to October 2020. The samples were analyzed by gamma ray spectroscopy and for low-level iodine-131 by radiochemical separation. The results are presented in Table VII-8 and Trending Graph 8. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation was measured in all 21 samples analyzed. The average concentration for the indicator locations was 1,277 pCi/kg (wet) with a range of 550 to 3,436 pCi/kg wet. The control location had an average concentration of 1,661 pCi/kg (wet) with a range of 444 to 3,602 pCi/kg (wet). Naturally occurring potassium-40 was measured in all 21 samples analyzed. The average concentration for the indicator locations was 5,763 pCi/kg (wet) with a range of 4,218 to 7,169 pCi/kg (wet). The control location had an average concentration of 6,314 pCi/kg (wet) with a range of 5,601 to 7,130 pCi/kg (wet). Naturally occurring thorium-228 was measured in ten samples analyzed. The average concentration for the indicator locations was 131 pCi/kg (wet) with a range of 63.5 to 248 pCi/kg (wet). The control location had an average concentration of 96.4 pCi/kg (wet) with a range of 62.1 to 183 pCi/kg (wet). All other gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has no discernable impact on broadleaf vegetation samples.

TRENDING GRAPH 8

IODINE-131 AND CESIUM-137 IN FOOD – BROADLEAF VEGETATION
ALL LOCATIONS



The low Cs-137 value reported in July 2001 was due to the wrong aliquot being entered for the gamma analysis resulted in an invalid analysis and is not reported

Due to delay in sample receipt, the I-131 had decayed away, resulting in an invalid analysis for May 2002 and is not reported.

Milk samples were collected in lieu of broadleaf vegetation samples in 2004 and 2005.

Due to delay in counting sample, the I-131 had decayed away, resulting in an invalid analysis for June 2006 and is not reported. The I-131 by chemical separation met required I-131 LLD.

Trending Graph 8 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

Broadleaf vegetation samples were not available for collection in 2011 due to Missouri River flooding.

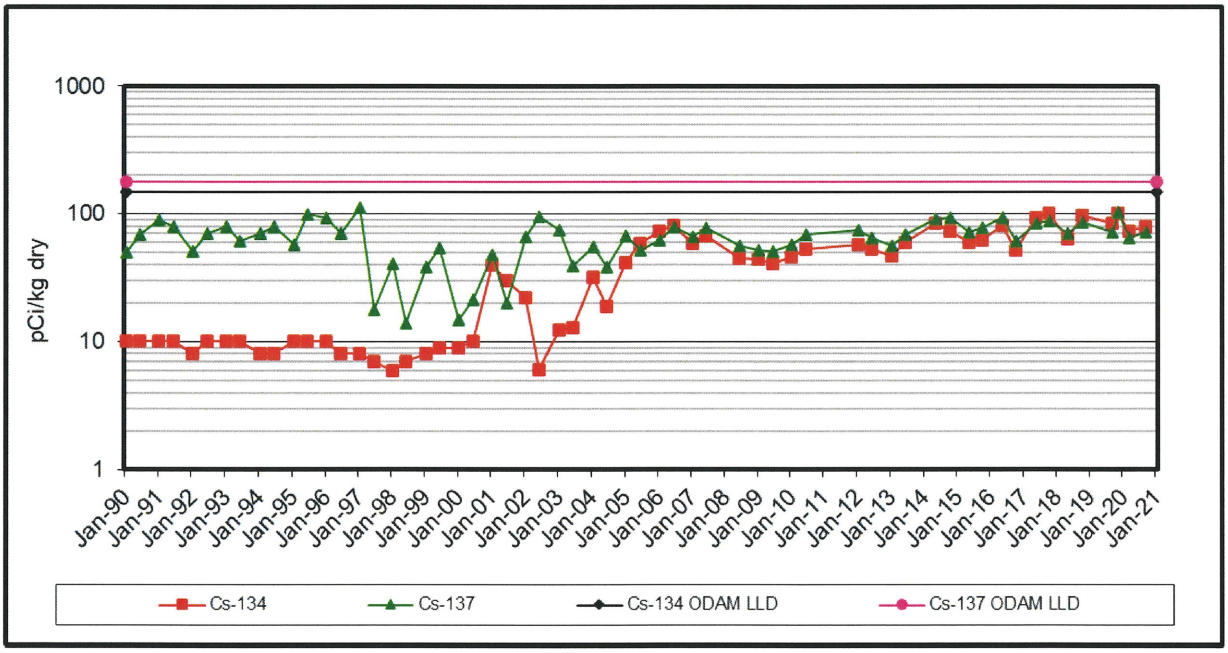
Broadleaf vegetation samples were not available for collection April thru August 2020 due to Missouri River Flooding.

I. Shoreline Sediment

Sediment samples were collected in March and September from indicator location 28 and control location 35. The samples collected were analyzed by gamma spectrometry. The results are presented in Table VII-9 and Trending Graph 9. A number of naturally occurring radionuclides were detected in these samples. Naturally occurring potassium-40 was observed in all four samples. The average concentration for the control location was 13,570 pCi/kg (dry weight) and a range of 12,860 to 14,280 pCi/kg (dry weight). The average concentration for the indicator location was 13,415 pCi/kg (dry weight) and a range of 11,810 to 15,020 pCi/kg (dry weight). Naturally occurring Radium-226 was observed in one of the control samples with an average concentration of 1,604 pCi/kg (dry weight). Naturally occurring Thorium-228 was observed in all four samples. The average concentration for the control location was 525 pCi/kg (dry weight) with a range of 461 to 589 pCi/kg (dry weight). The average concentration for the indicator location was 570 pCi/kg (dry weight) and a range of 498 to 641 pCi/kg (dry weight). All other gamma emitters were below the lower limit of detection. The operation of Cooper Nuclear Station has no discernable impact on shoreline sediment samples.

TRENDING GRAPH 9

CESIUM-134 AND CESIUM-137 IN SHORELINE SEDIMENT
STATIONS 28 AND 35



Trending Graph 9 represents minimum detectable concentration (MDC) results. Only one sample was collected in 2008. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit. Graph data extends through October 2020 only.
Shoreline sediment samples were not available for collection due to flooding of the Missouri River in 2011.
Shoreline sediment samples were not available for collection due to flooding of the Missouri River in September 2020

J. Errata Data

There was no errata data for 2020.

SECTION V. CONCLUSIONS

V. CONCLUSIONS

The results of the 2020 Radiological Environmental Monitoring Program (REMP) for Cooper Nuclear Station (CNS) of Nebraska Public Power District (NPPD) have been presented. The report contains data tables, summaries, and discussions of the data and trending graphs.

Naturally occurring radioactivity and residual traces of fallout were observed in sample media in the expected ranges. They have been discussed individually in the text. Observed radioactivity was at very low concentrations.

The results of the analyses have been presented. Based on the evidence of the Radiological Environmental Monitoring Program, Nebraska Public Power District, Cooper Nuclear Station has had no discernable radiological impact on the environment and is operating within regulatory limits.

SECTION VI. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY TABLE - 2020

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Cooper Nuclear Station
Location of Facility Nemaha Nebraska
(County/State)

Docket No. 50-298
Reporting Period January 1 2020 to December 31 2020

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean Name	Mean(2) Range(2)	Control Location Mean(2) Range(2)	No. of Reportable Occurrences
Air Particulate (pCi/m^3)	GR-B	516	0.01	.014(433/464) (.003/.037)	Sta. 3 2.5 mi.	.018(33/33) (.004/.035)	.012(49/52) (.004-.022)	0
	BE-7	42	NA	.092(38/38) (.050/.155)	Sta. 3 2.5 mi.	.132(3/3) (.119/.143)	.084(4/4) (.048-.133)	0
	K-40	42	NA	ND(0/38) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	CO-60	42	NA	ND(0/38) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	TH-228	42	NA	ND(0/38) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
Air Iodine (pCi/m^3)	I-131	516	0.07	ND(0/464) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/52) (ND-ND)	0
Fish (pCi/kg wet)	K-40	8	NA	3075(4/4) (2234/3582)	Sta. 28 1.8 mi.	3075(4/4) (2234/3582)	2489(4/4) (1879/2963)	0
	CO-60	8	130	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0

(1) Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

ND = Non Detectable.

NA = Not Applicable.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Cooper Nuclear Station
Location of Facility Nemaha Nebraska
(County/State)

Docket No. 50-298
Reporting Period January 1 2020 to December 31 2020

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean Name	Mean(2) Range(2)	Control Location Mean(2) Range(2)	No. of Reportable Occurrences
Fish (cont'd) (pCi/kg wet)	CS-137	8	150	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	TH-228	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
Milk Nearest (pCi/L)	I-131	17	1	ND(0/17) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	K-40	17	NA	1200(17/17) (971/1498)	Sta. 99 10.5 mi.	1200(17/17) (971/1498)	NA(0/0) (NA-NA)	0
	RA-226	17	NA	ND(0/17) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	TH-228	17	NA	ND(0/17) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
Water - Ground (pCi/L)	I-131	8	1	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	H-3	8	2000	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0

(1) Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

ND = Non Detectable.

NA = Not Applicable.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Cooper Nuclear Station
Location of Facility Nemaha Nebraska
(County/State)

Docket No. 50-298
Reporting Period January 1 2020 to December 31 2020

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean Name	Mean(2) Range(2)	Control Location Mean(2) Range(2)	No. of Reportable Occurrences
Water - Ground (cont'd) (pCi/L)	K-40	8	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	TH-228	8	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
River Water (pCi/L)	H-3	32	2000	ND(0/16) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/16) (ND-ND)	0
	K-40	24	NA	ND(0/12) (ND-ND)	Sta. 35 2.0 mi.	99.5(1/12) NA-NA	99.5(1/12) NA-NA	0
	TH-228	24	NA	ND(0/12) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/12) (ND-ND)	0
Thermoluminescence Dosimeter (mR/Quarter)	Gamma Dose	232	NA	21.2(216/224) (18.0/26.0)	Sta. N20 2.9 mi.	23.3(4/4) (22.0/25.0)	22.3(8/8) (20.0/24.0)	0
Broadleaf Vegetation (pCi/kg wet)	I-131	21	60	ND(0/14) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/7) (ND-ND)	0
	BE-7	21	NA	1277(14/14) (550/3436)	Sta. 96 1.3 mi.	1705(7/7) (550/3436)	1661(7/7) (444/3602)	0

(1) Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

ND = Non Detectable.

NA = Not Applicable.

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility Cooper Nuclear Station
Location of Facility Nemaha Nebraska
(County/State)

Docket No. 50-298
Reporting Period January 1 2020 to December 31 2020

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean Name	Mean(2) Range(2)	Control Location Mean(2) Range(2)	No. of Reportable Occurrences
Broadleaf Vegetation (cont'd) (pCi/kg wet)	K-40	21	NA	5763(14/14) (4218/7169)	Sta. 35 2.0 mi.	6314(7/7) (5601/7130)	6314(7/7) (5601/7130)	0
	RA-226	21	NA	ND(0/14) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/7) (ND-ND)	0
	TH-228	21	NA	131(5/14) (63.5/248)	Sta. 101 13.3 mi.	139(3/7) (63.5/248)	96.4(5/7) (62.1/183)	0
Shoreline Sediment (pCi/kg dry)	BE-7	4	NA	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	K-40	4	NA	13415(2/2) (11810/15020)	Sta. 35 2.0 mi.	13570(2/2) (12860/14280)	13570(2/2) (12860/14280)	0
	CS-137	4	180	ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	RA-226	4	NA	ND(0/2) (ND-ND)	Sta. 35 2.0 mi.	1604(1/2) NA-NA	1604(1/2) NA-NA	0
	TH-228	4	NA	570(2/2) (498/641)	Sta. 28 1.8 mi.	570(2/2) (498/641)	525(2/2) (461/589)	0

(1) Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

ND = Non Detectable.

NA = Not Applicable.

SECTION VII. COMPLETE DATA TABLES

VII-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 1

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.01E+04	CU.FT.	8.57E-03 ± 3.10E-03	< 7.E-02
01/07/20	01/14/20	1.03E+04	CU.FT.	2.09E-02 ± 4.27E-03	< 4.E-02
01/14/20	01/21/20	9.91E+03	CU.FT.	9.34E-03 ± 3.79E-03	< 4.E-02
01/21/20	01/28/20	9.98E+03	CU.FT.	1.48E-02 ± 4.24E-03	< 7.E-02
01/28/20	02/04/20	1.01E+04	CU.FT.	1.01E-02 ± 3.57E-03	< 7.E-02
02/04/20	02/11/20	1.01E+04	CU.FT.	7.54E-03 ± 3.05E-03	< 7.E-02
02/11/20	02/18/20	9.98E+03	CU.FT.	1.69E-02 ± 3.98E-03	< 6.E-02
02/18/20	02/25/20	1.03E+04	CU.FT.	6.68E-03 ± 3.12E-03	< 5.E-02
02/25/20	03/03/20	9.88E+03	CU.FT.	7.75E-03 ± 3.30E-03	< 3.E-02
03/03/20	03/10/20	1.00E+04	CU.FT.	6.90E-03 ± 2.88E-03	< 4.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	1.23E-02 ± 3.29E-03	< 5.E-02
03/17/20	03/24/20	1.00E+04	CU.FT.	6.56E-03 ± 3.06E-03	< 6.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	9.46E-03 ± 3.42E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	6.40E-03 ± 2.89E-03	< 6.E-02
04/07/20	04/14/20	1.00E+04	CU.FT.	1.55E-02 ± 3.65E-03	< 6.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.09E-02 ± 3.73E-03	< 2.E-02
04/21/20	04/28/20	1.01E+04	CU.FT.	1.05E-02 ± 3.55E-03	< 2.E-02
04/28/20	05/05/20	1.00E+04	CU.FT.	4.55E-03 ± 2.75E-03	< 6.E-02
05/05/20	05/12/20	1.01E+04	CU.FT.	7.47E-03 ± 3.06E-03	< 5.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	1.38E-02 ± 3.64E-03	< 5.E-02
05/19/20	05/26/20	1.01E+04	CU.FT.	5.44E-03 ± 2.74E-03	< 6.E-02
05/26/20	06/02/20	1.01E+04	CU.FT.	6.68E-03 ± 3.10E-03	< 6.E-02
06/02/20	06/09/20	1.00E+04	CU.FT.	< 3.85E-03	< 5.E-02
06/09/20	06/16/20	1.00E+04	CU.FT.	1.05E-02 ± 3.57E-03	< 5.E-02
06/16/20	06/23/20	1.01E+04	CU.FT.	1.84E-02 ± 3.82E-03	< 2.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	< 3.95E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.23E-02 ± 3.74E-03	< 5.E-02

VII-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 1

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	6.75E-03 ± 2.89E-03	< 6.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.14E-02 ± 3.28E-03	< 2.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	6.75E-03 ± 3.06E-03	< 3.E-02
07/28/20	08/04/20	1.00E+04	CU.FT.	8.85E-03 ± 2.83E-03	< 5.E-02
08/04/20	08/11/20	9.99E+03	CU.FT.	1.93E-02 ± 4.13E-03	< 5.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.24E-02 ± 3.45E-03	< 4.E-02
08/18/20	08/25/20	1.01E+04	CU.FT.	1.93E-02 ± 3.84E-03	< 2.E-02
08/25/20	09/01/20	1.00E+04	CU.FT.	1.53E-02 ± 3.69E-03	< 2.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	1.69E-02 ± 4.09E-03	< 3.E-02
09/08/20	09/15/20	9.98E+03	CU.FT.	4.30E-03 ± 2.73E-03	< 3.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	1.90E-02 ± 4.25E-03	< 5.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.53E-02 ± 3.79E-03	< 3.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	< 3.89E-03	< 4.E-02
10/06/20	10/13/20	1.01E+04	CU.FT.	1.99E-02 ± 4.02E-03	< 4.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	5.58E-03 ± 3.40E-03	< 4.E-02
10/20/20	10/27/20	1.00E+04	CU.FT.	1.28E-02 ± 3.75E-03	< 4.E-02
10/27/20	11/01/20	6.69E+03	CU.FT.	< 6.63E-03	< 6.E-02
11/01/20	11/10/20	1.00E+04	CU.FT.	2.20E-02 ± 4.33E-03	< 4.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	1.56E-02 ± 3.80E-03	< 3.E-02
11/17/20	11/24/20	1.00E+04	CU.FT.	2.80E-02 ± 4.52E-03	< 6.E-02
11/24/20	12/01/20	1.00E+04	CU.FT.	2.38E-02 ± 4.46E-03	< 7.E-02
12/01/20	12/08/20	1.01E+04	CU.FT.	2.05E-02 ± 3.85E-03	< 5.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	2.76E-02 ± 4.68E-03	< 3.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	2.19E-02 ± 4.16E-03	< 3.E-02
12/22/20	12/28/20	8.64E+03	CU.FT.	2.46E-02 ± 4.84E-03	< 4.E-02

VII-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 2

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.00E+04	CU.FT.	< 3.54E-03	< 7.E-02
01/07/20	01/14/20	1.03E+04	CU.FT.	< 3.74E-03	< 5.E-02
01/14/20	01/21/20	1.00E+04	CU.FT.	< 4.74E-03	< 4.E-02
01/21/20	01/28/20	9.97E+03	CU.FT.	1.72E-02 ± 4.42E-03	< 7.E-02
01/28/20	02/04/20	1.01E+04	CU.FT.	8.36E-03 ± 3.42E-03	< 7.E-02
02/04/20	02/11/20	1.01E+04	CU.FT.	1.51E-02 ± 3.72E-03	< 7.E-02
02/11/20	02/18/20	9.91E+03	CU.FT.	< 3.99E-03	< 2.E-02
02/18/20	02/25/20	1.03E+04	CU.FT.	8.65E-03 ± 3.31E-03	< 5.E-02
02/25/20	03/03/20	9.88E+03	CU.FT.	< 4.04E-03	< 7.E-02
03/03/20	03/10/20	1.01E+04	CU.FT.	3.42E-03 ± 2.47E-03	< 5.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	4.46E-03 ± 2.49E-03	< 5.E-02
03/17/20	03/24/20	9.98E+03	CU.FT.	1.16E-02 ± 3.54E-03	< 3.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	< 4.08E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	1.80E-02 ± 3.93E-03	< 6.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	7.33E-03 ± 2.92E-03	< 6.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.56E-02 ± 4.09E-03	< 4.E-02
04/21/20	04/28/20	1.02E+04	CU.FT.	6.32E-03 ± 3.15E-03	< 5.E-02
04/28/20	05/05/20	9.97E+03	CU.FT.	1.10E-02 ± 3.42E-03	< 6.E-02
05/05/20	05/12/20	1.01E+04	CU.FT.	< 3.67E-03	< 5.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	1.29E-02 ± 3.56E-03	< 5.E-02
05/19/20	05/26/20	9.99E+03	CU.FT.	7.33E-03 ± 2.96E-03	< 2.E-02
05/26/20	06/02/20	9.97E+03	CU.FT.	9.47E-03 ± 3.39E-03	< 2.E-02
06/02/20	06/09/20	9.99E+03	CU.FT.	5.01E-03 ± 2.94E-03	< 3.E-02
06/09/20	06/16/20	1.00E+04	CU.FT.	1.27E-02 ± 3.75E-03	< 5.E-02
06/16/20	06/23/20	1.01E+04	CU.FT.	1.15E-02 ± 3.22E-03	< 3.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	1.72E-02 ± 4.05E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	7.61E-03 ± 3.33E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 2

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	1.43E-02 ± 3.59E-03	< 6.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	7.61E-03 ± 2.93E-03	< 5.E-02
07/21/20	07/28/20	1.01E+04	CU.FT.	6.53E-03 ± 3.01E-03	< 7.E-02
07/28/20	08/04/20	9.98E+03	CU.FT.	1.16E-02 ± 3.11E-03	< 2.E-02
08/04/20	08/11/20	9.99E+03	CU.FT.	1.07E-02 ± 3.41E-03	< 5.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.30E-02 ± 3.50E-03	< 6.E-02
08/18/20	08/25/20	1.01E+04	CU.FT.	2.91E-02 ± 4.55E-03	< 4.E-02
08/25/20	09/01/20	1.00E+04	CU.FT.	1.08E-02 ± 3.30E-03	< 6.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	2.43E-02 ± 4.62E-03	< 5.E-02
09/08/20	09/15/20	9.98E+03	CU.FT.	7.56E-03 ± 3.07E-03	< 5.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	2.82E-02 ± 4.86E-03	< 5.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.12E-02 ± 3.43E-03	< 6.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	1.09E-02 ± 3.47E-03	< 4.E-02
10/06/20	10/13/20	1.00E+04	CU.FT.	2.67E-02 ± 4.52E-03	< 2.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.60E-02 ± 4.22E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	8.36E-03 ± 3.33E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	6.03E-03 ± 3.28E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	1.63E-02 ± 3.92E-03	< 5.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	1.80E-02 ± 3.99E-03	< 6.E-02
11/17/20	11/24/20	9.98E+03	CU.FT.	2.84E-02 ± 4.55E-03	< 3.E-02
11/24/20	12/01/20	1.01E+04	CU.FT.	2.11E-02 ± 4.25E-03	< 7.E-02
12/01/20	12/08/20	1.00E+04	CU.FT.	1.47E-02 ± 3.39E-03	< 4.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.74E-02 ± 3.99E-03	< 6.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.62E-02 ± 3.72E-03	< 6.E-02
12/22/20	12/28/20	8.64E+03	CU.FT.	1.95E-02 ± 4.46E-03	< 6.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 3

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
05/12/20	05/19/20	1.01E+04	CU.FT.	1.18E-02 ± 3.46E-03	< 5.E-02
05/19/20	05/26/20	1.03E+04	CU.FT.	4.44E-03 ± 2.58E-03	< 5.E-02
05/26/20	06/02/20	9.98E+03	CU.FT.	6.76E-03 ± 3.13E-03	< 6.E-02
06/02/20	06/09/20	1.00E+04	CU.FT.	6.10E-03 ± 3.05E-03	< 5.E-02
06/09/20	06/16/20	1.01E+04	CU.FT.	1.81E-02 ± 4.14E-03	< 5.E-02
06/16/20	06/23/20	1.02E+04	CU.FT.	1.14E-02 ± 3.19E-03	< 3.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	1.53E-02 ± 3.90E-03	< 5.E-02
06/30/20	07/07/20	9.86E+03	CU.FT.	2.47E-02 ± 4.73E-03	< 3.E-02
07/07/20	07/14/20	1.02E+04	CU.FT.	2.23E-02 ± 4.36E-03	< 6.E-02
07/14/20	07/21/20	1.03E+04	CU.FT.	1.83E-02 ± 3.82E-03	< 5.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	1.30E-02 ± 3.65E-03	< 7.E-02
07/28/20	08/04/20	1.01E+04	CU.FT.	1.16E-02 ± 3.09E-03	< 5.E-02
08/04/20	08/11/20	9.74E+03	CU.FT.	2.68E-02 ± 4.74E-03	< 2.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.52E-02 ± 3.68E-03	< 5.E-02
08/18/20	08/25/20	1.02E+04	CU.FT.	3.06E-02 ± 4.62E-03	< 4.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	1.22E-02 ± 3.40E-03	< 6.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	2.15E-02 ± 4.43E-03	< 5.E-02
09/08/20	09/15/20	9.91E+03	CU.FT.	6.57E-03 ± 2.98E-03	< 5.E-02
09/15/20	09/22/20	9.92E+03	CU.FT.	3.49E-02 ± 5.32E-03	< 3.E-02
09/22/20	09/29/20	1.00E+04	CU.FT.	1.77E-02 ± 3.98E-03	< 6.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	1.05E-02 ± 3.43E-03	< 4.E-02
10/06/20	10/13/20	1.04E+04	CU.FT.	2.81E-02 ± 4.51E-03	< 4.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.64E-02 ± 4.26E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	2.04E-02 ± 4.31E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	2.10E-02 ± 4.44E-03	< 5.E-02
11/03/20	11/10/20	1.01E+04	CU.FT.	1.96E-02 ± 4.13E-03	< 5.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	2.21E-02 ± 4.30E-03	< 6.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 3

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
11/17/20	11/24/20	1.00E+04	CU.FT.	2.00E-02 ± 3.94E-03	< 6.E-02
11/24/20	12/01/20	1.00E+04	CU.FT.	2.90E-02 ± 4.80E-03	< 7.E-02
12/01/20	12/08/20	1.02E+04	CU.FT.	1.63E-02 ± 3.49E-03	< 5.E-02
12/08/20	12/15/20	1.00E+04	CU.FT.	2.40E-02 ± 4.48E-03	< 6.E-02
12/15/20	12/22/20	9.84E+03	CU.FT.	1.72E-02 ± 3.85E-03	< 6.E-02
12/22/20	12/28/20	8.88E+03	CU.FT.	2.65E-02 ± 4.88E-03	< 6.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 4

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
03/12/20	03/17/20	7.16E+03	CU.FT.	1.07E-02 ± 4.00E-03	< 6.E-02
03/17/20	03/24/20	9.99E+03	CU.FT.	1.08E-02 ± 3.47E-03	< 6.E-02
03/24/20	03/31/20	1.01E+04	CU.FT.	< 4.04E-03	< 5.E-02
03/31/20	04/07/20	1.01E+04	CU.FT.	5.73E-03 ± 2.80E-03	< 6.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	8.83E-03 ± 3.07E-03	< 6.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.05E-02 ± 3.69E-03	< 4.E-02
04/21/20	04/28/20	1.03E+04	CU.FT.	4.51E-03 ± 2.95E-03	< 5.E-02
04/28/20	05/05/20	1.00E+04	CU.FT.	1.60E-02 ± 3.84E-03	< 6.E-02
05/05/20	05/12/20	1.00E+04	CU.FT.	< 3.71E-03	< 3.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	5.59E-03 ± 2.85E-03	< 4.E-02
05/19/20	05/26/20	1.01E+04	CU.FT.	8.61E-03 ± 3.07E-03	< 6.E-02
05/26/20	06/02/20	1.01E+04	CU.FT.	< 3.91E-03	< 6.E-02
06/02/20	06/09/20	1.01E+04	CU.FT.	7.27E-03 ± 3.14E-03	< 5.E-02
06/09/20	06/16/20	9.97E+03	CU.FT.	8.87E-03 ± 3.44E-03	< 3.E-02
06/16/20	06/23/20	1.03E+04	CU.FT.	1.70E-02 ± 3.66E-03	< 3.E-02
06/23/20	06/30/20	1.00E+04	CU.FT.	1.59E-02 ± 3.98E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.90E-02 ± 4.26E-03	< 5.E-02
07/07/20	07/14/20	9.93E+03	CU.FT.	5.58E-03 ± 3.09E-03	< 6.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.95E-02 ± 3.94E-03	< 5.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	1.13E-02 ± 3.50E-03	< 7.E-02
07/28/20	08/04/20	1.01E+04	CU.FT.	5.20E-03 ± 2.40E-03	< 5.E-02
08/04/20	08/11/20	9.96E+03	CU.FT.	9.77E-03 ± 3.34E-03	< 5.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.92E-02 ± 3.98E-03	< 5.E-02
08/18/20	08/25/20	1.00E+04	CU.FT.	2.00E-02 ± 3.91E-03	< 4.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	1.90E-02 ± 3.96E-03	< 6.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	1.10E-02 ± 3.62E-03	< 5.E-02
09/08/20	09/15/20	9.91E+03	CU.FT.	8.51E-03 ± 3.17E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 4

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
09/15/20	09/22/20	1.01E+04	CU.FT.	3.67E-02 ± 5.36E-03	< 5.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.92E-02 ± 4.10E-03	< 6.E-02
09/29/20	10/06/20	9.97E+03	CU.FT.	1.24E-02 ± 3.63E-03	< 3.E-02
10/06/20	10/13/20	1.03E+04	CU.FT.	2.78E-02 ± 4.52E-03	< 4.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.81E-02 ± 4.37E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.44E-02 ± 3.85E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	1.19E-02 ± 3.78E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	2.47E-02 ± 4.51E-03	< 5.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	1.24E-02 ± 3.53E-03	< 6.E-02
11/17/20	11/24/20	9.99E+03	CU.FT.	2.93E-02 ± 4.61E-03	< 6.E-02
11/24/20	12/01/20	9.98E+03	CU.FT.	1.37E-02 ± 3.71E-03	< 3.E-02
12/01/20	12/08/20	1.02E+04	CU.FT.	6.77E-03 ± 2.56E-03	< 5.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	8.57E-03 ± 3.26E-03	< 6.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.58E-02 ± 3.69E-03	< 6.E-02
12/22/20	12/28/20	8.65E+03	CU.FT.	9.40E-03 ± 3.60E-03	< 6.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 5

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
04/29/20	05/05/20	8.60E+03	CU.FT.	1.84E-02 ± 4.46E-03	< 3.E-02
05/05/20	05/12/20	1.01E+04	CU.FT.	< 3.67E-03	< 5.E-02
05/12/20	05/19/20	1.00E+04	CU.FT.	1.44E-02 ± 3.71E-03	< 5.E-02
05/19/20	05/26/20	1.01E+04	CU.FT.	4.68E-03 ± 2.65E-03	< 6.E-02
05/26/20	06/02/20	1.01E+04	CU.FT.	9.94E-03 ± 3.40E-03	< 6.E-02
06/02/20	06/09/20	1.01E+04	CU.FT.	7.74E-03 ± 3.19E-03	< 5.E-02
06/09/20	06/16/20	9.97E+03	CU.FT.	1.48E-02 ± 3.93E-03	< 5.E-02
06/16/20	06/23/20	1.03E+04	CU.FT.	2.15E-02 ± 4.00E-03	< 3.E-02
06/23/20	06/30/20	1.00E+04	CU.FT.	1.61E-02 ± 3.99E-03	< 2.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.65E-02 ± 4.08E-03	< 5.E-02
07/07/20	07/14/20	9.94E+03	CU.FT.	1.70E-02 ± 4.06E-03	< 2.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.35E-02 ± 3.46E-03	< 5.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	1.63E-02 ± 3.92E-03	< 7.E-02
07/28/20	08/04/20	1.01E+04	CU.FT.	1.23E-02 ± 3.16E-03	< 5.E-02
08/04/20	08/11/20	9.97E+03	CU.FT.	1.87E-02 ± 4.09E-03	< 5.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	3.81E-03 ± 2.62E-03	< 5.E-02
08/18/20	08/25/20	1.00E+04	CU.FT.	2.71E-02 ± 4.44E-03	< 4.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	1.53E-02 ± 3.66E-03	< 6.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	8.67E-03 ± 3.42E-03	< 5.E-02
09/08/20	09/15/20	9.87E+03	CU.FT.	3.75E-03 ± 2.70E-03	< 5.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	3.04E-02 ± 4.99E-03	< 5.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.79E-02 ± 4.00E-03	< 6.E-02
09/29/20	10/06/20	9.97E+03	CU.FT.	1.59E-02 ± 3.90E-03	< 4.E-02
10/06/20	10/13/20	1.02E+04	CU.FT.	2.78E-02 ± 4.54E-03	< 4.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.80E-02 ± 4.36E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.32E-02 ± 3.75E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	2.16E-02 ± 4.49E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 5

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
11/03/20	11/10/20	1.01E+04	CU.FT.	1.65E-02 ± 3.90E-03	< 5.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	2.40E-02 ± 4.43E-03	< 6.E-02
11/17/20	11/24/20	9.99E+03	CU.FT.	2.85E-02 ± 4.56E-03	< 6.E-02
11/24/20	12/01/20	9.98E+03	CU.FT.	2.63E-02 ± 4.63E-03	< 7.E-02
12/01/20	12/08/20	1.02E+04	CU.FT.	7.35E-03 ± 2.63E-03	< 5.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	2.05E-02 ± 4.21E-03	< 6.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.86E-02 ± 3.91E-03	< 6.E-02
12/22/20	12/28/20	8.65E+03	CU.FT.	2.80E-02 ± 5.07E-03	< 6.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 6

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
03/12/20	03/17/20	7.14E+03	CU.FT.	< 4.38E-03	< 5.E-02
03/17/20	03/24/20	9.99E+03	CU.FT.	5.32E-03 ± 2.94E-03	< 6.E-02
03/24/20	03/31/20	1.01E+04	CU.FT.	1.23E-02 ± 3.63E-03	< 5.E-02
03/31/20	04/07/20	1.01E+04	CU.FT.	6.34E-03 ± 2.86E-03	< 6.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	1.35E-02 ± 3.49E-03	< 6.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.38E-02 ± 3.95E-03	< 4.E-02
04/21/20	04/28/20	1.03E+04	CU.FT.	1.02E-02 ± 3.47E-03	< 5.E-02
04/28/20	05/05/20	1.00E+04	CU.FT.	< 3.58E-03	< 6.E-02
05/05/20	05/12/20	1.00E+04	CU.FT.	9.46E-03 ± 3.27E-03	< 5.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	4.04E-03 ± 2.67E-03	< 4.E-02
05/19/20	05/26/20	1.01E+04	CU.FT.	< 3.38E-03	< 4.E-02
05/26/20	06/02/20	1.01E+04	CU.FT.	< 3.91E-03	< 4.E-02
06/02/20	06/09/20	1.01E+04	CU.FT.	1.56E-02 ± 3.88E-03	< 5.E-02
06/09/20	06/16/20	9.97E+03	CU.FT.	8.26E-03 ± 3.38E-03	< 5.E-02
06/16/20	06/23/20	1.03E+04	CU.FT.	1.73E-02 ± 3.68E-03	< 5.E-02
06/23/20	06/30/20	1.00E+04	CU.FT.	< 3.99E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.59E-02 ± 4.03E-03	< 5.E-02
07/07/20	07/14/20	9.96E+03	CU.FT.	5.72E-03 ± 3.10E-03	< 4.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.02E-02 ± 3.18E-03	< 5.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	9.26E-03 ± 3.31E-03	< 5.E-02
07/28/20	08/04/20	1.01E+04	CU.FT.	1.31E-02 ± 3.23E-03	< 5.E-02
08/04/20	08/11/20	9.97E+03	CU.FT.	1.84E-02 ± 4.07E-03	< 4.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	4.69E-03 ± 2.72E-03	< 5.E-02
08/18/20	08/25/20	1.00E+04	CU.FT.	9.60E-03 ± 3.00E-03	< 5.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	9.21E-03 ± 3.12E-03	< 4.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	1.92E-02 ± 4.27E-03	< 6.E-02
09/08/20	09/15/20	9.86E+03	CU.FT.	8.55E-03 ± 3.19E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 6

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
09/15/20	09/22/20	1.01E+04	CU.FT.	1.62E-02 ± 4.04E-03	< 6.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.16E-02 ± 3.47E-03	< 2.E-02
09/29/20	10/06/20	9.96E+03	CU.FT.	< 3.95E-03	< 3.E-02
10/06/20	10/13/20	1.03E+04	CU.FT.	2.57E-02 ± 4.38E-03	< 5.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.81E-02 ± 4.37E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.90E-02 ± 4.21E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	2.69E-02 ± 4.83E-03	< 3.E-02
11/03/20	11/10/20	1.01E+04	CU.FT.	1.65E-02 ± 3.90E-03	< 4.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	6.65E-03 ± 2.98E-03	< 5.E-02
11/17/20	11/24/20	9.99E+03	CU.FT.	2.71E-02 ± 4.46E-03	< 6.E-02
11/24/20	12/01/20	9.98E+03	CU.FT.	1.45E-02 ± 3.78E-03	< 5.E-02
12/01/20	12/08/20	1.02E+04	CU.FT.	1.60E-02 ± 3.47E-03	< 6.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.24E-02 ± 3.59E-03	< 5.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.82E-02 ± 3.88E-03	< 6.E-02
12/22/20	12/28/20	8.66E+03	CU.FT.	1.43E-02 ± 4.04E-03	< 7.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 7

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.00E+04	CU.FT.	1.36E-02 ± 3.57E-03	< 4.E-02
01/07/20	01/14/20	1.03E+04	CU.FT.	9.26E-03 ± 3.34E-03	< 5.E-02
01/14/20	01/21/20	9.99E+03	CU.FT.	2.06E-02 ± 4.61E-03	< 4.E-02
01/21/20	01/28/20	9.97E+03	CU.FT.	1.81E-02 ± 4.49E-03	< 5.E-02
01/28/20	02/04/20	1.01E+04	CU.FT.	1.36E-02 ± 3.87E-03	< 4.E-02
02/04/20	02/11/20	1.01E+04	CU.FT.	1.19E-02 ± 3.45E-03	< 5.E-02
02/11/20	02/18/20	9.99E+03	CU.FT.	1.07E-02 ± 3.48E-03	< 5.E-02
02/18/20	02/25/20	1.02E+04	CU.FT.	8.89E-03 ± 3.36E-03	< 5.E-02
02/25/20	03/03/20	9.88E+03	CU.FT.	< 4.04E-03	< 3.E-02
03/03/20	03/10/20	1.01E+04	CU.FT.	8.76E-03 ± 3.04E-03	< 6.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	1.20E-02 ± 3.27E-03	< 6.E-02
03/17/20	03/24/20	9.98E+03	CU.FT.	1.08E-02 ± 3.47E-03	< 4.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	1.08E-02 ± 3.54E-03	< 3.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	5.49E-03 ± 2.79E-03	< 3.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	1.02E-02 ± 3.20E-03	< 3.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	8.54E-03 ± 3.53E-03	< 4.E-02
04/21/20	04/28/20	1.02E+04	CU.FT.	8.67E-03 ± 3.36E-03	< 5.E-02
04/28/20	05/05/20	9.96E+03	CU.FT.	7.25E-03 ± 3.06E-03	< 4.E-02
05/05/20	05/12/20	1.01E+04	CU.FT.	7.17E-03 ± 3.03E-03	< 5.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	1.26E-02 ± 3.53E-03	< 4.E-02
05/19/20	05/26/20	9.99E+03	CU.FT.	6.57E-03 ± 2.88E-03	< 4.E-02
05/26/20	06/02/20	1.01E+04	CU.FT.	5.04E-03 ± 2.94E-03	< 5.E-02
06/02/20	06/09/20	9.99E+03	CU.FT.	1.81E-02 ± 4.10E-03	< 5.E-02
06/09/20	06/16/20	1.00E+04	CU.FT.	1.27E-02 ± 3.75E-03	< 5.E-02
06/16/20	06/23/20	1.01E+04	CU.FT.	1.67E-02 ± 3.68E-03	< 3.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	7.43E-03 ± 3.22E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	5.59E-03 ± 3.14E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 7

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	1.06E-02 ± 3.53E-03	< 7.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.43E-02 ± 3.53E-03	< 5.E-02
07/21/20	07/28/20	1.01E+04	CU.FT.	1.69E-02 ± 3.94E-03	< 5.E-02
07/28/20	08/04/20	9.98E+03	CU.FT.	1.16E-02 ± 3.11E-03	< 5.E-02
08/04/20	08/11/20	1.00E+04	CU.FT.	1.85E-02 ± 4.07E-03	< 4.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	2.04E-02 ± 4.07E-03	< 5.E-02
08/18/20	08/25/20	1.01E+04	CU.FT.	2.35E-02 ± 4.16E-03	< 5.E-02
08/25/20	09/01/20	1.00E+04	CU.FT.	1.10E-02 ± 3.31E-03	< 2.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	1.97E-02 ± 4.30E-03	< 6.E-02
09/08/20	09/15/20	9.98E+03	CU.FT.	9.48E-03 ± 3.25E-03	< 5.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	1.06E-02 ± 3.60E-03	< 6.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.15E-02 ± 3.46E-03	< 5.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	6.50E-03 ± 3.07E-03	< 5.E-02
10/06/20	10/13/20	1.00E+04	CU.FT.	2.38E-02 ± 4.33E-03	< 5.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.31E-02 ± 4.01E-03	< 2.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.08E-02 ± 3.56E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	9.96E-03 ± 3.62E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	1.42E-02 ± 3.75E-03	< 4.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	1.22E-02 ± 3.52E-03	< 2.E-02
11/17/20	11/24/20	9.98E+03	CU.FT.	2.00E-02 ± 3.95E-03	< 6.E-02
11/24/20	12/01/20	1.01E+04	CU.FT.	1.78E-02 ± 4.00E-03	< 5.E-02
12/01/20	12/08/20	1.01E+04	CU.FT.	1.05E-02 ± 2.99E-03	< 6.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.71E-02 ± 3.96E-03	< 5.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	2.04E-02 ± 4.05E-03	< 6.E-02
12/22/20	12/28/20	8.64E+03	CU.FT.	1.15E-02 ± 3.80E-03	< 3.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 8

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.03E+04	CU.FT.	7.82E-03 ± 2.98E-03	< 4.E-02
01/07/20	01/14/20	1.01E+04	CU.FT.	1.21E-02 ± 3.64E-03	< 5.E-02
01/14/20	01/21/20	9.97E+03	CU.FT.	1.07E-02 ± 3.88E-03	< 4.E-02
01/21/20	01/28/20	9.97E+03	CU.FT.	1.72E-02 ± 4.42E-03	< 5.E-02
01/28/20	02/04/20	1.02E+04	CU.FT.	1.56E-02 ± 4.00E-03	< 4.E-02
02/04/20	02/11/20	1.00E+04	CU.FT.	1.11E-02 ± 3.41E-03	< 6.E-02
02/11/20	02/18/20	9.99E+03	CU.FT.	1.38E-02 ± 3.73E-03	< 5.E-02
02/18/20	02/25/20	1.02E+04	CU.FT.	7.81E-03 ± 3.26E-03	< 5.E-02
02/25/20	03/03/20	9.99E+03	CU.FT.	< 3.99E-03	< 3.E-02
03/03/20	03/10/20	9.97E+03	CU.FT.	< 3.36E-03	< 6.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	1.34E-02 ± 3.39E-03	< 6.E-02
03/17/20	03/24/20	9.98E+03	CU.FT.	< 3.79E-03	< 4.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	< 4.08E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	1.55E-02 ± 3.73E-03	< 6.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	1.27E-02 ± 3.43E-03	< 5.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.53E-02 ± 4.06E-03	< 6.E-02
04/21/20	04/28/20	1.02E+04	CU.FT.	< 4.11E-03	< 5.E-02
04/28/20	05/05/20	9.97E+03	CU.FT.	5.35E-03 ± 2.85E-03	< 4.E-02
05/05/20	05/12/20	1.01E+04	CU.FT.	5.27E-03 ± 2.84E-03	< 5.E-02
05/12/20	05/19/20	1.01E+04	CU.FT.	7.61E-03 ± 3.06E-03	< 4.E-02
05/19/20	05/26/20	1.04E+04	CU.FT.	7.77E-03 ± 2.92E-03	< 4.E-02
05/26/20	06/02/20	9.75E+03	CU.FT.	< 4.05E-03	< 3.E-02
06/02/20	06/09/20	9.99E+03	CU.FT.	1.28E-02 ± 3.68E-03	< 5.E-02
06/09/20	06/16/20	1.00E+04	CU.FT.	1.17E-02 ± 3.67E-03	< 5.E-02
06/16/20	06/23/20	1.01E+04	CU.FT.	1.48E-02 ± 3.52E-03	< 5.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	1.25E-02 ± 3.68E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	8.86E-03 ± 3.45E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 8

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	1.24E-02 ± 3.68E-03	< 7.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	7.02E-03 ± 2.87E-03	< 5.E-02
07/21/20	07/28/20	1.00E+04	CU.FT.	9.10E-03 ± 3.29E-03	< 3.E-02
07/28/20	08/03/20	8.42E+03	CU.FT.	1.19E-02 ± 3.51E-03	< 4.E-02
08/04/20	08/11/20	9.85E+03	CU.FT.	1.34E-02 ± 3.69E-03	< 4.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	9.37E-03 ± 3.18E-03	< 5.E-02
08/18/20	08/25/20	1.01E+04	CU.FT.	2.44E-02 ± 4.22E-03	< 5.E-02
08/25/20	09/01/20	1.00E+04	CU.FT.	1.56E-02 ± 3.71E-03	< 4.E-02
09/01/20	09/08/20	1.02E+04	CU.FT.	1.16E-02 ± 3.65E-03	< 6.E-02
09/08/20	09/15/20	9.97E+03	CU.FT.	6.67E-03 ± 2.98E-03	< 5.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	1.63E-02 ± 4.05E-03	< 6.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.34E-02 ± 3.63E-03	< 5.E-02
09/29/20	10/06/20	1.03E+04	CU.FT.	1.36E-02 ± 3.64E-03	< 5.E-02
10/06/20	10/13/20	9.87E+03	CU.FT.	2.98E-02 ± 4.76E-03	< 3.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.36E-02 ± 4.05E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	7.27E-03 ± 3.23E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	9.05E-03 ± 3.54E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	2.26E-02 ± 4.37E-03	< 4.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	8.36E-03 ± 3.16E-03	< 5.E-02
11/17/20	11/24/20	9.98E+03	CU.FT.	9.16E-03 ± 2.99E-03	< 6.E-02
11/24/20	12/01/20	1.01E+04	CU.FT.	2.19E-02 ± 4.30E-03	< 5.E-02
12/01/20	12/08/20	1.01E+04	CU.FT.	1.63E-02 ± 3.52E-03	< 6.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.86E-02 ± 4.07E-03	< 5.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.07E-02 ± 3.25E-03	< 6.E-02
12/22/20	12/28/20	8.64E+03	CU.FT.	1.66E-02 ± 4.23E-03	< 7.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 9

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.03E+04	CU.FT.	4.20E-03 ± 2.61E-03	< 4.E-02
01/07/20	01/14/20	1.01E+04	CU.FT.	1.78E-02 ± 4.09E-03	< 5.E-02
01/14/20	01/21/20	9.86E+03	CU.FT.	7.96E-03 ± 3.69E-03	< 4.E-02
01/21/20	01/28/20	9.98E+03	CU.FT.	1.24E-02 ± 4.06E-03	< 4.E-02
01/28/20	02/04/20	1.02E+04	CU.FT.	< 4.16E-03	< 4.E-02
02/04/20	02/11/20	9.98E+03	CU.FT.	4.27E-03 ± 2.73E-03	< 6.E-02
02/11/20	02/18/20	9.84E+03	CU.FT.	4.51E-03 ± 2.94E-03	< 4.E-02
02/18/20	02/25/20	1.03E+04	CU.FT.	1.46E-02 ± 3.81E-03	< 4.E-02
02/25/20	03/03/20	9.97E+03	CU.FT.	< 4.00E-03	< 3.E-02
03/03/20	03/10/20	9.92E+03	CU.FT.	6.20E-03 ± 2.82E-03	< 6.E-02
03/10/20	03/17/20	1.03E+04	CU.FT.	4.52E-03 ± 2.45E-03	< 3.E-02
03/17/20	03/24/20	9.99E+03	CU.FT.	1.44E-02 ± 3.78E-03	< 3.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	5.47E-03 ± 3.06E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	1.02E-02 ± 3.27E-03	< 6.E-02
04/07/20	04/14/20	1.01E+04	CU.FT.	9.01E-03 ± 3.06E-03	< 5.E-02
04/14/20	04/21/20	9.90E+03	CU.FT.	5.30E-03 ± 3.27E-03	< 3.E-02
04/21/20	04/28/20	1.01E+04	CU.FT.	9.05E-03 ± 3.42E-03	< 5.E-02
04/28/20	05/05/20	1.02E+04	CU.FT.	6.46E-03 ± 2.92E-03	< 2.E-02
05/05/20	05/12/20	9.97E+03	CU.FT.	4.45E-03 ± 2.78E-03	< 3.E-02
05/12/20	05/19/20	1.00E+04	CU.FT.	8.16E-03 ± 3.14E-03	< 3.E-02
05/19/20	05/26/20	1.03E+04	CU.FT.	< 3.31E-03	< 4.E-02
05/26/20	06/02/20	9.97E+03	CU.FT.	6.01E-03 ± 3.06E-03	< 5.E-02
06/02/20	06/09/20	1.02E+04	CU.FT.	7.51E-03 ± 3.14E-03	< 5.E-02
06/09/20	06/16/20	9.96E+03	CU.FT.	6.74E-03 ± 3.24E-03	< 3.E-02
06/16/20	06/23/20	1.02E+04	CU.FT.	9.71E-03 ± 3.03E-03	< 5.E-02
06/23/20	06/30/20	9.90E+03	CU.FT.	1.39E-02 ± 3.84E-03	< 3.E-02
06/23/20	07/07/20	1.01E+04	CU.FT.	1.71E-02 ± 4.12E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 9

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	1.83E-02 ± 4.13E-03	< 7.E-02
07/14/20	07/21/20	1.02E+04	CU.FT.	1.49E-02 ± 3.58E-03	< 5.E-02
07/21/20	07/28/20	1.01E+04	CU.FT.	1.57E-02 ± 3.84E-03	< 5.E-02
07/28/20	08/04/20	1.02E+04	CU.FT.	4.71E-03 ± 2.32E-03	< 5.E-02
08/04/20	08/11/20	9.85E+03	CU.FT.	2.53E-02 ± 4.61E-03	< 3.E-02
08/11/20	08/18/20	1.03E+04	CU.FT.	1.44E-02 ± 3.56E-03	< 5.E-02
08/18/20	08/25/20	9.86E+03	CU.FT.	2.19E-02 ± 4.10E-03	< 3.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	1.86E-02 ± 3.93E-03	< 4.E-02
09/01/20	09/08/20	1.03E+04	CU.FT.	9.10E-03 ± 3.41E-03	< 6.E-02
09/08/20	09/15/20	9.84E+03	CU.FT.	5.71E-03 ± 2.91E-03	< 5.E-02
09/15/20	09/22/20	1.00E+04	CU.FT.	2.14E-02 ± 4.44E-03	< 3.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.93E-02 ± 4.11E-03	< 5.E-02
09/29/20	10/06/20	1.03E+04	CU.FT.	1.16E-02 ± 3.48E-03	< 5.E-02
10/06/20	10/13/20	9.92E+03	CU.FT.	2.93E-02 ± 4.72E-03	< 5.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.24E-02 ± 3.96E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.87E-02 ± 4.19E-03	< 5.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	1.37E-02 ± 3.92E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	1.08E-02 ± 3.47E-03	< 4.E-02
11/10/20	11/17/20	1.01E+04	CU.FT.	1.42E-02 ± 3.69E-03	< 5.E-02
11/17/20	11/24/20	9.98E+03	CU.FT.	2.81E-02 ± 4.53E-03	< 6.E-02
11/24/20	11/29/20	7.75E+03	CU.FT.	1.38E-02 ± 4.45E-03	< 5.E-02
12/02/20	12/08/20	8.66E+03	CU.FT.	1.58E-02 ± 3.81E-03	< 3.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.52E-02 ± 3.82E-03	< 5.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	1.44E-02 ± 3.58E-03	< 6.E-02
12/22/20	12/28/20	8.65E+03	CU.FT.	1.28E-02 ± 3.91E-03	< 7.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 10

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	9.94E+03	CU.FT.	1.13E-02 ± 3.38E-03	< 4.E-02
01/07/20	01/14/20	1.03E+04	CU.FT.	5.61E-03 ± 2.99E-03	< 6.E-02
01/14/20	01/21/20	1.00E+04	CU.FT.	2.50E-02 ± 4.89E-03	< 5.E-02
01/21/20	01/28/20	9.97E+03	CU.FT.	1.92E-02 ± 4.56E-03	< 5.E-02
01/28/20	02/04/20	1.00E+04	CU.FT.	1.39E-02 ± 3.92E-03	< 5.E-02
02/04/20	02/11/20	1.01E+04	CU.FT.	1.15E-02 ± 3.41E-03	< 5.E-02
02/11/20	02/18/20	1.00E+04	CU.FT.	4.88E-03 ± 2.94E-03	< 5.E-02
02/18/20	02/25/20	1.02E+04	CU.FT.	1.82E-02 ± 4.12E-03	< 5.E-02
02/25/20	03/03/20	9.85E+03	CU.FT.	1.03E-02 ± 3.55E-03	< 3.E-02
03/03/20	03/10/20	1.01E+04	CU.FT.	6.68E-03 ± 2.83E-03	< 6.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	6.83E-03 ± 2.76E-03	< 6.E-02
03/17/20	03/24/20	9.99E+03	CU.FT.	4.85E-03 ± 2.88E-03	< 4.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	7.54E-03 ± 3.25E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	5.49E-03 ± 2.79E-03	< 6.E-02
04/07/20	04/14/20	9.97E+03	CU.FT.	1.00E-02 ± 3.18E-03	< 5.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.17E-02 ± 3.79E-03	< 6.E-02
04/21/20	04/28/20	1.03E+04	CU.FT.	9.60E-03 ± 3.42E-03	< 3.E-02
04/28/20	05/05/20	9.91E+03	CU.FT.	1.52E-02 ± 3.80E-03	< 4.E-02
05/05/20	05/12/20	1.02E+04	CU.FT.	4.78E-03 ± 2.77E-03	< 5.E-02
05/12/20	05/19/20	1.00E+04	CU.FT.	3.92E-03 ± 2.68E-03	< 4.E-02
05/19/20	05/26/20	9.93E+03	CU.FT.	6.15E-03 ± 2.85E-03	< 2.E-02
05/26/20	06/02/20	1.02E+04	CU.FT.	6.32E-03 ± 3.04E-03	< 4.E-02
06/02/20	06/09/20	9.92E+03	CU.FT.	2.21E-02 ± 4.41E-03	< 3.E-02
06/09/20	06/16/20	1.00E+04	CU.FT.	1.72E-02 ± 4.10E-03	< 5.E-02
06/16/20	06/23/20	1.01E+04	CU.FT.	1.81E-02 ± 3.79E-03	< 5.E-02
06/23/20	06/30/20	1.02E+04	CU.FT.	1.36E-02 ± 3.74E-03	< 5.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.86E-02 ± 4.24E-03	< 4.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 10

COLL START DATE	COLL STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	1.00E+04	CU.FT.	1.54E-02 ± 3.95E-03	< 7.E-02
07/14/20	07/21/20	1.01E+04	CU.FT.	1.46E-02 ± 3.58E-03	< 3.E-02
07/21/20	07/28/20	1.03E+04	CU.FT.	1.08E-02 ± 3.38E-03	< 5.E-02
07/28/20	08/04/20	1.01E+04	CU.FT.	8.76E-03 ± 2.80E-03	< 5.E-02
08/04/20	08/11/20	9.90E+03	CU.FT.	2.28E-02 ± 4.42E-03	< 4.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.27E-02 ± 3.48E-03	< 2.E-02
08/18/20	08/25/20	9.99E+03	CU.FT.	2.01E-02 ± 3.93E-03	< 5.E-02
08/25/20	09/01/20	1.01E+04	CU.FT.	2.58E-02 ± 4.45E-03	< 4.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	2.12E-02 ± 4.41E-03	< 3.E-02
09/08/20	09/15/20	1.00E+04	CU.FT.	6.21E-03 ± 2.93E-03	< 2.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	3.19E-02 ± 5.08E-03	< 6.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.37E-02 ± 3.65E-03	< 5.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	1.06E-02 ± 3.45E-03	< 5.E-02
10/06/20	10/13/20	1.01E+04	CU.FT.	2.58E-02 ± 4.44E-03	< 5.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	1.60E-02 ± 4.22E-03	< 5.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	2.12E-02 ± 4.37E-03	< 2.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	2.14E-02 ± 4.48E-03	< 5.E-02
11/03/20	11/10/20	1.00E+04	CU.FT.	2.23E-02 ± 4.35E-03	< 2.E-02
11/10/20	11/17/20	1.02E+04	CU.FT.	1.95E-02 ± 4.08E-03	< 5.E-02
11/17/20	11/24/20	9.92E+03	CU.FT.	2.96E-02 ± 4.65E-03	< 3.E-02
11/24/20	12/01/20	1.00E+04	CU.FT.	2.42E-02 ± 4.49E-03	< 5.E-02
12/01/20	12/08/20	1.01E+04	CU.FT.	1.77E-02 ± 3.63E-03	< 6.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	2.33E-02 ± 4.40E-03	< 3.E-02
12/15/20	12/22/20	1.00E+04	CU.FT.	2.03E-02 ± 4.04E-03	< 5.E-02
12/22/20	12/28/20	8.64E+03	CU.FT.	1.95E-02 ± 4.46E-03	< 7.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 111

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	1.01E+04	CU.FT.	7.53E-03 ± 3.00E-03	< 3.E-02
01/07/20	01/14/20	1.03E+04	CU.FT.	1.67E-02 ± 3.96E-03	< 6.E-02
01/14/20	01/21/20	1.00E+04	CU.FT.	9.26E-03 ± 3.75E-03	< 5.E-02
01/21/20	01/28/20	9.98E+03	CU.FT.	< 4.86E-03	< 5.E-02
01/28/20	02/04/20	1.00E+04	CU.FT.	4.85E-03 ± 3.11E-03	< 4.E-02
02/04/20	02/11/20	1.02E+04	CU.FT.	1.22E-02 ± 3.46E-03	< 5.E-02
02/11/20	02/18/20	1.00E+04	CU.FT.	< 3.96E-03	< 5.E-02
02/18/20	02/25/20	1.02E+04	CU.FT.	9.04E-03 ± 3.37E-03	< 5.E-02
02/25/20	03/03/20	9.82E+03	CU.FT.	7.48E-03 ± 3.29E-03	< 3.E-02
03/03/20	03/10/20	1.02E+04	CU.FT.	3.82E-03 ± 2.50E-03	< 3.E-02
03/10/20	03/17/20	1.01E+04	CU.FT.	1.26E-02 ± 3.32E-03	< 6.E-02
03/17/20	03/24/20	9.94E+03	CU.FT.	6.76E-03 ± 3.10E-03	< 4.E-02
03/24/20	03/31/20	1.00E+04	CU.FT.	4.73E-03 ± 2.99E-03	< 5.E-02
03/31/20	04/07/20	1.00E+04	CU.FT.	1.45E-02 ± 3.64E-03	< 6.E-02
04/07/20	04/14/20	9.96E+03	CU.FT.	3.89E-03 ± 2.54E-03	< 5.E-02
04/14/20	04/21/20	1.00E+04	CU.FT.	1.11E-02 ± 3.74E-03	< 6.E-02
04/21/20	04/28/20	1.03E+04	CU.FT.	6.25E-03 ± 3.12E-03	< 5.E-02
04/28/20	05/05/20	9.91E+03	CU.FT.	4.28E-03 ± 2.74E-03	< 4.E-02
05/05/20	05/12/20	1.02E+04	CU.FT.	7.68E-03 ± 3.05E-03	< 5.E-02
05/12/20	05/19/20	1.00E+04	CU.FT.	7.69E-03 ± 3.09E-03	< 3.E-02
05/19/20	05/26/20	9.97E+03	CU.FT.	7.80E-03 ± 3.01E-03	< 3.E-02
05/26/20	06/02/20	1.02E+04	CU.FT.	< 3.87E-03	< 2.E-02
06/02/20	06/09/20	1.01E+04	CU.FT.	1.28E-02 ± 3.65E-03	< 4.E-02
06/09/20	06/16/20	9.90E+03	CU.FT.	1.03E-02 ± 3.58E-03	< 3.E-02
06/16/20	06/23/20	1.03E+04	CU.FT.	8.88E-03 ± 2.93E-03	< 2.E-02
06/23/20	06/30/20	1.01E+04	CU.FT.	1.58E-02 ± 3.94E-03	< 3.E-02
06/30/20	07/07/20	1.01E+04	CU.FT.	1.90E-02 ± 4.26E-03	< 4.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER 111

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/07/20	07/14/20	9.90E+03	CU.FT.	5.73E-03 ± 3.16E-03	< 2.E-02
07/14/20	07/21/20	1.01E+04	CU.FT.	1.15E-02 ± 3.32E-03	< 3.E-02
07/21/20	07/28/20	7.50E+03	CU.FT.	9.21E-03 ± 4.10E-03	< 5.E-02
07/28/20	08/04/20	1.00E+04	CU.FT.	4.50E-03 ± 2.32E-03	< 4.E-02
08/04/20	08/11/20	1.00E+04	CU.FT.	1.54E-02 ± 3.82E-03	< 3.E-02
08/11/20	08/18/20	1.01E+04	CU.FT.	1.17E-02 ± 3.39E-03	< 4.E-02
08/18/20	08/25/20	1.01E+04	CU.FT.	2.10E-02 ± 3.97E-03	< 5.E-02
08/25/20	09/01/20	1.00E+04	CU.FT.	1.95E-02 ± 4.02E-03	< 4.E-02
09/01/20	09/08/20	1.01E+04	CU.FT.	1.76E-02 ± 4.15E-03	< 4.E-02
09/08/20	09/15/20	9.91E+03	CU.FT.	7.46E-03 ± 3.07E-03	< 4.E-02
09/15/20	09/22/20	1.01E+04	CU.FT.	1.03E-02 ± 3.57E-03	< 3.E-02
09/22/20	09/29/20	9.98E+03	CU.FT.	1.90E-02 ± 4.09E-03	< 5.E-02
09/29/20	10/06/20	1.01E+04	CU.FT.	1.08E-02 ± 3.46E-03	< 4.E-02
10/06/20	10/13/20	1.02E+04	CU.FT.	1.62E-02 ± 3.72E-03	< 4.E-02
10/13/20	10/20/20	1.01E+04	CU.FT.	9.50E-03 ± 3.73E-03	< 4.E-02
10/20/20	10/27/20	1.01E+04	CU.FT.	1.15E-02 ± 3.61E-03	< 7.E-02
10/27/20	11/03/20	1.01E+04	CU.FT.	1.09E-02 ± 3.70E-03	< 4.E-02
11/03/20	11/10/20	1.01E+04	CU.FT.	2.18E-02 ± 4.29E-03	< 3.E-02
11/10/20	11/17/20	9.98E+03	CU.FT.	1.02E-02 ± 3.36E-03	< 2.E-02
11/17/20	11/24/20	1.00E+04	CU.FT.	1.74E-02 ± 3.73E-03	< 3.E-02
11/24/20	12/01/20	1.00E+04	CU.FT.	2.00E-02 ± 4.19E-03	< 2.E-02
12/01/20	12/08/20	1.01E+04	CU.FT.	1.40E-02 ± 3.31E-03	< 3.E-02
12/08/20	12/15/20	1.01E+04	CU.FT.	1.00E-02 ± 3.39E-03	< 4.E-02
12/15/20	12/22/20	9.91E+03	CU.FT.	1.94E-02 ± 3.99E-03	< 2.E-02
12/22/20	12/28/20	8.65E+03	CU.FT.	1.81E-02 ± 4.35E-03	< 5.E-02

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 1

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	5.00E-02 ± 2.53E-02	7.67E-02 ± 3.38E-02	8.68E-02 ± 3.80E-02	1.07E-01 ± 3.92E-02
K-40	< 4.E-02	< 4.E-02	< 5.E-02	< 6.E-02
MN-54	< 2.E-03	< 3.E-03	< 3.E-03	< 4.E-03
CO-58	< 5.E-03	< 4.E-03	< 4.E-03	< 6.E-03
FE-59	< 1.E-02	< 1.E-02	< 1.E-02	< 2.E-02
CO-60	< 3.E-03	< 3.E-03	< 3.E-03	< 5.E-03
ZN-65	< 7.E-03	< 8.E-03	< 8.E-03	< 1.E-02
ZR-95	< 8.E-03	< 7.E-03	< 8.E-03	< 1.E-02
RU-103	< 8.E-03	< 5.E-03	< 6.E-03	< 1.E-02
RU-106	< 2.E-02	< 2.E-02	< 2.E-02	< 3.E-02
I-131	< 6.E-01	< 4.E-01	< 6.E-01	< 9.E-01
CS-134	< 3.E-03	< 2.E-03	< 2.E-03	< 4.E-03
CS-137	< 2.E-03	< 2.E-03	< 2.E-03	< 4.E-03
BA-140	< 3.E-01	< 2.E-01	< 3.E-01	< 4.E-01
LA-140	< 1.E-01	< 7.E-02	< 1.E-01	< 2.E-01
CE-141	< 1.E-02	< 8.E-03	< 9.E-03	< 1.E-02
CE-144	< 1.E-02	< 1.E-02	< 1.E-02	< 2.E-02
RA-226	< 4.E-02	< 4.E-02	< 4.E-02	< 5.E-02
TH-228	< 4.E-03	< 4.E-03	< 4.E-03	< 5.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 2

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	5.46E-02 ± 3.14E-02	9.57E-02 ± 2.64E-02	1.02E-01 ± 2.83E-02	6.93E-02 ± 2.32E-02
K-40	< 5.E-02	< 3.E-02	< 3.E-02	< 3.E-02
MN-54	< 3.E-03	< 3.E-03	< 1.E-03	< 2.E-03
CO-58	< 4.E-03	< 3.E-03	< 3.E-03	< 3.E-03
FE-59	< 1.E-02	< 9.E-03	< 1.E-02	< 5.E-03
CO-60	< 2.E-03	< 3.E-03	< 3.E-03	< 3.E-03
ZN-65	< 6.E-03	< 7.E-03	< 5.E-03	< 6.E-03
ZR-95	< 8.E-03	< 5.E-03	< 6.E-03	< 7.E-03
RU-103	< 8.E-03	< 5.E-03	< 4.E-03	< 4.E-03
RU-106	< 2.E-02	< 2.E-02	< 2.E-02	< 2.E-02
I-131	< 6.E-01	< 3.E-01	< 4.E-01	< 5.E-01
CS-134	< 3.E-03	< 2.E-03	< 2.E-03	< 2.E-03
CS-137	< 2.E-03	< 2.E-03	< 1.E-03	< 2.E-03
BA-140	< 3.E-01	< 2.E-01	< 2.E-01	< 2.E-01
LA-140	< 1.E-01	< 5.E-02	< 1.E-01	< 7.E-02
CE-141	< 1.E-02	< 6.E-03	< 6.E-03	< 8.E-03
CE-144	< 1.E-02	< 9.E-03	< 7.E-03	< 9.E-03
RA-226	< 4.E-02	< 3.E-02	< 3.E-02	< 3.E-02
TH-228	< 4.E-03	< 3.E-03	< 2.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 3

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:	(a)			
BE-7		1.43E-01 ± 4.69E-02	1.19E-01 ± 4.33E-02	1.34E-01 ± 3.41E-02
K-40		< 6.E-02	< 5.E-02	< 3.E-02
MN-54		< 3.E-03	< 3.E-03	< 3.E-03
CO-58		< 5.E-03	< 4.E-03	< 4.E-03
FE-59		< 2.E-02	< 1.E-02	< 1.E-02
CO-60		< 3.E-03	< 3.E-03	< 2.E-03
ZN-65		< 1.E-02	< 7.E-03	< 5.E-03
ZR-95		< 1.E-02	< 8.E-03	< 7.E-03
RU-103		< 8.E-03	< 6.E-03	< 6.E-03
RU-106		< 3.E-02	< 2.E-02	< 2.E-02
I-131		< 6.E-01	< 5.E-01	< 5.E-01
CS-134		< 4.E-03	< 2.E-03	< 2.E-03
CS-137		< 3.E-03	< 2.E-03	< 2.E-03
BA-140		< 3.E-01	< 2.E-01	< 2.E-01
LA-140		< 1.E-01	< 1.E-01	< 6.E-02
CE-141		< 9.E-03	< 9.E-03	< 9.E-03
CE-144		< 1.E-02	< 1.E-02	< 1.E-02
RA-226		< 5.E-02	< 4.E-02	< 4.E-02
TH-228		< 4.E-03	< 4.E-03	< 3.E-03

(a) Due to Missouri River flooding, samples were not able to be obtained.

VII-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 4

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	1.55E-01 ± 7.90E-02	5.62E-02 ± 3.43E-02	1.35E-01 ± 5.04E-02	1.02E-01 ± 3.10E-02
K-40	< 1.E-01	< 4.E-02	< 6.E-02	< 6.E-02
MN-54	< 1.E-02	< 3.E-03	< 4.E-03	< 2.E-03
CO-58	< 1.E-02	< 4.E-03	< 5.E-03	< 5.E-03
FE-59	< 4.E-02	< 1.E-02	< 1.E-02	< 2.E-02
CO-60	< 1.E-02	< 2.E-03	< 3.E-03	< 3.E-03
ZN-65	< 2.E-02	< 6.E-03	< 9.E-03	< 9.E-03
ZR-95	< 3.E-02	< 6.E-03	< 1.E-02	< 9.E-03
RU-103	< 2.E-02	< 7.E-03	< 9.E-03	< 8.E-03
RU-106	< 7.E-02	< 2.E-02	< 4.E-02	< 2.E-02
I-131	< 2.E+00	< 4.E-01	< 8.E-01	< 6.E-01
CS-134	< 9.E-03	< 3.E-03	< 4.E-03	< 3.E-03
CS-137	< 9.E-03	< 2.E-03	< 3.E-03	< 2.E-03
BA-140	< 6.E-01	< 2.E-01	< 3.E-01	< 4.E-01
LA-140	< 5.E-01	< 8.E-02	< 2.E-01	< 9.E-02
CE-141	< 3.E-02	< 7.E-03	< 1.E-02	< 9.E-03
CE-144	< 4.E-02	< 1.E-02	< 1.E-02	< 1.E-02
RA-226	< 1.E-01	< 4.E-02	< 5.E-02	< 4.E-02
TH-228	< 1.E-02	< 4.E-03	< 4.E-03	< 4.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 5

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:	(a)			
BE-7		9.14E-02 ± 5.06E-02	1.03E-01 ± 3.19E-02	8.29E-02 ± 2.44E-02
K-40		< 9.E-02	< 3.E-02	< 2.E-02
MN-54		< 5.E-03	< 2.E-03	< 2.E-03
CO-58		< 8.E-03	< 3.E-03	< 3.E-03
FE-59		< 3.E-02	< 1.E-02	< 1.E-02
CO-60		< 7.E-03	< 2.E-03	< 3.E-03
ZN-65		< 2.E-02	< 5.E-03	< 5.E-03
ZR-95		< 2.E-02	< 8.E-03	< 5.E-03
RU-103		< 1.E-02	< 5.E-03	< 4.E-03
RU-106		< 4.E-02	< 2.E-02	< 2.E-02
I-131		< 8.E-01	< 4.E-01	< 4.E-01
CS-134		< 5.E-03	< 2.E-03	< 2.E-03
CS-137		< 5.E-03	< 2.E-03	< 2.E-03
BA-140		< 4.E-01	< 2.E-01	< 2.E-01
LA-140		< 2.E-01	< 1.E-01	< 7.E-02
CE-141		< 2.E-02	< 7.E-03	< 6.E-03
CE-144		< 2.E-02	< 9.E-03	< 8.E-03
RA-226		< 7.E-02	< 3.E-02	< 3.E-02
TH-228		< 7.E-03	< 3.E-03	< 3.E-03

(a) Due to Missouri River flooding, samples were not able to be obtained.

VII-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 6

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	1.44E-01 ± 8.71E-02	9.73E-02 ± 2.37E-02	8.08E-02 ± 3.67E-02	9.38E-02 ± 4.98E-02
K-40	< 1.E-01	< 3.E-02	< 4.E-02	< 5.E-02
MN-54	< 8.E-03	< 2.E-03	< 2.E-03	< 5.E-03
CO-58	< 1.E-02	< 2.E-03	< 3.E-03	< 8.E-03
FE-59	< 4.E-02	< 8.E-03	< 1.E-02	< 2.E-02
CO-60	< 6.E-03	< 2.E-03	< 2.E-03	< 5.E-03
ZN-65	< 2.E-02	< 4.E-03	< 7.E-03	< 2.E-02
ZR-95	< 3.E-02	< 5.E-03	< 7.E-03	< 1.E-02
RU-103	< 2.E-02	< 4.E-03	< 5.E-03	< 9.E-03
RU-106	< 7.E-02	< 1.E-02	< 2.E-02	< 4.E-02
I-131	< 2.E+00	< 3.E-01	< 4.E-01	< 9.E-01
CS-134	< 8.E-03	< 2.E-03	< 2.E-03	< 4.E-03
CS-137	< 7.E-03	< 2.E-03	< 2.E-03	< 4.E-03
BA-140	< 7.E-01	< 2.E-01	< 2.E-01	< 4.E-01
LA-140	< 3.E-01	< 5.E-02	< 5.E-02	< 2.E-01
CE-141	< 2.E-02	< 6.E-03	< 8.E-03	< 1.E-02
CE-144	< 3.E-02	< 9.E-03	< 9.E-03	< 2.E-02
RA-226	< 9.E-02	< 3.E-02	< 3.E-02	< 5.E-02
TH-228	< 8.E-03	< 2.E-03	< 3.E-03	< 6.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 7

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	7.44E-02 ± 3.59E-02	9.24E-02 ± 3.85E-02	7.68E-02 ± 3.10.E-02	6.74E-02 ± 4.00E-02
K-40	< 6.E-02	< 3.E-02	< 4.E-02	< 5.E-02
MN-54	< 4.E-03	< 2.E-03	< 3.E-03	< 2.E-03
CO-58	< 6.E-03	< 3.E-03	< 4.E-03	< 5.E-03
FE-59	< 1.E-02	< 9.E-03	< 1.E-02	< 2.E-02
CO-60	< 4.E-03	< 3.E-03	< 3.E-03	< 3.E-03
ZN-65	< 1.E-02	< 4.E-03	< 7.E-03	< 6.E-03
ZR-95	< 1.E-02	< 6.E-03	< 7.E-03	< 7.E-03
RU-103	< 9.E-03	< 4.E-03	< 7.E-03	< 8.E-03
RU-106	< 3.E-02	< 2.E-02	< 3.E-02	< 2.E-02
I-131	< 7.E-01	< 4.E-01	< 6.E-01	< 7.E-01
CS-134	< 4.E-03	< 3.E-03	< 2.E-03	< 3.E-03
CS-137	< 4.E-03	< 2.E-03	< 2.E-03	< 2.E-03
BA-140	< 4.E-01	< 1.E-01	< 3.E-01	< 3.E-01
LA-140	< 1.E-01	< 6.E-02	< 8.E-02	< 1.E-01
CE-141	< 1.E-02	< 8.E-03	< 9.E-03	< 1.E-02
CE-144	< 1.E-02	< 1.E-02	< 1.E-02	< 1.E-02
RA-226	< 5.E-02	< 4.E-02	< 4.E-02	< 4.E-02
TH-228	< 5.E-03	< 3.E-03	< 4.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 8

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	5.22E-02 ± 1.97E-02	6.41E-02 ± 3.11E-02	9.78E-02 ± 2.45E-02	8.51E-02 ± 2.64E-02
K-40	< 3.E-02	< 4.E-02	< 2.E-02	< 4.E-02
MN-54	< 2.E-03	< 2.E-03	< 2.E-03	< 3.E-03
CO-58	< 3.E-03	< 4.E-03	< 2.E-03	< 3.E-03
FE-59	< 9.E-03	< 1.E-02	< 1.E-02	< 9.E-03
CO-60	< 2.E-03	< 2.E-03	< 3.E-03	< 3.E-03
ZN-65	< 5.E-03	< 8.E-03	< 7.E-03	< 5.E-03
ZR-95	< 6.E-03	< 7.E-03	< 6.E-03	< 6.E-03
RU-103	< 5.E-03	< 4.E-03	< 4.E-03	< 5.E-03
RU-106	< 2.E-02	< 2.E-02	< 2.E-02	< 2.E-02
I-131	< 4.E-01	< 3.E-01	< 4.E-01	< 5.E-01
CS-134	< 2.E-03	< 2.E-03	< 2.E-03	< 2.E-03
CS-137	< 2.E-03	< 2.E-03	< 2.E-03	< 2.E-03
BA-140	< 2.E-01	< 1.E-01	< 2.E-01	< 2.E-01
LA-140	< 9.E-02	< 8.E-02	< 9.E-02	< 9.E-02
CE-141	< 7.E-03	< 7.E-03	< 6.E-03	< 7.E-03
CE-144	< 9.E-03	< 1.E-02	< 8.E-03	< 9.E-03
RA-226	< 3.E-02	< 3.E-02	< 3.E-02	< 3.E-02
TH-228	< 2.E-03	< 3.E-03	< 3.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 9

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	5.34E-02 ± 2.32E-02	6.10E-02 ± 2.10E-02	1.14E-01 ± 4.51.E-02	5.80E-02 ± 2.78E-02
K-40	< 3.E-02	< 3.E-02	< 5.E-02	< 3.E-02
MN-54	< 2.E-03	< 2.E-03	< 3.E-03	< 2.E-03
CO-58	< 3.E-03	< 3.E-03	< 5.E-03	< 4.E-03
FE-59	< 8.E-03	< 9.E-03	< 1.E-02	< 1.E-02
CO-60	< 2.E-03	< 3.E-03	< 3.E-03	< 2.E-03
ZN-65	< 5.E-03	< 6.E-03	< 7.E-03	< 6.E-03
ZR-95	< 5.E-03	< 7.E-03	< 8.E-03	< 6.E-03
RU-103	< 3.E-03	< 4.E-03	< 8.E-03	< 5.E-03
RU-106	< 2.E-02	< 1.E-02	< 2.E-02	< 2.E-02
I-131	< 4.E-01	< 3.E-01	< 6.E-01	< 4.E-01
CS-134	< 2.E-03	< 2.E-03	< 3.E-03	< 2.E-03
CS-137	< 2.E-03	< 2.E-03	< 2.E-03	< 2.E-03
BA-140	< 2.E-01	< 2.E-01	< 3.E-01	< 2.E-01
LA-140	< 6.E-02	< 2.E-02	< 1.E-01	< 7.E-02
CE-141	< 6.E-03	< 5.E-03	< 1.E-02	< 7.E-03
CE-144	< 8.E-03	< 8.E-03	< 1.E-02	< 9.E-03
RA-226	< 3.E-02	< 3.E-02	< 4.E-02	< 3.E-02
TH-228	< 2.E-03	< 2.E-03	< 3.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 10

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	9.12E-02 ± 4.12E-02	1.25E-01 ± 3.47E-02	9.76E-02 ± 3.26E-02	9.85E-02 ± 2.76E-02
K-40	< 5.E-02	< 4.E-02	< 2.E-02	< 4.E-02
MN-54	< 4.E-03	< 2.E-03	< 2.E-03	< 2.E-03
CO-58	< 7.E-03	< 4.E-03	< 4.E-03	< 4.E-03
FE-59	< 2.E-02	< 1.E-02	< 1.E-02	< 1.E-02
CO-60	< 3.E-03	< 3.E-03	< 2.E-03	< 2.E-03
ZN-65	< 1.E-02	< 7.E-03	< 5.E-03	< 6.E-03
ZR-95	< 1.E-02	< 7.E-03	< 6.E-03	< 5.E-03
RU-103	< 7.E-03	< 5.E-03	< 4.E-03	< 5.E-03
RU-106	< 3.E-02	< 2.E-02	< 1.E-02	< 2.E-02
I-131	< 7.E-01	< 3.E-01	< 4.E-01	< 5.E-01
CS-134	< 3.E-03	< 3.E-03	< 3.E-03	< 2.E-03
CS-137	< 3.E-03	< 2.E-03	< 2.E-03	< 2.E-03
BA-140	< 3.E-01	< 2.E-01	< 2.E-01	< 2.E-01
LA-140	< 1.E-01	< 9.E-02	< 7.E-02	< 9.E-02
CE-141	< 1.E-02	< 9.E-03	< 6.E-03	< 8.E-03
CE-144	< 1.E-02	< 1.E-02	< 7.E-03	< 1.E-02
RA-226	< 5.E-02	< 4.E-02	< 3.E-02	< 4.E-02
TH-228	< 4.E-03	< 4.E-03	< 2.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE AIR PARTICULATE FILTERS

(PCI/CU.M.)

STATION NUMBER 111

DATE COLLECTED	12/31-03/31/2020	03/31-06/30/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:				
BE-7	4.79E-02 ± 2.15E-02	1.33E-01 ± 3.87E-02	9.07E-02 ± 2.86E-02	6.50E-02 ± 2.43E-02
K-40	< 4.E-02	< 5.E-02	< 4.E-02	< 3.E-02
MN-54	< 2.E-03	< 4.E-03	< 3.E-03	< 2.E-03
CO-58	< 4.E-03	< 5.E-03	< 5.E-03	< 4.E-03
FE-59	< 8.E-03	< 2.E-02	< 8.E-03	< 1.E-02
CO-60	< 2.E-03	< 5.E-03	< 2.E-03	< 2.E-03
ZN-65	< 6.E-03	< 1.E-02	< 7.E-03	< 5.E-03
ZR-95	< 4.E-03	< 1.E-02	< 8.E-03	< 6.E-03
RU-103	< 6.E-03	< 7.E-03	< 7.E-03	< 5.E-03
RU-106	< 2.E-02	< 4.E-02	< 2.E-02	< 2.E-02
I-131	< 4.E-01	< 5.E-01	< 6.E-01	< 5.E-01
CS-134	< 2.E-03	< 5.E-03	< 3.E-03	< 2.E-03
CS-137	< 2.E-03	< 4.E-03	< 2.E-03	< 2.E-03
BA-140	< 2.E-01	< 3.E-01	< 3.E-01	< 2.E-01
LA-140	< 1.E-01	< 2.E-01	< 8.E-02	< 1.E-01
CE-141	< 8.E-03	< 1.E-02	< 8.E-03	< 8.E-03
CE-144	< 8.E-03	< 2.E-02	< 1.E-02	< 8.E-03
RA-226	< 3.E-02	< 6.E-02	< 4.E-02	< 3.E-02
TH-228	< 3.E-03	< 5.E-03	< 3.E-03	< 3.E-03

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH

(PCI/KG WET)

STATION NUMBER 28

DATE COLLECTED	6/24/2020 CATFISH	6/24/2020 CARP	9/3/2020 CATFISH	9/3/2020 CARP
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 4.E+02	< 5.E+02	< 5.E+02	< 4.E+02
K-40	3.47E+03 ± 9.64E+02	3.58E+03 ± 9.80E+02	3.02E+03 ± 9.52E+02	2.23E+03 ± 6.98E+02
MN-54	< 6.E+01	< 6.E+01	< 7.E+01	< 5.E+01
CO-58	< 5.E+01	< 6.E+01	< 6.E+01	< 5.E+01
FE-59	< 1.E+02	< 1.E+02	< 2.E+02	< 9.E+01
CO-60	< 4.E+01	< 6.E+01	< 8.E+01	< 4.E+01
ZN-65	< 1.E+02	< 1.E+02	< 1.E+02	< 9.E+01
ZR-95	< 8.E+01	< 1.E+02	< 1.E+02	< 8.E+01
RU-103	< 5.E+01	< 6.E+01	< 6.E+01	< 5.E+01
RU-106	< 6.E+02	< 5.E+02	< 5.E+02	< 4.E+02
I-131	< 7.E+01	< 1.E+02	< 1.E+02	< 1.E+02
CS-134	< 5.E+01	< 7.E+01	< 7.E+01	< 4.E+01
CS-137	< 6.E+01	< 6.E+01	< 6.E+01	< 5.E+01
BA-140	< 2.E+02	< 3.E+02	< 3.E+02	< 2.E+02
CE-141	< 6.E+01	< 8.E+01	< 9.E+01	< 5.E+01
CE-144	< 2.E+02	< 3.E+02	< 3.E+02	< 2.E+02
RA-226	< 9.E+02	< 1.E+03	< 1.E+03	< 8.E+02
TH-228	< 8.E+01	< 1.E+02	< 1.E+02	< 6.E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH

(PCI/KG WET)

STATION NUMBER 35

DATE COLLECTED	6/24/2020 CATFISH	6/24/2020 CARP	9/3/2020 CATFISH	9/3/2020 CARP
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 6.E+02	< 4.E+02	< 5.E+02	< 3.E+02
K-40	1.88E+03 ± 1.15E+03	2.52E+03 ± 8.78E+02	2.59E+03 ± 7.65E+02	2.96E+03 ± 6.87E+02
MN-54	< 7.E+01	< 5.E+01	< 5.E+01	< 4.E+01
CO-58	< 6.E+01	< 6.E+01	< 5.E+01	< 3.E+01
FE-59	< 1.E+02	< 9.E+01	< 1.E+02	< 9.E+01
CO-60	< 6.E+01	< 7.E+01	< 5.E+01	< 5.E+01
ZN-65	< 2.E+02	< 1.E+02	< 1.E+02	< 9.E+01
ZR-95	< 1.E+02	< 9.E+01	< 9.E+01	< 7.E+01
RU-103	< 7.E+01	< 5.E+01	< 6.E+01	< 4.E+01
RU-106	< 7.E+02	< 5.E+02	< 5.E+02	< 4.E+02
I-131	< 1.E+02	< 9.E+01	< 1.E+02	< 1.E+02
CS-134	< 7.E+01	< 6.E+01	< 5.E+01	< 5.E+01
CS-137	< 8.E+01	< 5.E+01	< 6.E+01	< 4.E+01
BA-140	< 3.E+02	< 2.E+02	< 3.E+02	< 3.E+02
CE-141	< 8.E+01	< 9.E+01	< 8.E+01	< 6.E+01
CE-144	< 3.E+02	< 3.E+02	< 3.E+02	< 2.E+02
RA-226	< 1.E+03	< 1.E+03	< 1.E+03	< 9.E+02
TH-228	< 1.E+02	< 1.E+02	< 9.E+01	< 7.E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK NEAREST PRODUCER

(PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	1/7/2020	2/4/2020	3/3/2020	4/7/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 6.E-01	< 6.E-01	< 7.E-01	< 7.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 5.E+01	< 7.E+01	< 8.E+01	< 7.E+01
K-40	9.83E+02 ± 1.55E+02	1.17E+03 ± 1.70E+02	1.05E+03 ± 1.80E+02	1.20E+03 ± 1.85E+02
MN-54	< 9.E+00	< 7.E+00	< 1.E+01	< 8.E+00
CO-58	< 8.E+00	< 7.E+00	< 8.E+00	< 8.E+00
FE-59	< 2.E+01	< 2.E+01	< 2.E+01	< 1.E+01
CO-60	< 9.E+00	< 7.E+00	< 8.E+00	< 9.E+00
ZN-65	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
ZR-95	< 1.E+01	< 1.E+01	< 2.E+01	< 1.E+01
RU-103	< 7.E+00	< 7.E+00	< 8.E+00	< 8.E+00
RU-106	< 7.E+01	< 7.E+01	< 8.E+01	< 8.E+01
I-131	< 1.E+01	< 1.E+01	< 8.E+00	< 9.E+00
CS-134	< 8.E+00	< 1.E+01	< 1.E+01	< 1.E+01
CS-137	< 8.E+00	< 8.E+00	< 9.E+00	< 9.E+00
BA-140	< 3.E+01	< 3.E+01	< 3.E+01	< 3.E+01
LA-140	< 8.E+00	< 6.E+00	< 7.E+00	< 6.E+00
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 4.E+01	< 6.E+01	< 6.E+01	< 6.E+01
RA-226	< 2.E+02	< 2.E+02	< 2.E+02	< 2.E+02
TH-228	< 1.E+01	< 2.E+01	< 2.E+01	< 2.E+01

VII-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK NEAREST PRODUCER

(PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	5/5/2020	6/2/2020	6/16/2020	6/30/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 7.E-01	< 7.E-01	< 8.E-01	< 7.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 6.E+01	< 6.E+01	< 6.E+01	< 6.E+01
K-40	1.17E+03 ± 1.60E+02	1.30E+03 ± 1.67E+02	1.03E+03 ± 1.61E+02	1.50E+03 ± 2.19E+02
MN-54	< 8.E+00	< 8.E+00	< 7.E+00	< 8.E+00
CO-58	< 8.E+00	< 8.E+00	< 7.E+00	< 5.E+00
FE-59	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
CO-60	< 1.E+01	< 1.E+01	< 7.E+00	< 8.E+00
ZN-65	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
ZR-95	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
RU-103	< 8.E+00	< 8.E+00	< 7.E+00	< 6.E+00
RU-106	< 7.E+01	< 7.E+01	< 7.E+01	< 7.E+01
I-131	< 1.E+01	< 1.E+01	< 9.E+00	< 8.E+00
CS-134	< 8.E+00	< 9.E+00	< 1.E+01	< 9.E+00
CS-137	< 8.E+00	< 9.E+00	< 6.E+00	< 8.E+00
BA-140	< 3.E+01	< 3.E+01	< 3.E+01	< 4.E+01
LA-140	< 1.E+01	< 7.E+00	< 4.E+00	< 1.E+01
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 5.E+01	< 5.E+01	< 5.E+01	< 5.E+01
RA-226	< 2.E+02	< 2.E+02	< 2.E+02	< 2.E+02
TH-228	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01

VII-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK NEAREST PRODUCER

(PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	7/14/2020	7/28/2020	8/11/2020	8/25/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 9.E-01	< 8.E-01	< 8.E-01	< 4.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 7.E+01	< 5.E+01	< 5.E+01	< 6.E+01
K-40	1.28E+03 ± 1.91E+02	1.17E+03 ± 1.72E+02	1.11E+03 ± 1.29E+02	1.17E+03 ± 1.55E+02
MN-54	< 9.E+00	< 8.E+00	< 6.E+00	< 8.E+00
CO-58	< 7.E+00	< 7.E+00	< 6.E+00	< 9.E+00
FE-59	< 2.E+01	< 2.E+01	< 1.E+01	< 2.E+01
CO-60	< 1.E+01	< 7.E+00	< 8.E+00	< 9.E+00
ZN-65	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
ZR-95	< 2.E+01	< 1.E+01	< 1.E+01	< 1.E+01
RU-103	< 8.E+00	< 7.E+00	< 7.E+00	< 7.E+00
RU-106	< 7.E+01	< 8.E+01	< 5.E+01	< 7.E+01
I-131	< 1.E+01	< 6.E+00	< 7.E+00	< 1.E+01
CS-134	< 1.E+01	< 8.E+00	< 8.E+00	< 8.E+00
CS-137	< 9.E+00	< 8.E+00	< 6.E+00	< 8.E+00
BA-140	< 3.E+01	< 2.E+01	< 2.E+01	< 3.E+01
LA-140	< 9.E+00	< 1.E+01	< 6.E+00	< 1.E+01
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 5.E+01	< 4.E+01	< 5.E+01	< 5.E+01
RA-226	< 2.E+02	< 2.E+02	< 1.E+02	< 2.E+02
TH-228	< 2.E+01	< 1.E+01	< 1.E+01	< 1.E+01

VII-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK NEAREST PRODUCER

(PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	9/8/2020	9/22/2020	10/6/2020	11/3/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 8.E-01	< 7.E-01	< 8.E-01	< 8.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 6.E+01	< 6.E+01	< 6.E+01	< 7.E+01
K-40	1.21E+03 ± 1.88E+02	1.21E+03 ± 1.97E+02	1.17E+03 ± 1.58E+02	1.02E+03 ± 1.68E+02
MN-54	< 6.E+00	< 8.E+00	< 7.E+00	< 8.E+00
CO-58	< 9.E+00	< 6.E+00	< 6.E+00	< 8.E+00
FE-59	< 1.E+01	< 2.E+01	< 1.E+01	< 2.E+01
CO-60	< 1.E+01	< 7.E+00	< 9.E+00	< 8.E+00
ZN-65	< 2.E+01	< 2.E+01	< 1.E+01	< 2.E+01
ZR-95	< 1.E+01	< 1.E+01	< 1.E+01	< 2.E+01
RU-103	< 7.E+00	< 8.E+00	< 7.E+00	< 7.E+00
RU-106	< 6.E+01	< 6.E+01	< 6.E+01	< 7.E+01
I-131	< 8.E+00	< 1.E+01	< 7.E+00	< 1.E+01
CS-134	< 1.E+01	< 9.E+00	< 7.E+00	< 1.E+01
CS-137	< 7.E+00	< 1.E+01	< 7.E+00	< 9.E+00
BA-140	< 3.E+01	< 4.E+01	< 3.E+01	< 3.E+01
LA-140	< 9.E+00	< 8.E+00	< 7.E+00	< 1.E+01
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 4.E+01	< 6.E+01	< 4.E+01	< 6.E+01
RA-226	< 2.E+02	< 2.E+02	< 2.E+02	< 2.E+02
TH-228	< 1.E+01	< 2.E+01	< 1.E+01	< 2.E+01

VII-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK NEAREST PRODUCER

(PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	12/1/2020
RADIOCHEMICAL ANALYSIS:	
I-131	< 9.E-01
GAMMA SPECTRUM ANALYSIS:	
BE-7	< 8.E+01
K-40	9.71E+02 ± 1.75E+02
MN-54	< 8.E+00
CO-58	< 1.E+01
FE-59	< 2.E+01
CO-60	< 9.E+00
ZN-65	< 2.E+01
ZR-95	< 2.E+01
RU-103	< 1.E+01
RU-106	< 7.E+01
I-131	< 1.E+01
CS-134	< 1.E+01
CS-137	< 1.E+01
BA-140	< 3.E+01
LA-140	< 1.E+01
CE-141	< 2.E+01
CE-144	< 6.E+01
RA-226	< 2.E+02
TH-228	< 2.E+01

VII-5

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - GROUND

(PCI/LITER)

STATION NUMBER 11

DATE COLLECTED	1/8/2020	4/1/2020	7/6/2020	10/5/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 4.E-01	< 6.E-01	< 7.E-01	< 6.E-01
H-3	< 3.E+02	< 3.E+02	< 3.E+02	< 3.E+02
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 4.E+01	< 5.E+01	< 4.E+01	< 5.E+01
K-40	< 1.E+02	< 6.E+01	< 7.E+01	< 1.E+02
MN-54	< 4.E+00	< 5.E+00	< 4.E+00	< 5.E+00
CO-58	< 4.E+00	< 7.E+00	< 5.E+00	< 5.E+00
FE-59	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01
CO-60	< 4.E+00	< 7.E+00	< 5.E+00	< 6.E+00
ZN-65	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01
ZR-95	< 8.E+00	< 1.E+01	< 9.E+00	< 1.E+01
RU-103	< 5.E+00	< 7.E+00	< 5.E+00	< 6.E+00
RU-106	< 4.E+01	< 6.E+01	< 4.E+01	< 5.E+01
I-131	< 7.E+00	< 1.E+01	< 6.E+00	< 8.E+00
CS-134	< 6.E+00	< 7.E+00	< 5.E+00	< 5.E+00
CS-137	< 5.E+00	< 6.E+00	< 6.E+00	< 5.E+00
BA-140	< 2.E+01	< 3.E+01	< 2.E+01	< 2.E+01
LA-140	< 9.E+00	< 9.E+00	< 7.E+00	< 7.E+00
CE-141	< 7.E+00	< 1.E+01	< 9.E+00	< 1.E+01
CE-144	< 3.E+01	< 4.E+01	< 4.E+01	< 5.E+01
RA-226	< 1.E+02	< 1.E+02	< 1.E+02	< 2.E+02
TH-228	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01

VII-5

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - GROUND

(PCI/LITER)

STATION NUMBER 47

DATE COLLECTED	1/7/2020	4/1/2020	7/6/2020	10/5/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 5.E-01	< 5.E-01	< 7.E-01	< 7.E-01
H-3	< 3.E+02	< 3.E+02	< 3.E+02	< 3.E+02
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 5.E+01	< 6.E+01	< 4.E+01	< 5.E+01
K-40	< 8.E+01	< 1.E+02	< 1.E+02	< 8.E+01
MN-54	< 5.E+00	< 7.E+00	< 5.E+00	< 6.E+00
CO-58	< 5.E+00	< 7.E+00	< 5.E+00	< 5.E+00
FE-59	< 1.E+01	< 1.E+01	< 1.E+01	< 8.E+00
CO-60	< 5.E+00	< 6.E+00	< 6.E+00	< 6.E+00
ZN-65	< 9.E+00	< 1.E+01	< 1.E+01	< 9.E+00
ZR-95	< 8.E+00	< 1.E+01	< 8.E+00	< 8.E+00
RU-103	< 5.E+00	< 7.E+00	< 6.E+00	< 5.E+00
RU-106	< 5.E+01	< 7.E+01	< 5.E+01	< 5.E+01
I-131	< 9.E+00	< 9.E+00	< 8.E+00	< 7.E+00
CS-134	< 6.E+00	< 7.E+00	< 5.E+00	< 5.E+00
CS-137	< 5.E+00	< 8.E+00	< 6.E+00	< 4.E+00
BA-140	< 2.E+01	< 3.E+01	< 2.E+01	< 2.E+01
LA-140	< 7.E+00	< 6.E+00	< 8.E+00	< 6.E+00
CE-141	< 8.E+00	< 1.E+01	< 9.E+00	< 9.E+00
CE-144	< 3.E+01	< 6.E+01	< 4.E+01	< 3.E+01
RA-226	< 1.E+02	< 2.E+02	< 1.E+02	< 1.E+02
TH-228	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01

VII-6

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	1/7/2020	2/4/2020	3/9/2020	4/7/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 2.E+02	< 3.E+02	< 3.E+02
H-3 Qtrly			< 3.E+02	
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 4.E+01	< 6.E+01	< 6.E+01	< 4.E+01
K-40	< 1.E+02	< 7.E+01	< 1.E+02	< 1.E+02
MN-54	< 4.E+00	< 7.E+00	< 7.E+00	< 6.E+00
CO-58	< 5.E+00	< 6.E+00	< 8.E+00	< 6.E+00
FE-59	< 8.E+00	< 1.E+01	< 1.E+01	< 1.E+01
CO-60	< 7.E+00	< 9.E+00	< 8.E+00	< 6.E+00
ZN-65	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
ZR-95	< 9.E+00	< 9.E+00	< 1.E+01	< 7.E+00
RU-103	< 5.E+00	< 8.E+00	< 8.E+00	< 5.E+00
RU-106	< 5.E+01	< 7.E+01	< 7.E+01	< 6.E+01
I-131	< 6.E+00	< 8.E+00	< 1.E+01	< 6.E+00
CS-134	< 5.E+00	< 1.E+01	< 8.E+00	< 6.E+00
CS-137	< 5.E+00	< 7.E+00	< 7.E+00	< 6.E+00
BA-140	< 2.E+01	< 3.E+01	< 3.E+01	< 2.E+01
LA-140	< 7.E+00	< 1.E+01	< 1.E+01	< 5.E+00
CE-141	< 9.E+00	< 1.E+01	< 1.E+01	< 9.E+00
CE-144	< 3.E+01	< 5.E+01	< 5.E+01	< 4.E+01
RA-226	< 1.E+02	< 2.E+02	< 2.E+02	< 1.E+02
TH-228	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01

VII-6

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	5/5/2020	6/8/2020	7/7/2020	8/4/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 4.E+02	< 3.E+02	< 3.E+02
H-3 Qtrly		< 3.E+02		
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 4.E+01	< 6.E+01	< 5.E+01	< 6.E+01
K-40	< 8.E+01	< 9.E+01	< 9.E+01	< 1.E+02
MN-54	< 4.E+00	< 5.E+00	< 5.E+00	< 8.E+00
CO-58	< 5.E+00	< 6.E+00	< 5.E+00	< 5.E+00
FE-59	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01
CO-60	< 5.E+00	< 7.E+00	< 6.E+00	< 9.E+00
ZN-65	< 8.E+00	< 1.E+01	< 1.E+01	< 2.E+01
ZR-95	< 8.E+00	< 9.E+00	< 8.E+00	< 1.E+01
RU-103	< 5.E+00	< 6.E+00	< 7.E+00	< 7.E+00
RU-106	< 4.E+01	< 7.E+01	< 6.E+01	< 7.E+01
I-131	< 6.E+00	< 9.E+00	< 6.E+00	< 8.E+00
CS-134	< 5.E+00	< 7.E+00	< 8.E+00	< 8.E+00
CS-137	< 5.E+00	< 8.E+00	< 6.E+00	< 8.E+00
BA-140	< 2.E+01	< 2.E+01	< 2.E+01	< 3.E+01
LA-140	< 5.E+00	< 5.E+00	< 8.E+00	< 1.E+01
CE-141	< 8.E+00	< 1.E+01	< 9.E+00	< 1.E+01
CE-144	< 4.E+01	< 4.E+01	< 4.E+01	< 4.E+01
RA-226	< 1.E+02	< 2.E+02	< 1.E+02	< 2.E+02
TH-228	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	9/4/2020	10/5/2020	11/3/2020	12/2/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 3.E+02	< 3.E+02	< 3.E+02
H-3 Qtrly	< 3.E+02			< 3.E+02
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 7.E+01	< 4.E+01	< 6.E+01	< 6.E+01
K-40	< 7.E+01	< 1.E+02	< 1.E+02	< 1.E+02
MN-54	< 9.E+00	< 6.E+00	< 6.E+00	< 6.E+00
CO-58	< 7.E+00	< 5.E+00	< 5.E+00	< 7.E+00
FE-59	< 1.E+01	< 1.E+01	< 1.E+01	< 2.E+01
CO-60	< 9.E+00	< 6.E+00	< 7.E+00	< 8.E+00
ZN-65	< 2.E+01	< 1.E+01	< 1.E+01	< 2.E+01
ZR-95	< 1.E+01	< 9.E+00	< 1.E+01	< 1.E+01
RU-103	< 7.E+00	< 5.E+00	< 6.E+00	< 9.E+00
RU-106	< 7.E+01	< 4.E+01	< 7.E+01	< 7.E+01
I-131	< 1.E+01	< 7.E+00	< 8.E+00	< 1.E+01
CS-134	< 9.E+00	< 6.E+00	< 7.E+00	< 8.E+00
CS-137	< 8.E+00	< 6.E+00	< 7.E+00	< 6.E+00
BA-140	< 3.E+01	< 2.E+01	< 3.E+01	< 3.E+01
LA-140	< 8.E+00	< 8.E+00	< 7.E+00	< 1.E+01
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 5.E+01	< 5.E+01	< 4.E+01	< 5.E+01
RA-226	< 1.E+02	< 2.E+02	< 2.E+02	< 2.E+02
TH-228	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01

VII-6

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	1/7/2020	2/4/2020	3/9/2020	4/7/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 2.E+02	< 2.E+02	< 3.E+02
H-3 Qtrly			< 3.E+02	
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 5.E+01	< 6.E+01	< 7.E+01	< 4.E+01
K-40	< 1.E+02	< 1.E+02	< 2.E+02	< 5.E+01
MN-54	< 5.E+00	< 7.E+00	< 8.E+00	< 6.E+00
CO-58	< 3.E+00	< 7.E+00	< 8.E+00	< 4.E+00
FE-59	< 1.E+01	< 2.E+01	< 1.E+01	< 1.E+01
CO-60	< 6.E+00	< 8.E+00	< 7.E+00	< 6.E+00
ZN-65	< 1.E+01	< 1.E+01	< 2.E+01	< 8.E+00
ZR-95	< 6.E+00	< 1.E+01	< 2.E+01	< 9.E+00
RU-103	< 5.E+00	< 8.E+00	< 7.E+00	< 4.E+00
RU-106	< 5.E+01	< 6.E+01	< 8.E+01	< 5.E+01
I-131	< 7.E+00	< 8.E+00	< 1.E+01	< 5.E+00
CS-134	< 7.E+00	< 9.E+00	< 1.E+01	< 5.E+00
CS-137	< 5.E+00	< 8.E+00	< 7.E+00	< 6.E+00
BA-140	< 2.E+01	< 3.E+01	< 3.E+01	< 2.E+01
LA-140	< 8.E+00	< 1.E+01	< 9.E+00	< 5.E+00
CE-141	< 8.E+00	< 1.E+01	< 1.E+01	< 8.E+00
CE-144	< 3.E+01	< 5.E+01	< 5.E+01	< 4.E+01
RA-226	< 1.E+02	< 2.E+02	< 2.E+02	< 1.E+02
TH-228	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01

VII-6

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	5/5/2020	6/8/2020	7/7/2020	8/4/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 3.E+02	< 3.E+02	< 3.E+02
H-3 Qtrly		< 3.E+02		
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 4.E+01	< 4.E+01	< 5.E+01	< 7.E+01
K-40	9.95E+01 ± 5.76E+01	< 1.E+02	< 1.E+02	< 1.E+02
MN-54	< 5.E+00	< 7.E+00	< 6.E+00	< 6.E+00
CO-58	< 4.E+00	< 6.E+00	< 5.E+00	< 7.E+00
FE-59	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CO-60	< 5.E+00	< 8.E+00	< 7.E+00	< 1.E+01
ZN-65	< 9.E+00	< 2.E+01	< 7.E+00	< 1.E+01
ZR-95	< 9.E+00	< 7.E+00	< 8.E+00	< 1.E+01
RU-103	< 5.E+00	< 7.E+00	< 5.E+00	< 7.E+00
RU-106	< 5.E+01	< 6.E+01	< 4.E+01	< 6.E+01
I-131	< 6.E+00	< 9.E+00	< 6.E+00	< 6.E+00
CS-134	< 7.E+00	< 8.E+00	< 6.E+00	< 8.E+00
CS-137	< 6.E+00	< 6.E+00	< 5.E+00	< 7.E+00
BA-140	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
LA-140	< 7.E+00	< 1.E+01	< 5.E+00	< 9.E+00
CE-141	< 8.E+00	< 1.E+01	< 9.E+00	< 9.E+00
CE-144	< 3.E+01	< 4.E+01	< 4.E+01	< 4.E+01
RA-226	< 1.E+02	< 2.E+02	< 1.E+02	< 2.E+02
TH-228	< 9.E+00	< 1.E+01	< 1.E+01	< 1.E+01

VII-6

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

WATER - RIVER

(PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	9/4/2020	10/5/2020	11/3/2020	12/2/2020
RADIOCHEMICAL ANALYSIS:				
H-3	< 3.E+02	< 3.E+02	< 3.E+02	< 3.E+02
H-3 Qtrly	< 3.E+02			< 3.E+02
GAMMA SPECTRUM ANALYSIS:				
BE-7	< 6.E+01	< 7.E+01	< 7.E+01	< 7.E+01
K-40	< 1.E+02	< 2.E+02	< 1.E+02	< 2.E+02
MN-54	< 6.E+00	< 5.E+00	< 7.E+00	< 6.E+00
CO-58	< 7.E+00	< 7.E+00	< 7.E+00	< 6.E+00
FE-59	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CO-60	< 6.E+00	< 6.E+00	< 8.E+00	< 9.E+00
ZN-65	< 2.E+01	< 1.E+01	< 2.E+01	< 2.E+01
ZR-95	< 1.E+01	< 1.E+01	< 1.E+01	< 2.E+01
RU-103	< 8.E+00	< 7.E+00	< 7.E+00	< 1.E+01
RU-106	< 7.E+01	< 8.E+01	< 7.E+01	< 8.E+01
I-131	< 1.E+01	< 1.E+01	< 8.E+00	< 1.E+01
CS-134	< 7.E+00	< 9.E+00	< 9.E+00	< 9.E+00
CS-137	< 8.E+00	< 8.E+00	< 7.E+00	< 8.E+00
BA-140	< 3.E+01	< 3.E+01	< 3.E+01	< 4.E+01
LA-140	< 1.E+01	< 8.E+00	< 9.E+00	< 1.E+01
CE-141	< 1.E+01	< 1.E+01	< 1.E+01	< 1.E+01
CE-144	< 5.E+01	< 5.E+01	< 5.E+01	< 6.E+01
RA-226	< 2.E+02	< 2.E+02	< 2.E+02	< 2.E+02
TH-228	< 1.E+01	< 2.E+01	< 1.E+01	< 1.E+01

VII-7

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD

MILLIREM/QUARTER

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	1	21.0 ± 0.8	24.0 ± 1.2	22.0 ± 1.7	23.0 ± 5.6	22.5 ± 1.3
	2	20.0 ± 0.4	22.0 ± 0.6	21.0 ± 2.6	19.0 ± 1.0	20.5 ± 1.3
	3	(a)	19.0 ± 0.9	21.0 ± 0.6	20.0 ± 0.7	20.0 ± 1.0
	4	20.0 ± 0.4	22.0 ± 0.9	21.0 ± 0.7	22.0 ± 1.1	21.3 ± 1.0
	5	20.0 ± 0.6	(b)	20.0 ± 1.2	20.0 ± 0.6	20.0 ± 0.0
	6	19.0 ± 0.5	21.0 ± 0.8	20.0 ± 0.4	20.0 ± 1.4	20.0 ± 0.8
	7	20.0 ± 1.0	21.0 ± 0.9	22.0 ± 0.2	22.0 ± 0.9	21.3 ± 1.0
	8	21.0 ± 0.8	23.0 ± 0.1	22.0 ± 0.7	23.0 ± 1.5	22.3 ± 1.0
	9	19.0 ± 0.6	21.0 ± 1.3	21.0 ± 1.3	22.0 ± 0.8	20.8 ± 1.3
	10	20.0 ± 0.5	21.0 ± 0.9	20.0 ± 0.8	22.0 ± 0.2	20.8 ± 1.0
	20	19.0 ± 0.5	23.0 ± 1.1	22.0 ± 1.1	22.0 ± 0.8	21.5 ± 1.7
	44	22.0 ± 0.2	24.0 ± 0.3	24.0 ± 1.1	23.0 ± 0.8	23.3 ± 1.0
	56	20.0 ± 0.8	22.0 ± 1.0	20.0 ± 1.1	21.0 ± 0.3	20.8 ± 1.0
	58	20.0 ± 0.6	21.0 ± 1.1	21.0 ± 0.5	20.0 ± 0.9	20.5 ± 0.6
	59	(a)	21.0 ± 0.5	(c)	23.0 ± 0.5	22.0 ± 1.4
	66	20.0 ± 2.0	24.0 ± 0.7	21.0 ± 0.5	21.0 ± 0.5	21.5 ± 1.7
	67	21.0 ± 1.0	22.0 ± 0.5	22.0 ± 0.9	22.0 ± 0.2	21.8 ± 0.5
	71	20.0 ± 0.5	22.0 ± 0.9	22.0 ± 0.9	23.0 ± 1.3	21.8 ± 1.3
	79	20.0 ± 0.8	(b)	20.0 ± 0.7	21.0 ± 0.6	20.3 ± 0.6
	80	20.0 ± 0.4	22.0 ± 0.6	23.0 ± 0.8	23.0 ± 0.9	22.0 ± 1.4
	81	21.0 ± 0.4	23.0 ± 1.5	24.0 ± 0.9	22.0 ± 0.6	22.5 ± 1.3
	82	(a)	21.0 ± 1.0	22.0 ± 0.6	22.0 ± 0.4	21.7 ± 0.6
	83	21.0 ± 0.4	22.0 ± 0.5	23.0 ± 1.1	25.0 ± 1.0	22.8 ± 1.7
	84	22.0 ± 0.6	23.0 ± 0.6	21.0 ± 1.6	23.0 ± 0.7	22.3 ± 1.0
	85	19.0 ± 0.1	21.0 ± 0.6	21.0 ± 0.9	21.0 ± 1.1	20.5 ± 1.0

(a) Due to Missouri River flooding, sample station was inaccessible.

(b) TLD was lost in the field and unable to be analyzed.

(c) TLD was unable to be delivered to laboratory and was not analyzed.

VII-7

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD

MILLIREM/QUARTER

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	86	21.0 ± 0.8	22.0 ± 2.0	22.0 ± 0.8	23.0 ± 0.1	22.0 ± 0.8
	87	21.0 ± 0.3	22.0 ± 0.5	22.0 ± 1.4	21.0 ± 1.1	21.5 ± 0.6
	88	21.0 ± 0.4	22.0 ± 0.4	21.0 ± 2.6	21.0 ± 0.8	21.3 ± 0.5
	89	20.0 ± 0.8	21.0 ± 1.7	21.0 ± 0.7	22.0 ± 1.5	21.0 ± 0.8
	90	21.0 ± 0.5	21.0 ± 1.2	20.0 ± 1.1	21.0 ± 1.0	20.8 ± 0.5
	91	21.0 ± 0.1	21.0 ± 1.1	21.0 ± 0.2	21.0 ± 0.9	21.0 ± 0.0
	94	20.0 ± 0.4	22.0 ± 0.4	21.0 ± 0.3	21.0 ± 0.8	21.0 ± 0.8
	111	21.0 ± 0.3	23.0 ± 0.7	20.0 ± 0.8	21.0 ± 1.0	21.3 ± 1.3
	N01	20.0 ± 0.7	23.0 ± 1.4	22.0 ± 0.7	22.0 ± 0.8	21.8 ± 1.3
	N02	21.0 ± 0.2	24.0 ± 1.5	20.0 ± 0.4	22.0 ± 0.3	21.8 ± 1.7
	N03	21.0 ± 0.4	26.0 ± 1.5	22.0 ± 1.3	21.0 ± 1.8	22.5 ± 2.4
	N04	18.0 ± 0.5	19.0 ± 0.6	20.0 ± 0.5	20.0 ± 0.6	19.3 ± 1.0
	N05	20.0 ± 0.5	21.0 ± 0.5	21.0 ± 0.9	21.0 ± 0.9	20.8 ± 0.5
	N06	21.0 ± 0.1	20.0 ± 1.1	21.0 ± 0.9	19.0 ± 0.9	20.3 ± 1.0
	N07	22.0 ± 0.3	23.0 ± 0.9	21.0 ± 1.5	22.0 ± 0.7	22.0 ± 0.8
	N08	20.0 ± 0.9	21.0 ± 1.2	19.0 ± 0.6	19.0 ± 0.3	19.8 ± 1.0
	N09	19.0 ± 0.3	20.0 ± 0.8	20.0 ± 0.9	20.0 ± 0.4	19.8 ± 0.5
	N10	22.0 ± 0.1	22.0 ± 1.2	22.0 ± 1.0	22.0 ± 1.1	22.0 ± 0.0
	N11	21.0 ± 0.4	22.0 ± 0.9	22.0 ± 3.2	20.0 ± 0.2	21.3 ± 1.0
	N12	21.0 ± 0.5	22.0 ± 0.4	22.0 ± 0.7	21.0 ± 0.7	21.5 ± 0.6
	N13	21.0 ± 0.3	23.0 ± 0.9	20.0 ± 0.1	22.0 ± 0.6	21.5 ± 1.3
	N14	21.0 ± 0.4	22.0 ± 1.2	22.0 ± 1.1	20.0 ± 0.7	21.3 ± 1.0
	N15	(a)	22.0 ± 1.2	20.0 ± 2.3	22.0 ± 1.4	21.0 ± 1.2
	N16	21.0 ± 0.4	23.0 ± 0.6	22.0 ± 0.7	22.0 ± 0.2	22.0 ± 0.8
	N17	19.0 ± 0.9	24.0 ± 1.3	23.0 ± 0.5	22.0 ± 1.1	22.0 ± 2.2

(a) Due to Missouri River flooding, sample station was inaccessible.

VII-7

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD

MILLIREM/QUARTER

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	N18	21.0 ± 4.8	21.0 ± 0.7	22.0 ± 0.8	18.0 ± 0.4	20.5 ± 1.7
	N19	21.0 ± 0.2	22.0 ± 0.4	20.0 ± 0.6	20.0 ± 1.9	20.8 ± 1.0
	N20	(a)	25.0 ± 1.2	23.0 ± 0.4	22.0 ± 0.6	23.3 ± 1.5
	N21	18.0 ± 0.2	20.0 ± 0.6	18.0 ± 0.6	19.0 ± 0.4	18.8 ± 1.0
	N22	19.0 ± 0.1	22.0 ± 1.0	22.0 ± 0.6	21.0 ± 0.6	21.0 ± 1.4
	N23	20.0 ± 0.3	23.0 ± 0.2	20.0 ± 0.3	19.0 ± 0.9	20.5 ± 1.7
	N24	20.0 ± 1.1	22.0 ± 0.6	21.0 ± 0.3	20.0 ± 0.3	20.8 ± 1.0
	N25	19.0 ± 0.5	22.0 ± 1.0	21.0 ± 0.6	22.0 ± 0.6	21.0 ± 1.4
Average/Quarter		20.3 ± 1.0	22.0 ± 1.3	21.2 ± 1.2	21.3 ± 1.3	
Range		(18.0-22.0)	(19.0-26.0)	(18.0-24.0)	(18.0-25.0)	
Detection/Total		55/61	59/61	60/61	61/61	

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	Control*	-1.0 ± 0.1	15.0 ± 0.3	15.0 ± 0.2	14.0 ± 0.3	10.8 ± 7.8
		15.0 ± 0.6	15.0 ± 0.5	14.0 ± 0.6	15.0 ± 0.3	14.8 ± 0.5
		14.0 ± 0.4	15.0 ± 0.3	-1.0 ± 0.2	13.0 ± 0.2	10.3 ± 7.5

*Transit Control TLDs. Not included in the control calcuations.

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 35

DATE COLLECTED	4/27/2020	5/20/2020	6/17/2020	7/13/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 3.E+01	< 4.E+01	< 4.E+01	< 4.E+01
GAMMA SPECTRUM ANALYSIS:				
BE-7	6.53E+02 ± 2.34E+02	4.44E+02 ± 2.84E+02	5.87E+02 ± 2.17E+02	1.86E+03 ± 3.44E+02
K-40	6.55E+03 ± 5.84E+02	7.13E+03 ± 7.47E+02	6.28E+03 ± 7.37E+02	6.92E+03 ± 7.13E+02
MN-54	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
CO-58	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
FE-59	< 5.E+01	< 7.E+01	< 6.E+01	< 6.E+01
CO-60	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
ZN-65	< 6.E+01	< 7.E+01	< 6.E+01	< 5.E+01
ZR-95	< 4.E+01	< 5.E+01	< 4.E+01	< 4.E+01
RU-103	< 2.E+01	< 2.E+01	< 2.E+01	< 2.E+01
RU-106	< 2.E+02	< 3.E+02	< 2.E+02	< 2.E+02
I-131	< 3.E+01	< 4.E+01	< 2.E+01	< 3.E+01
CS-134	< 3.E+01	< 4.E+01	< 3.E+01	< 2.E+01
CS-137	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
BA-140	< 8.E+01	< 1.E+02	< 9.E+01	< 9.E+01
CE-141	< 4.E+01	< 5.E+01	< 3.E+01	< 4.E+01
CE-144	< 2.E+02	< 2.E+02	< 1.E+02	< 2.E+02
RA-226	< 6.E+02	< 7.E+02	< 5.E+02	< 6.E+02
TH-228	1.83E+02 ± 4.25E+01	< 5.E+01	9.99E+01 ± 4.24E+01	6.21E+01 ± 4.14E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 35

DATE COLLECTED	8/3/2020	9/14/2020	10/7/2020
RADIOCHEMICAL ANALYSIS:			
I-131	< 3.E+01	< 5.E+01	< 5.E+01
GAMMA SPECTRUM ANALYSIS:			
BE-7	1.27E+03 ± 2.47E+02	3.60E+03 ± 4.29E+02	3.21E+03 ± 4.03E+02
K-40	5.92E+03 ± 6.03E+02	5.80E+03 ± 7.34E+02	5.60E+03 ± 7.49E+02
MN-54	< 3.E+01	< 3.E+01	< 3.E+01
CO-58	< 2.E+01	< 2.E+01	< 3.E+01
FE-59	< 6.E+01	< 7.E+01	< 7.E+01
CO-60	< 3.E+01	< 3.E+01	< 4.E+01
ZN-65	< 7.E+01	< 7.E+01	< 7.E+01
ZR-95	< 4.E+01	< 6.E+01	< 5.E+01
RU-103	< 2.E+01	< 3.E+01	< 3.E+01
RU-106	< 2.E+02	< 3.E+02	< 3.E+02
I-131	< 3.E+01	< 4.E+01	< 3.E+01
CS-134	< 3.E+01	< 3.E+01	< 3.E+01
CS-137	< 2.E+01	< 3.E+01	< 3.E+01
BA-140	< 9.E+01	< 9.E+01	< 1.E+02
CE-141	< 3.E+01	< 5.E+01	< 4.E+01
CE-144	< 1.E+02	< 2.E+02	< 2.E+02
RA-226	< 6.E+02	< 8.E+02	< 6.E+02
TH-228	< 5.E+01	6.57E+01 ± 3.31E+01	7.13E+01 ± 3.99E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 96

DATE COLLECTED	4/27/2020	5/20/2020	6/17/2020	7/13/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 4.E+01	< 3.E+01	< 5.E+01	< 3.E+01
GAMMA SPECTRUM ANALYSIS:				
BE-7	1.08E+03 ± 2.30E+02	5.61E+02 ± 2.84E+02	5.50E+02 ± 2.58E+02	1.47E+03 ± 2.84E+02
K-40	4.73E+03 ± 5.22E+02	7.17E+03 ± 8.24E+02	4.22E+03 ± 5.02E+02	6.10E+03 ± 6.89E+02
MN-54	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
CO-58	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
FE-59	< 4.E+01	< 7.E+01	< 5.E+01	< 7.E+01
CO-60	< 1.E+01	< 3.E+01	< 2.E+01	< 3.E+01
ZN-65	< 5.E+01	< 7.E+01	< 6.E+01	< 7.E+01
ZR-95	< 4.E+01	< 4.E+01	< 4.E+01	< 5.E+01
RU-103	< 2.E+01	< 2.E+01	< 3.E+01	< 3.E+01
RU-106	< 2.E+02	< 3.E+02	< 2.E+02	< 3.E+02
I-131	< 2.E+01	< 4.E+01	< 2.E+01	< 3.E+01
CS-134	< 1.E+01	< 2.E+01	< 3.E+01	< 4.E+01
CS-137	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
BA-140	< 7.E+01	< 1.E+02	< 9.E+01	< 1.E+02
CE-141	< 2.E+01	< 4.E+01	< 4.E+01	< 4.E+01
CE-144	< 1.E+02	< 2.E+02	< 1.E+02	< 2.E+02
RA-226	< 4.E+02	< 7.E+02	< 6.E+02	< 7.E+02
TH-228	1.72E+02 ± 3.10E+01	< 5.E+01	< 5.E+01	< 6.E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 96

DATE COLLECTED	8/3/2020	9/14/2020	10/7/2020
RADIOCHEMICAL ANALYSIS:			
I-131	< 4.E+01	< 3.E+01	< 4.E+01
GAMMA SPECTRUM ANALYSIS:			
BE-7	2.56E+03 ± 3.26E+02	2.29E+03 ± 3.76E+02	3.44E+03 ± 4.45E+02
K-40	6.57E+03 ± 6.27E+02	5.23E+03 ± 7.45E+02	4.60E+03 ± 7.53E+02
MN-54	< 2.E+01	< 3.E+01	< 3.E+01
CO-58	< 2.E+01	< 2.E+01	< 3.E+01
FE-59	< 4.E+01	< 6.E+01	< 6.E+01
CO-60	< 2.E+01	< 3.E+01	< 3.E+01
ZN-65	< 5.E+01	< 6.E+01	< 7.E+01
ZR-95	< 4.E+01	< 3.E+01	< 5.E+01
RU-103	< 2.E+01	< 2.E+01	< 3.E+01
RU-106	< 2.E+02	< 2.E+02	< 3.E+02
I-131	< 3.E+01	< 3.E+01	< 3.E+01
CS-134	< 2.E+01	< 3.E+01	< 3.E+01
CS-137	< 2.E+01	< 3.E+01	< 3.E+01
BA-140	< 8.E+01	< 9.E+01	< 1.E+02
CE-141	< 3.E+01	< 3.E+01	< 4.E+01
CE-144	< 1.E+02	< 1.E+02	< 2.E+02
RA-226	< 5.E+02	< 6.E+02	< 7.E+02
TH-228	< 4.E+01	< 6.E+01	6.86E+01 ± 5.05E+01

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NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 101

DATE COLLECTED	4/27/2020	5/20/2020	6/17/2020	7/13/2020
RADIOCHEMICAL ANALYSIS:				
I-131	< 3.E+01	< 4.E+01	< 5.E+01	< 3.E+01
GAMMA SPECTRUM ANALYSIS:				
BE-7	6.00E+02 ± 1.87E+02	7.74E+02 ± 3.54E+02	6.13E+02 ± 2.36E+02	1.27E+03 ± 2.80E+02
K-40	5.32E+03 ± 4.95E+02	6.46E+03 ± 8.23E+02	5.89E+03 ± 6.56E+02	6.16E+03 ± 7.18E+02
MN-54	< 2.E+01	< 3.E+01	< 3.E+01	< 3.E+01
CO-58	< 2.E+01	< 4.E+01	< 3.E+01	< 3.E+01
FE-59	< 4.E+01	< 8.E+01	< 6.E+01	< 4.E+01
CO-60	< 2.E+01	< 3.E+01	< 4.E+01	< 3.E+01
ZN-65	< 4.E+01	< 7.E+01	< 7.E+01	< 4.E+01
ZR-95	< 3.E+01	< 5.E+01	< 5.E+01	< 4.E+01
RU-103	< 2.E+01	< 3.E+01	< 3.E+01	< 2.E+01
RU-106	< 2.E+02	< 3.E+02	< 3.E+02	< 2.E+02
I-131	< 2.E+01	< 4.E+01	< 3.E+01	< 2.E+01
CS-134	< 2.E+01	< 3.E+01	< 4.E+01	< 3.E+01
CS-137	< 2.E+01	< 4.E+01	< 3.E+01	< 2.E+01
BA-140	< 6.E+01	< 1.E+02	< 1.E+02	< 8.E+01
CE-141	< 3.E+01	< 5.E+01	< 4.E+01	< 3.E+01
CE-144	< 1.E+02	< 2.E+02	< 2.E+02	< 1.E+02
RA-226	< 5.E+02	< 6.E+02	< 6.E+02	< 5.E+02
TH-228	2.48E+02 ± 4.13E+01	< 5.E+01	< 6.E+01	6.35E+01 ± 4.57E+01

VII-8

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION - TERRESTRIAL, BROADLEAF

(PCI/KG WET)

STATION NUMBER 101

DATE COLLECTED	8/3/2020	9/14/2020	10/7/2020
RADIOCHEMICAL ANALYSIS:			
I-131	< 4.E+01	< 4.E+01	< 5.E+01
GAMMA SPECTRUM ANALYSIS:			
BE-7	1.06E+03 ± 2.33E+02	9.42E+02 ± 2.47E+02	6.81E+02 ± 2.09E+02
K-40	6.45E+03 ± 6.68E+02	5.03E+03 ± 6.24E+02	6.74E+03 ± 6.22E+02
MN-54	< 2.E+01	< 2.E+01	< 2.E+01
CO-58	< 3.E+01	< 2.E+01	< 1.E+01
FE-59	< 5.E+01	< 5.E+01	< 4.E+01
CO-60	< 2.E+01	< 2.E+01	< 2.E+01
ZN-65	< 6.E+01	< 5.E+01	< 4.E+01
ZR-95	< 4.E+01	< 4.E+01	< 3.E+01
RU-103	< 2.E+01	< 2.E+01	< 2.E+01
RU-106	< 2.E+02	< 2.E+02	< 2.E+02
I-131	< 3.E+01	< 2.E+01	< 2.E+01
CS-134	< 2.E+01	< 3.E+01	< 2.E+01
CS-137	< 3.E+01	< 2.E+01	< 2.E+01
BA-140	< 9.E+01	< 8.E+01	< 7.E+01
CE-141	< 3.E+01	< 3.E+01	< 3.E+01
CE-144	< 1.E+02	< 1.E+02	< 1.E+02
RA-226	< 6.E+02	< 5.E+02	< 5.E+02
TH-228	< 5.E+01	< 5.E+01	1.06E+02 ± 2.77E+01

VII-9

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

SHORELINE SEDIMENT

(PCI/KG DRY)

STATION NUMBER 28

DATE COLLECTED	3/9/2020	9/4/2020
GAMMA SPECTRUM ANALYSIS:		
BE-7	< 7.E+02	< 6.E+02
K-40	1.50E+04 ± 1.70E+03	1.18E+04 ± 1.47E+03
MN-54	< 8.E+01	< 7.E+01
CO-58	< 7.E+01	< 6.E+01
FE-59	< 1.E+02	< 1.E+02
CO-60	< 7.E+01	< 5.E+01
ZN-65	< 2.E+02	< 2.E+02
ZR-95	< 1.E+02	< 1.E+02
RU-103	< 8.E+01	< 7.E+01
RU-106	< 7.E+02	< 6.E+02
I-131	< 1.E+02	< 1.E+02
CS-134	< 9.E+01	< 7.E+01
CS-137	< 7.E+01	< 6.E+01
BA-140	< 3.E+02	< 4.E+02
CE-141	< 1.E+02	< 1.E+02
CE-144	< 4.E+02	< 4.E+02
RA-226	< 2.E+03	< 1.E+03
TH-228	6.41E+02 ± 1.79E+02	4.98E+02 ± 1.30E+02

VII-9

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

SHORELINE SEDIMENT

(PCI/KG DRY)

STATION NUMBER 35

DATE COLLECTED	3/9/2020	9/4/2020
GAMMA SPECTRUM ANALYSIS:		
BE-7	< 5.E+02	< 6.E+02
K-40	1.29E+04 ± 1.26E+03	1.43E+04 ± 1.65E+03
MN-54	< 5.E+01	< 6.E+01
CO-58	< 5.E+01	< 6.E+01
FE-59	< 9.E+01	< 2.E+02
CO-60	< 5.E+01	< 6.E+01
ZN-65	< 1.E+02	< 1.E+02
ZR-95	< 9.E+01	< 1.E+02
RU-103	< 5.E+01	< 7.E+01
RU-106	< 5.E+02	< 6.E+02
I-131	< 8.E+01	< 1.E+02
CS-134	< 6.E+01	< 9.E+01
CS-137	< 6.E+01	< 8.E+01
BA-140	< 3.E+02	< 4.E+02
CE-141	< 6.E+01	< 1.E+02
CE-144	< 3.E+02	< 4.E+02
RA-226	1.60E+03 ± 9.45E+02	< 1.E+03
TH-228	5.89E+02 ± 8.74E+01	4.61E+02 ± 1.12E+02

SECTION VIII. REFERENCES

VIII. REFERENCES

1. Nebraska Public Power District, Cooper Nuclear Station Environmental Radiation Monitoring Program, Annual Report, January 1, 1982-December 31, 1982 (prepared by Teledyne Isotopes).

2. Nebraska Public Power District, Cooper Nuclear Station Environmental Radiation Monitoring Program, Annual Report, January 1, 1983-December 31, 1983 (prepared by Teledyne Isotopes).

3. Nebraska Public Power District Cooper Nuclear Station, Environmental Monitoring Program, Annual Report, January 1, 1984 to December 31, 1984. (Prepared by Teledyne Isotopes.)

4. U.S. Department of Energy; EML 440 March 1985; EML-444 April 1989; Environmental Measurements Laboratory, US Department of Energy, New York, New York 10014.

5. U.S. Environmental Protection Agency; Environmental Radiation Data, Report 35, July -- September 1983, Report 39, July -- September 1985; Report 40, October -- December 1984; Report 41, January -- March 1985. Report 42, April -- June 1985; Report 43, July-September 1985, Report 44-45, October-March 1986; Report 46, April-June 1986; Report 47, July-September 1986; Report 48, October-December 1986; Report 49, January-March 1987. Environmental Radiation Facility, Montgomery, Alabama.

6. U.S. Department of Energy; EML 460, October 1, 1986; Environmental Measurements Laboratory, US Department of Energy, New York, New York 10014.

7. U.S. Nuclear Regulatory Commission, 1975, Regulatory Guide 4.8, Environmental Technical Specifications for Nuclear Power Plants.

8. U.S. Regulatory Commission, Branch Technical Position, Radiological Monitoring Acceptable Program (November, 1979, Revision 1).

APPENDIX A
2020 LAND USE CENSUS

ANNUAL CNS LAND USE CENSUS / POTABLE WATER USE

Conducted July 23, 2020
0-3 miles

Cooper Nuclear Station (CNS) Offsite Dose Assessment Manual (ODAM) requires an annual land use census. This census identifies the location of the nearest garden that is greater than 500 square feet in area and yields leafy green vegetables, the nearest milk animal, and the location of the nearest resident in each of the 16 meteorological sectors within 3 miles of CNS.

A land use census was performed July 23, 2020, in accordance with the CNS ODAM. The nearest residence was found in sector Q, 0.9 miles from CNS, and the nearest garden was found in sector D, 1.7 miles from CNS.

No milk animals were found within 3 miles of CNS and there was no evidence of potable water use from the Missouri River within three miles of CNS.

ANNUAL CNS LAND USE CENSUS

July 23, 2020
0-3 Miles

SECTOR	NEAREST RESIDENT Distance	Direction in Degrees	NEAREST GARDEN Distance	Direction in Degrees	NEAREST MILK ANIMAL
A/N	NONE	NA	NONE	NA	NONE
B/NNE	NONE	NA	NONE	NA	NONE
C/NE	1.6 Miles	45.0°	NONE	NA	NONE
D/ENE	NONE	NA	1.7 Miles	60.0°	NONE
E/E	2.0 Miles	100.0°	NONE	NA	NONE
F/ESE	NONE	NA	2.8 Miles	107.0°	NONE
G/SE	NONE	NA	NONE	NA	NONE
H/SSE	NONE	NA	NONE	NA	NONE
J/S	NONE	NA	NONE	NA	NONE
K/SSW	NONE	NA	NONE	NA	NONE
L/SW	1.3 Miles	221.0°	2.2 Miles	230.0°	NONE
M/WSW	1.8 Miles	251.0°	2.5 Miles	251.0°	NONE
N/W	NONE	NA	NONE	NA	NONE
P/WNW	2.5 Miles	290.0°	NONE	NA	NONE
Q/NW	0.9 Miles	307.0°	NONE	NA	NONE
R/NNW	1.9 Miles	337.0°	2.6 Miles	330.0°	NONE

Yellow Highlight = Nearest Resident and Nearest Garden, respectively.

APPENDIX B
SUMMARY OF INTRALABORATORY COMPARISONS

INTERLABORATORY COMPARISION PROGRAM

The purpose of the Interlaboratory Comparison Program (ICP) is to confirm the accuracy of results produced by Teledyne Brown Engineering. Samples of various matrices (i.e. soil, water, vegetation, air filters, and milk) are spiked with known amounts of radioactivity by commercial vendors of this service and by departments within the government. TBE participates in three programs. Two are commercial, Analytics Inc. and Environmental Resource Associates (ERA) and one is a government sponsored program, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP). The DOE's MAPEP was created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities. All three programs are blind performance evaluation studies in which samples with known activities are sent to TBE for analysis. Once analyzed, TBE submits the results to the respective agency for evaluation. The results of these evaluations are published in TBE's quarterly and annual QA reports.

The National Institute of Standards and Technology (NIST) is the approval authority for laboratory providers participating in Intercomparison Study Programs; however, at this time, there are no approved laboratories for environmental and/or radiochemical isotope analyses.

For the TBE laboratory, 126 out of 133 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. A summary of the NCR dispositions is provided.

A.1 Analytics Environmental Radioactivity Cross Check Program
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***

A.1 Analytics Environmental Radioactivity Cross Check Program
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]
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
	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

A.2 DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	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

(2) Sensitivity evaluation

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

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

A.3 ERA Environmental Radioactivity Cross Check Program
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***

- NCR 20-13: 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 20-19: 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 Sr-89 loss during sample prep. The December 2020 result was at 92% of the known.

- NCR 20-17: 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 20-18: 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 20-20: 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 occurred during the sample prep step.

APPENDIX C
SYNOPSIS OF ANALYTICAL PROCEDURES

SYNOPSIS OF ANALYTICAL PROCEDURES

Appendix C is a synopsis of the analytical procedures performed during this reporting period on samples collected for the Nebraska Public Power Nuclear Plant's Radiological Environmental Monitoring Program. All analyses have been mutually agreed upon by Nebraska Public Power District and Teledyne Brown Engineering and include those recommended by the USNRC Branch Technical Position, Rev. 1, November 1979.

ANALYSIS TITLE **PAGE**

GROSS BETA ANALYSIS OF AIR PARTICULATE SAMPLES

Air Particulates

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filters are counted in a gas-flow proportional counter.

Calculations of the results, the two sigma error and the lower limit of detection (LLD):

$$\text{RESULT } (pCi/m^3) = ((S/T) - (B/t))/(2.22\ V\ E)$$

$$\text{TWO SIGMA ERROR } (pCi/m^3) = 2((S/T^2) + (B/t^2))^{1/2}/(2.22\ V\ E)$$

$$\text{LLD } (pCi/m^3) = 4.66(B^{1/2})/(2.22\ V\ E\ t)$$

where:

S	=	Gross counts of sample including blank
B	=	Counts of blank
E	=	Counting efficiency
T	=	Number of minutes sample was counted
t	=	Number of minutes blank was counted
V	=	Sample aliquot size (cubic meters)

DETERMINATION OF GROSS BETA ACTIVITY IN WATER SAMPLES

Introduction

The procedures described in this section are used to measure the overall radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved.

One liter of the sample is evaporated on a hot plate. A smaller volume may be used if the sample has a significant salt content as measured gravimetrically. If requested by the customer, the sample is filtered through No. 54 filter paper before evaporation, removing particles greater than 30 microns in size.

After evaporating to a small volume in a beaker, the sample is rinsed into a 2-inch diameter stainless steel planchette, which is stamped with a concentric ring pattern to distribute residue evenly. Final evaporation to dryness takes place under heat lamps.

Residue mass is determined by weighing the planchette before and after mounting the sample. The planchette is counted for beta activity on an automatic proportional counter. Results are calculated using empirical self-absorption curves which allow for the change in effective counting efficiency caused by the residue mass.

Detection Capability

Detection capability depends upon the sample volume actually represented on the planchette, the background and the efficiency of the counting instrument, and upon self-absorption of beta particles by the mounted sample. Because the radioactive species are not identified, no decay corrections are made and the reported activity refers to the counting time.

The minimum detectable level (MDL) for water samples is nominally 1.6 picoCuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/L at the 2.83 sigma level), assuming that 1 liter of sample is used and that 0.5 gram of sample residue is mounted on the planchette. These figures are based upon a counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively

The MDL becomes significantly lower as the mount weight decreases because of reduced self-absorption. At a zero mount weight, the 4.66 sigma MDL for gross beta is 0.9 pCi/L. These values reflect a beta counting efficiency of 0.38.

ANALYSIS OF SAMPLES FOR TRITIUM

(Liquid Scintillation)

Water

Ten milliliters of water are mixed with 10 ml of a liquid scintillation "cocktail" and then the mixture is counted in an automatic liquid scintillator.

Calculation of the results, the two sigma error and the lower limit detection (LLD) in pCi/L:

RESULT = $(N-B)/(2.22\ V\ E)$

TWO SIGMA ERROR = $2((N + B)/\Delta t)^{1/2} / (2.22\ V\ E)$

LLD = $4.66(B/\Delta t)^{1/2}/(2.22\ V\ E)$

where:

N	=	the gross cpm of the sample
B	=	the background of the detector in cpm
2.22	=	conversion factor changing dpm to pCi
V	=	volume of the sample in ml
E	=	efficiency of the detector
Δt	=	counting time for the sample

ANALYSIS OF SAMPLES FOR IODINE-131

Milk or Water

Two or more liters of sample are first equilibrated with stable iodide carrier. A batch treatment with anion exchange resin is used to remove iodine from the sample. The iodine is then stripped from the resin with sodium hypochlorite solution, is reduced with hydroxylamine hydrochloride and is extracted into carbon tetrachloride as free iodine. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchette for low-level beta counting.

Calculations of results, two sigma error and the lower limit of detection (LLD) in pCi/L:

RESULT = $(N/\Delta t - B)/(2.22\ E\ V\ Y\ DF)$

TWO SIGMA ERROR = $2((N/\Delta t + B)/\Delta t)^{1/2}/(2.22\ E\ V\ Y\ DF)$

LLD = $4.66(B/\Delta t)^{1/2}/(2.22\ E\ V\ Y\ DF)$

where:

N	=	total counts from sample (counts)
Δt	=	counting time for sample (min)
B	=	background rate of counter (cpm)
2.22	=	dpm/pCi
V	=	volume or weight of sample analyzed
Y	=	chemical yield of the mount or sample counted
DF	=	decay factor from the collection to the counting date
E	=	efficiency of the counter for I-131, corrected for self absorption effects by the formula
E	=	$E_s(\exp -0.0061M)/(\exp -0.0061M_s)$
E_s	=	efficiency of the counter determined from an I-131 standard mount
Ms	=	mass of PdI_2 on the standard mount, mg
M	=	mass of PdI_2 on the sample mount, mg

GAMMA SPECTROMETRY OF SAMPLES

Milk or Water

A 1.0 or 4.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted until detection limits are met with a shielded high purity germanium (HPGe) detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

Dried Solids other than Soils and Sediments

A large quantity of the sample is dried at a low temperature, less than 100°C. As much as possible (up to the total sample) is loaded into a tare, standard 240 cc container and weighed. The sample is then counted until detection limits are met with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

Fish

As much as possible (up to the total sample) of the edible portion of the sample is loaded into a tared Marinelli and weighed. The sample is then counted until detection limits are met with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

Soils and Sediments

Soils and sediments are dried at a low temperature, less than 100°C. The soil or sediment is loaded fully into a tared, standard 240 cc container and weighed. The sample is then counted until detection limits are met with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height and analysis.

Charcoal Cartridges (Air Iodine)

Charcoal cartridges are counted up to five at a time, with one positioned on the face of an HPGe detector and up to four on the side of the HPGe detector. Each HPGe detector is calibrated for both positions. The detection limit for iodine-131 of each charcoal cartridge can be determined (assuming no positive iodine-131) uniquely from the volume of air, which passed through it. In the event iodine-131 is observed in the initial counting of a set, each charcoal cartridge is then counted separately, positioned on the face of the detector.

Air Particulates

The thirteen airborne particulate filters for a quarterly composite for each field station are aligned one in front of another and then counted until detection limits are met with a shielded HPGe detector coupled to a VAX-based data acquisition system which performs pulse height analysis.

A VAX software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half-life, detector efficiency, and net counts in the peak region.

The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume or pCi/mass:

RESULT = $(S-B)/(2.22\ t\ E\ V\ F\ DF)$

TWO SIGMA ERROR = $2(S+B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

LLD = $4.66(B)^{1/2}/(2.22\ t\ E\ V\ F\ DF)$

where:

S	=	Area, in counts, of sample peak and background (region of spectrum of interest)
B	=	Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak
t	=	length of time in minutes the sample was counted
2.22	=	dpm/pCi
E	=	detector efficiency for energy of interest and geometry of sample
V	=	sample aliquot size (liters, cubic meters, kilograms, or grams)
F	=	fractional gamma abundance (specific for each emitted gamma)
DF	=	decay factor from the mid-collection date to the counting date

ADDENDUM TO GAMMA SPECTROMETRY PROCEDURE

Ba-140 (half-life =~12.8d) decays to LA-140 (half-life ~40 hrs) and the daughter radionuclide, La-140 approaches ~ 90 % of the Ba-140 activity within ~ 6 days. The La-140 photon energy at 1596 keV is used to quantify the Ba-140 activity due to its high photon emission probability yield (96%) producing a higher count rate when present and therefore, a smaller associated counting error.

Zr-95 (half-life = ~65d) decays to Nb-95 (half-life = ~35d). The photon energy of Nb-95 (~765 keV) is used to quantify Zr-95 because of the high photon emission probability yield (~100%) yielding a higher count rate and an associated lower counting error. The daughter radionuclide, Nb-95 approaches the Zr-95 activity after a time period of ~65 days, an estimated time interval occurring between sample exposure, collection and shipping, and analysis.

ENVIRONMENTAL DOSIMETRY

Environmental Dosimetry services are provided by Mirion Technologies. Mirion Technologies uses a thermoluminescent dosimeter (TLD) manufactured by Panasonic, Inc. Panasonic identifies it as an UD-814A1 TLD. The TLD has four elements, numbered 1-4. Elements and their filtration are composed of:

ELEMENT	MATERIAL	FILTRATION
1	$^{n}Li_2{}^{n}B_4O_7$-Cu	Thin plastic
2	$CaSO_4$-Tm	Lead
3	$CaSO_4$-Tm	Lead
4	$CaSO_4$-Tm	Lead

This material has a high light output, negligible thermally induced signal loss (fading) and negligible self-dosing. The energy response curve (as will as other features) satisfies NRC Regulatory Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Prior to being sent to Cooper Nuclear Station, the Mirion badges are exposed to Cs-137, to a known dose and read in the Panasonic UD-710 reader, with reference badges to establish an element response level for each badge. Badges are then re-annealed for assignment and distribution to Cooper Nuclear Station.

Following the field exposure the badges are returned to Mirion Technologies for processing in a Panasonic UD-710 reader. Each element is heated and the measured light emission is recorded. The transit controls are read in the same manner. Total exposure for each badge is the average of Elements 2, 3, and 4.

Transit Controls are calculated using the following equation:

$$\text{TRANSDOSE} = \frac{(E3_1 + E4_1 + E3_2 + E4_2)}{4} - \frac{(E3_{trans} + E4_{trans})}{2}$$

LOWER LIMIT of DETECTION FORMULAS

The LLD formulas in Appendix C are consistent with the LLD discussion in the ODAM. The term s_b in the ODAM equals $\sqrt{B/t}$ by Poisson statistics, where B = blank counts and t = blank counting intervals. The decay factor term $e^{-\lambda\Delta t}$ in the ODAM is the same as the DF terms in Appendix C, but does not appear in certain analyses such as gross beta because decay does not apply. In the tritium analysis, decay is not considered because of the relatively long half-life.

Efficiencies and volumes are consistent between the two documents. Chemical yields appear in Appendix C where applicable but do not apply to other analyses such as tritium and gross beta.

APPENDIX D
DETECTION LIMITS AND REPORTING LEVELS

NEBRASKA PUBLIC POWER - COOPER NUCLEAR STATION
DETECTION LIMITS AND REPORTING LEVELS

Isotope	ODAM LLD	NRC Rept. Level
Water - pCi/liter		
Gross beta	4	N/A
H-3	2000	20000[a] /30000[b]
Mn-54	15	1000
Fe-59	30	400
Co-58	15	1000
Co-60	15	300
Zn-65	30	300
Zr-95	30	400 - [Nb-95]
Nb-95	15	400 - [Zr-95]
I-131	1[c]	2
Cs-134	15	30
Cs-137	18	50
Ba-140	60	200 - [La-140]
La-140	15	200 - [Ba-140]
Air Filter - pCi/m^3		
Gross Beta	0.01	N/A
I-131	0.07	0.9
Cs-134	0.05	10
Cs-137	0.06	20
Fish - pCi/kg-wet		
Mn-54	130	30000
Fe-59	260	10000
Co-58	130	30000
Co-60	130	10000
Zn-65	260	20000
Cs-134	130	1000
Cs-137	150	2000
Milk - pCi/liter		
I-131	1	3
Cs-134	15	60
Cs-137	18	70
Ba-140	60	300 - [La-140]
La-140	15	300 - [Ba-140]

(a) For drinking water samples
(b) For samples of water not used as a source of drinking water
(c) LLD for drinking water

NEBRASKA PUBLIC POWER - COOPER NUCLEAR STATION
DETECTION LIMITS AND REPORTING LEVELS

Isotope	ODAM LLD	NRC Rept. Level
Vegetation - pCi/kg-wet		
I-131	60	100
Cs-134	60	1000
Cs-137	80	2000
Sediment - pCi/kg-dry		
Cs-134	150	N/A
Cs-137	180	N/A

APPENDIX E
REMP SAMPLING AND ANALYTICAL EXCEPTIONS

EXCEPTIONS

Appendix E contains the exceptions to the 2020 REMP Program. Where possible, causes of the deviation have been corrected to prevent recurrence.

Any deviations from the sampling schedule are documented on the data tables. Data Tables are in Section VII.

2020 Exceptions Table

Condition Report Number (CR-CNS-)	Requirement	Analyses Impacted	Cause of Exception	Location Where Replacement Samples were Obtained
There were no REMP Sampling or Analytical Exceptions in 2020				

APPENDIX F

SUMMARY OF DOSES TO A MEMBER OF THE PUBLIC OFFSITE

LIQUID EFFLUENT DOSE CALCULATIONS

Doses to the maximum individual and 0 to 50 - mile population resulting from the release of radioactive material in liquid effluents from Cooper Nuclear Station were calculated using the latest version of the LADTAP II computer program included as part of NRCDose 2.3.20 (ORNL 2015). The LADTAP II program implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from three principal exposure pathways in the aquatic environment -- potable water, aquatic foods, and recreational water use. Doses to both the maximum individual and 0 to 50 mile population are calculated as a function of age group and pathway for significant body organs, and are presented in Tables 1 - 6.

Assumptions and data sources used for input to the LADTAP II code are described in a separate section of this appendix (see page F-67).

TABLE 1. Doses to Maximum Individual at the Site Boundary, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, January-June 2020 Cooper Nuclear Station

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
1st Quarter								
Drinking Water		2.96 E-04	3.52 E-03	3.38 E-03	3.05 E-03	3.22 E-03	3.09 E-03	3.61 E-03
Shoreline	1.70 E-04	1.44 E-04	1.44 E-04	1.44 E-04	1.44 E-04	1.44 E-04	1.44 E-04	1.44 E-04
Totals	**1.70 E-04**	**4.40 E-04**	**3.66 E-03**	**3.52 E-03**	**3.19 E-03**	**3.36 E-03**	**3.23 E-03**	**3.75 E-03**
2nd Quarter								
Eating Fish		2.40 E-02	3.30 E-02	2.17 E-02	4.77 E-05	1.13 E-02	3.74 E-03	2.36 E-03
Drinking Water		4.16 E-04	2.47 E-03	2.34 E-03	1.84 E-03	2.04 E-03	1.91 E-03	2.95 E-03
Shoreline	3.55 E-04	3.02 E-04	3.02 E-04	3.02 E-04	3.02 E-04	3.02 E-04	3.02 E-04	3.02 E-04
Totals	**3.55 E-04**	**2.47 E-02**	**3.58 E-02**	**2.44 E-02**	**2.19 E-03**	**1.36 E-02**	**5.94 E-03**	**5.62 E-03**
Totals for 1st & 2nd Quarters	**5.25 E-04**	**2.51 E-02**	**3.95 E-02**	**2.79 E-02**	**5.38 E-03**	**1.70 E-02**	**9.17 E-03**	**9.37 E-03**

Calculated doses are based on the following periods of exposures: Fishing: April - November; Drinking water and shoreline: January - December

TABLE 2. Doses to Maximum Individual at the Site Boundary, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, July-December 2020, Cooper Nuclear Station

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
3rd Quarter								
Eating Fish		1.65 E-02	2.27 E-02	1.49 E-02	3.82 E-05	7.76 E-03	2.58 E-03	1.07 E-03
Drinking Water		2.78 E-04	1.89 E-03	1.78 E-03	1.48 E-03	1.61 E-03	1.52 E-03	1.85 E-03
Shoreline	1.31 E-04	1.12 E-04	1.12 E-04	1.12 E-04	1.12 E-04	1.12 E-04	1.12 E-04	1.12 E-04
Totals	**1.31 E-04**	**1.69 E-02**	**2.47 E-02**	**1.68 E-02**	**1.63 E-03**	**9.48 E-03**	**4.21 E-03**	**3.03 E-03**
4th Quarter								
Eating Fish		1.87 E-02	2.67 E-02	1.87 E-02	5.79 E-05	8.82 E-03	2.94 E-03	1.72 E-02
Drinking Water		3.28 E-04	3.29 E-03	3.82 E-03	2.24 E-03	2.40 E-03	2.29 E-03	1.34 E-02
Shoreline	3.23 E-03	2.74 E-03	2.74 E-03	2.74 E-03	2.74 E-03	2.74 E-03	2.74 E-03	2.74 E-03
Totals	**3.23 E-03**	**2.18 E-02**	**3.28 E-02**	**2.53 E-02**	**5.04 E-03**	**1.40 E-02**	**7.97 E-03**	**3.33 E-02**
Totals for 3rd & 4th Quarters	**3.36 E-03**	**3.87 E-02**	**5.75 E-02**	**4.21 E-02**	**6.67 E-03**	**3.25 E-02**	**1.22 E-02**	**3.63 E-02**

Calculated doses are based on the following periods of exposures: Fishing: April - November; Drinking water and shoreline: January - December

TABLE 3. Summary of Doses to Maximum Individual at the Site Boundary, Resulting from Exposure to Radioactivity Discharged in Liquid Effluents, January-December 2020, Cooper Nuclear Station

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
1st Quarter	1.70 E-04	4.40 E-04	3.66 E-03	3.52 E-03	3.19 E-03	3.63 E-03	3.23 E-03	3.75 E-03
2nd Quarter	3.55 E-04	2.47 E-02	3.58 E-02	2.44 E-02	2.19 E-03	1.36 E-02	5.94 E-03	5.62 E-03
3rd Quarter	1.31 E-04	1.69 E-02	2.47 E-02	1.68 E-02	1.63 E-03	9.48 E-03	4.21 E-03	3.03 E-03
4th Quarter	3.23 E-03	2.18 E-02	3.28 E-02	2.53 E-02	5.04 E-03	1.40 E-02	7.97 E-03	3.33 E-02
Totals for 2020	**3.89 E-03**	**6.38 E-02**	**9.70 E-02**	**7.00 E-02**	**1.21 E-02**	**4.04 E-02**	**2.14 E-02**	**4.57 E-02**

TABLE 4. Doses to Population Within a 50-Mile Radius, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, January-June 2020, Cooper Nuclear Station

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
1st Quarter								
Drinking Water		8.89 E-03	8.44 E-02	7.91 E-02	7.19 E-02	7.64 E-02	7.31 E-02	8.31 E-02
Shoreline	5.28 E-03	0.00 E+00	0.00 E+00	4.50 E-03	4.50 E-03	0.00 E+00	0.00 E+00	0.00 E+00
Totals	**5.28 E-03**	**8.89 E-03**	**8.44 E-02**	**8.36 E-02**	**7.64 E-02**	**7.64 E-02**	**7.31 E-02**	**8.31 E-02**
2nd Quarter								
Eating Fish		3.49 E-02	4.47 E-02	2.41 E-02	5.91 E-05	1.51 E-02	5.19 E-03	2.69 E-03
Drinking Water		1.27 E-02	6.04 E-02	5.44 E-02	4.35 E-02	4.87 E-02	4.53 E-02	6.57 E-02
Shoreline	1.11 E-02	0.00 E+00	0.00 E+00	9.40 E-03	9.40 E-03	0.00 E+00	0.00 E+00	0.00 E+00
Swimming	0.00 E+00	0.00 E+00	0.00 E+00	4.86 E-05	4.86 E-05	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	1.78 E-04	1.78 E-04	0.00 E+00	0.00 E+00	0.00 E+00
Totals	**1.11 E-02**	**4.76 E-02**	**1.05 E-01**	**8.81 E-02**	**5.32 E-02**	**6.38 E-02**	**5.05 E-02**	**6.84 E-02**
Totals for 1st & 2nd Quarters	**1.64 E-02**	**5.65 E-02**	**1.90 E-01**	**1.72 E-01**	**1.30 E-01**	**1.40 E-01**	**1.24 E-01**	**1.51 E-01**

Calculated doses are based on the following periods of exposures: Fishing and Boating: April - November; Drinking water and shoreline: January - December; Swimming: June - September. Exposure from drinking water is calculated for the city of St. Joseph, Missouri, nearest public water intake from the Missouri River, 84 miles downstream.

TABLE 5. Doses to Population Within a 50-Mile Radius, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, July-December 2020, Cooper Nuclear Station

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
3rd Quarter								
Eating Fish		3.90 E-02	4.98 E-02	2.68 E-02	7.67 E-05	1.69 E-02	5.81 E-03	1.98 E-03
Drinking Water		1.42 E-02	7.44 E-02	6.65 E-02	5.64 E-02	6.22 E-02	5.84 E-02	6.86 E-02
Shoreline	6.62 E-03	0.00 E+00	0.00 E+00	5.64 E-03	5.64 E-03	0.00 E+00	0.00 E+00	0.00 E+00
Swimming	0.00 E+00	0.00 E+00	0.00 E+00	2.76 E-05	2.76 E-05	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	1.01 E-04	1.01 E-04	0.00 E+00	0.00 E+00	0.00 E+00
Totals	**6.62 E-03**	**5.32 E-02**	**1.24 E-01**	**9.91 E-02**	**6.22 E-02**	**7.91 E-02**	**6.42 E-02**	**7.06 E-02**
4th Quarter								
Eating Fish		3.65 E-02	4.84 E-02	2.84 E-02	9.61 E-05	1.59 E-02	5.47 E-03	2.60 E-02
Drinking Water		1.34 E-02	1.08 E-01	1.27 E-01	7.07 E-02	7.63 E-02	7.26 E-02	3.68 E-01
Shoreline	1.35 E-01	0.00 E+00	0.00 E+00	1.14 E-01	1.14 E-01	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	2.31 E-03	2.31 E-03	0.00 E+00	0.00 E+00	0.00 E+00
Totals	**1.35 E-01**	**4.99 E-02**	**1.56 E-01**	**2.72 E-01**	**1.87 E-01**	**9.22 E-02**	**7.81 E-02**	**3.94 E-01**
Totals for 3rd & 4th Quarters	**1.42 E-01**	**1.03 E-01**	**2.81 E-01**	**3.71 E-01**	**2.49 E-01**	**1.71 E-01**	**1.42 E-01**	**4.65 E-01**

Calculated doses are based on the following periods of exposures: Fishing and Boating: April - November; Drinking water and shoreline: January - December; Swimming: June - September. Exposure from drinking water is calculated for the city of St. Joseph, Missouri, nearest public water intake from the Missouri River, 84 miles downstream.

TABLE 6. Summary of Doses to Population Within a 50-Mile Radius, Resulting from Exposure to Radioactivity Discharged in Liquid Effluents, January-December 2020 Cooper Nuclear Station

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
1st Quarter	5.28 E-03	8.89 E-03	8.44 E-02	8.36 E-02	7.64 E-02	7.64 E-02	7.31 E-02	8.31 E-02
2nd Quarter	1.11 E-02	4.76 E-02	1.05 E-01	8.81 E-02	5.32 E-02	6.38 E-02	5.05 E-02	6.84 E-02
3rd Quarter	6.62 E-03	5.32 E-02	1.24 E-01	9.91 E-02	6.22 E-02	7.91 E-02	6.42 E-02	7.06 E-02
4th Quarter	1.35 E-01	4.99 E-02	1.56 E-01	2.72 E-01	1.87 E-01	9.22 E-02	7.81 E-02	3.94 E-01
Totals for 2020	**1.58 E-01**	**1.60 E-01**	**4.70 E-01**	**5.43 E-01**	**3.79 E-01**	**3.12 E-01**	**2.66 E-01**	**6.16 E-01**

GASEOUS EFFLUENT DOSE CALCULATIONS (EXCEPT CARBON-14)

Doses to the maximum individual and 0 to 50 mile population resulting from the release of radioactive material in gaseous effluents from the Cooper Nuclear Station were calculated using the latest version of the GASPAR computer code included as part of NRCDose 2.3.20 (ORNL 2015). Four sites were selected for individual dose calculations: the site boundary, the nearest residence, the nearest garden and the nearest cow. GASPAR implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground, inhalation, and ingestion. Doses to the maximum individual and the population are calculated as a function of age group and pathway for significant body organs.

Tables 1 through 7 present maximum individual doses. Population doses are given in Tables 8 through 14.

Assumptions and data used for input to the GASPAR code are described in a separate section of this appendix (see page F-67).

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 6.72E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.09E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.34E-06	7.34E-06	7.34E-06	7.34E-06	7.34E-06	7.34E-06	7.40E-06	1.44E-05
GROUND	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.01E-05	2.35E-05
VEGET								
ADULT	5.21E-06	1.99E-06	6.28E-06	8.00E-06	5.07E-06	5.58E-04	7.00E-07	0.00E+00
TEEN	5.10E-06	2.16E-06	1.01E-05	1.26E-05	7.84E-06	7.50E-04	1.31E-06	0.00E+00
CHILD	5.52E-06	1.49E-06	2.38E-05	2.16E-05	1.27E-05	1.44E-03	2.00E-06	0.00E+00
MEAT								
ADULT	4.01E-07	3.85E-07	4.08E-07	5.71E-07	2.50E-07	1.49E-05	5.72E-08	0.00E+00
TEEN	1.96E-07	2.09E-07	3.39E-07	4.61E-07	2.03E-07	1.08E-05	5.41E-08	0.00E+00
CHILD	1.61E-07	1.06E-07	6.23E-07	6.09E-07	2.58E-07	1.63E-05	6.36E-08	0.00E+00
COW MILK								
ADULT	3.56E-06	5.73E-07	4.09E-06	5.63E-06	3.76E-06	4.24E-04	4.84E-07	0.00E+00
TEEN	3.89E-06	7.61E-07	7.41E-06	9.95E-06	6.68E-06	6.71E-04	1.00E-06	0.00E+00
CHILD	4.28E-06	6.01E-07	1.79E-05	1.73E-05	1.11E-05	1.33E-03	1.54E-06	0.00E+00
INFANT	6.24E-06	5.90E-07	3.05E-05	3.58E-05	1.87E-05	3.24E-03	2.78E-06	0.00E+00
GOATMILK								
ADULT	9.32E-06	7.53E-07	1.06E-05	1.45E-05	7.13E-06	5.08E-04	1.45E-06	0.00E+00
TEEN	9.40E-06	1.01E-06	1.92E-05	2.55E-05	1.26E-05	8.06E-04	3.00E-06	0.00E+00
CHILD	8.58E-06	8.05E-07	4.62E-05	4.43E-05	2.10E-05	1.60E-03	4.61E-06	0.00E+00
INFANT	1.07E-05	7.95E-07	7.61E-05	8.90E-05	3.49E-05	3.89E-03	8.34E-06	0.00E+00
INHAL								
ADULT	1.88E-07	3.07E-07	2.60E-07	3.91E-07	5.31E-07	6.05E-05	1.27E-06	0.00E+00
TEEN	2.07E-07	1.23E-06	3.65E-07	5.37E-07	7.34E-07	7.77E-05	2.01E-06	0.00E+00
CHILD	1.97E-07	9.56E-06	4.95E-07	5.28E-07	6.89E-07	9.37E-05	1.72E-06	0.00E+00
INFANT	1.34E-07	8.40E-06	3.65E-07	4.67E-07	4.53E-07	8.61E-05	1.47E-06	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 3.64E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.92E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.97E-06	3.97E-06	3.97E-06	3.97E-06	3.97E-06	3.97E-06	4.01E-06	7.81E-06
GROUND	1.46E-05	1.46E-05	1.46E-05	1.46E-05	1.46E-05	1.46E-05	1.46E-05	1.71E-05
VEGET								
ADULT	3.80E-06	1.45E-06	4.57E-06	5.83E-06	3.69E-06	4.06E-04	5.10E-07	0.00E+00
TEEN	3.72E-06	1.57E-06	7.34E-06	9.19E-06	5.71E-06	5.46E-04	9.56E-07	0.00E+00
CHILD	4.02E-06	1.08E-06	1.73E-05	1.57E-05	9.26E-06	1.05E-03	1.45E-06	0.00E+00
MEAT								
ADULT	2.92E-07	2.80E-07	2.97E-07	4.16E-07	1.82E-07	1.08E-05	4.17E-08	0.00E+00
TEEN	1.43E-07	1.52E-07	2.47E-07	3.36E-07	1.48E-07	7.85E-06	3.94E-08	0.00E+00
CHILD	1.17E-07	7.76E-08	4.54E-07	4.44E-07	1.88E-07	1.19E-05	4.63E-08	0.00E+00
COW MILK								
ADULT	2.60E-06	4.17E-07	2.98E-06	4.10E-06	2.74E-06	3.08E-04	3.53E-07	0.00E+00
TEEN	2.84E-06	5.54E-07	5.40E-06	7.25E-06	4.86E-06	4.89E-04	7.29E-07	0.00E+00
CHILD	3.12E-06	4.38E-07	1.30E-05	1.26E-05	8.08E-06	9.71E-04	1.12E-06	0.00E+00
INFANT	4.54E-06	4.30E-07	2.22E-05	2.61E-05	1.37E-05	2.36E-03	2.03E-06	0.00E+00
GOATMILK								
ADULT	6.79E-06	5.48E-07	7.70E-06	1.05E-05	5.19E-06	3.70E-04	1.06E-06	0.00E+00
TEEN	6.85E-06	7.34E-07	1.40E-05	1.86E-05	9.21E-06	5.86E-04	2.19E-06	0.00E+00
CHILD	6.25E-06	5.86E-07	3.36E-05	3.23E-05	1.53E-05	1.17E-03	3.36E-06	0.00E+00
INFANT	7.79E-06	5.79E-07	5.54E-05	6.48E-05	2.54E-05	2.83E-03	6.08E-06	0.00E+00
INHAL								
ADULT	1.62E-07	2.63E-07	2.23E-07	3.36E-07	4.57E-07	5.21E-05	1.08E-06	0.00E+00
TEEN	1.78E-07	1.06E-06	3.14E-07	4.62E-07	6.32E-07	6.69E-05	1.72E-06	0.00E+00
CHILD	1.69E-07	8.19E-06	4.26E-07	4.55E-07	5.93E-07	8.07E-05	1.47E-06	0.00E+00
INFANT	1.15E-07	7.19E-06	3.14E-07	4.02E-07	3.90E-07	7.42E-05	1.26E-06	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 6.16E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.00E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.73E-05	6.79E-05	1.32E-04
GROUND	5.71E-06	5.71E-06	5.71E-06	5.71E-06	5.71E-06	5.71E-06	5.71E-06	6.69E-06
VEGET								
ADULT	1.54E-06	6.82E-07	2.86E-06	2.34E-06	1.61E-06	1.94E-04	1.94E-07	0.00E+00
TEEN	1.55E-06	7.51E-07	4.43E-06	3.68E-06	2.49E-06	2.61E-04	3.63E-07	0.00E+00
CHILD	1.79E-06	5.30E-07	1.02E-05	6.28E-06	4.03E-06	5.00E-04	5.53E-07	0.00E+00
MEAT								
ADULT	1.14E-07	1.13E-07	1.27E-07	1.62E-07	7.47E-08	5.18E-06	1.58E-08	0.00E+00
TEEN	5.64E-08	6.15E-08	1.04E-07	1.31E-07	6.07E-08	3.75E-06	1.50E-08	0.00E+00
CHILD	4.75E-08	3.15E-08	1.91E-07	1.72E-07	7.71E-08	5.67E-06	1.76E-08	0.00E+00
COW MILK								
ADULT	1.04E-06	1.90E-07	1.24E-06	1.65E-06	1.20E-06	1.47E-04	1.34E-07	0.00E+00
TEEN	1.17E-06	2.54E-07	2.24E-06	2.92E-06	2.13E-06	2.33E-04	2.77E-07	0.00E+00
CHILD	1.35E-06	2.01E-07	5.40E-06	5.07E-06	3.55E-06	4.63E-04	4.26E-07	0.00E+00
INFANT	2.04E-06	1.98E-07	9.28E-06	1.06E-05	6.02E-06	1.12E-03	7.70E-07	0.00E+00
GOATMILK								
ADULT	2.65E-06	2.48E-07	3.10E-06	4.12E-06	2.17E-06	1.77E-04	4.02E-07	0.00E+00
TEEN	2.71E-06	3.32E-07	5.60E-06	7.28E-06	3.85E-06	2.80E-04	8.31E-07	0.00E+00
CHILD	2.58E-06	2.66E-07	1.35E-05	1.26E-05	6.39E-06	5.55E-04	1.28E-06	0.00E+00
INFANT	3.34E-06	2.63E-07	2.23E-05	2.55E-05	1.06E-05	1.35E-03	2.31E-06	0.00E+00
INHAL								
ADULT	4.16E-08	7.06E-08	5.92E-08	8.70E-08	1.20E-07	1.37E-05	2.79E-07	0.00E+00
TEEN	4.63E-08	2.79E-07	8.29E-08	1.20E-07	1.65E-07	1.76E-05	4.44E-07	0.00E+00
CHILD	4.47E-08	2.15E-06	1.12E-07	1.18E-07	1.55E-07	2.12E-05	3.80E-07	0.00E+00
INFANT	3.05E-08	1.89E-06	8.24E-08	1.04E-07	1.02E-07	1.95E-05	3.27E-07	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 3.08E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.01E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.36E-05	3.36E-05	3.36E-05	3.36E-05	3.36E-05	3.36E-05	3.39E-05	6.61E-05
GROUND	2.65E-07	2.65E-07	2.65E-07	2.65E-07	2.65E-07	2.65E-07	2.65E-07	3.10E-07
VEGET								
ADULT	7.36E-08	3.64E-08	1.77E-07	1.11E-07	8.16E-08	1.04E-05	8.78E-09	0.00E+00
TEEN	7.58E-08	4.05E-08	2.70E-07	1.74E-07	1.26E-07	1.40E-05	1.65E-08	0.00E+00
CHILD	9.18E-08	2.90E-08	6.15E-07	2.97E-07	2.03E-07	2.68E-05	2.50E-08	0.00E+00
MEAT								
ADULT	5.26E-09	5.41E-09	6.36E-09	7.47E-09	3.61E-09	2.78E-07	7.17E-10	0.00E+00
TEEN	2.64E-09	2.94E-09	5.17E-09	6.03E-09	2.94E-09	2.02E-07	6.79E-10	0.00E+00
CHILD	2.28E-09	1.51E-09	9.40E-09	7.97E-09	3.73E-09	3.04E-07	7.98E-10	0.00E+00
COW MILK								
ADULT	4.93E-08	9.87E-09	6.10E-08	7.87E-08	6.08E-08	7.88E-06	6.07E-09	0.00E+00
TEEN	5.65E-08	1.32E-08	1.10E-07	1.39E-07	1.08E-07	1.25E-05	1.25E-08	0.00E+00
CHILD	6.79E-08	1.04E-08	2.63E-07	2.41E-07	1.80E-07	2.48E-05	1.93E-08	0.00E+00
INFANT	1.05E-07	1.03E-08	4.54E-07	5.09E-07	3.06E-07	6.02E-05	3.49E-08	0.00E+00
GOATMILK								
ADULT	1.23E-07	1.28E-08	1.48E-07	1.91E-07	1.06E-07	9.46E-06	1.82E-08	0.00E+00
TEEN	1.27E-07	1.71E-08	2.66E-07	3.38E-07	1.88E-07	1.50E-05	3.76E-08	0.00E+00
CHILD	1.25E-07	1.37E-08	6.39E-07	5.86E-07	3.12E-07	2.97E-05	5.79E-08	0.00E+00
INFANT	1.67E-07	1.36E-08	1.06E-06	1.19E-06	5.22E-07	7.23E-05	1.05E-07	0.00E+00
INHAL								
ADULT	4.19E-09	6.52E-09	6.62E-09	8.81E-09	1.25E-08	1.47E-06	2.18E-08	0.00E+00
TEEN	4.82E-09	1.92E-08	9.14E-09	1.21E-08	1.72E-08	1.88E-06	3.43E-08	0.00E+00
CHILD	4.82E-09	1.28E-07	1.23E-08	1.19E-08	1.62E-08	2.26E-06	2.92E-08	0.00E+00
INFANT	3.33E-09	1.12E-07	8.85E-09	1.07E-08	1.07E-08	2.07E-06	2.42E-08	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 4.20E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 6.84E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.63E-06	9.02E-06
GROUND	3.81E-07	3.81E-07	3.81E-07	3.81E-07	3.81E-07	3.81E-07	3.81E-07	4.46E-07
VEGET								
ADULT	1.00E-07	4.07E-08	1.46E-07	1.53E-07	1.01E-07	1.15E-05	1.32E-08	0.00E+00
TEEN	9.93E-08	4.44E-08	2.31E-07	2.42E-07	1.55E-07	1.54E-05	2.46E-08	0.00E+00
CHILD	1.10E-07	3.10E-08	5.39E-07	4.13E-07	2.52E-07	2.96E-05	3.75E-08	0.00E+00
MEAT								
ADULT	7.59E-09	7.40E-09	8.03E-09	1.08E-08	4.84E-09	3.07E-07	1.07E-09	0.00E+00
TEEN	3.74E-09	4.01E-09	6.63E-09	8.74E-09	3.93E-09	2.22E-07	1.02E-09	0.00E+00
CHILD	3.09E-09	2.05E-09	1.22E-08	1.15E-08	4.99E-09	3.35E-07	1.19E-09	0.00E+00
COW MILK								
ADULT	6.83E-08	1.16E-08	7.96E-08	1.08E-07	7.46E-08	8.71E-06	9.09E-09	0.00E+00
TEEN	7.54E-08	1.54E-08	1.44E-07	1.91E-07	1.33E-07	1.38E-05	1.88E-08	0.00E+00
CHILD	8.46E-08	1.22E-08	3.47E-07	3.32E-07	2.21E-07	2.74E-05	2.89E-08	0.00E+00
INFANT	1.25E-07	1.20E-08	5.94E-07	6.90E-07	3.73E-07	6.67E-05	5.22E-08	0.00E+00
GOATMILK								
ADULT	1.77E-07	1.51E-08	2.03E-07	2.75E-07	1.39E-07	1.05E-05	2.73E-08	0.00E+00
TEEN	1.79E-07	2.03E-08	3.68E-07	4.85E-07	2.46E-07	1.66E-05	5.64E-08	0.00E+00
CHILD	1.66E-07	1.62E-08	8.85E-07	8.41E-07	4.09E-07	3.29E-05	8.66E-08	0.00E+00
INFANT	2.11E-07	1.60E-08	1.46E-06	1.69E-06	6.80E-07	8.00E-05	1.57E-07	0.00E+00
INHAL								
ADULT	6.40E-09	1.05E-08	8.98E-09	1.34E-08	1.85E-08	2.12E-06	4.18E-08	0.00E+00
TEEN	7.11E-09	4.15E-08	1.26E-08	1.84E-08	2.55E-08	2.72E-06	6.64E-08	0.00E+00
CHILD	6.85E-09	3.18E-07	1.71E-08	1.81E-08	2.40E-08	3.28E-06	5.68E-08	0.00E+00
INFANT	4.68E-09	2.80E-07	1.26E-08	1.61E-08	1.58E-08	3.01E-06	4.88E-08	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .65 MILES SE

ANNUAL BETA AIR DOSE = 6.71E-07 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.41E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.41E-07	9.41E-07	9.41E-07	9.41E-07	9.41E-07	9.41E-07	9.47E-07	1.67E-06
GROUND	5.33E-05	5.33E-05	5.33E-05	5.33E-05	5.33E-05	5.33E-05	5.33E-05	6.26E-05
VEGET								
ADULT	7.69E-06	7.99E-06	2.22E-05	1.07E-05	5.44E-06	4.47E-04	1.02E-06	0.00E+00
TEEN	7.75E-06	8.94E-06	3.66E-05	1.69E-05	8.47E-06	6.00E-04	1.90E-06	0.00E+00
CHILD	9.20E-06	6.32E-06	8.86E-05	2.88E-05	1.38E-05	1.15E-03	2.89E-06	0.00E+00
MEAT								
ADULT	6.67E-07	1.42E-06	7.05E-07	8.44E-07	3.12E-07	1.19E-05	8.29E-08	0.00E+00
TEEN	3.54E-07	7.66E-07	5.87E-07	6.80E-07	2.53E-07	8.61E-06	7.85E-08	0.00E+00
CHILD	3.43E-07	3.90E-07	1.09E-06	8.93E-07	3.21E-07	1.30E-05	9.22E-08	0.00E+00
COW MILK								
ADULT	4.73E-06	8.71E-07	5.98E-06	7.32E-06	3.98E-06	3.41E-04	7.02E-07	0.00E+00
TEEN	4.92E-06	1.13E-06	1.09E-05	1.29E-05	7.06E-06	5.40E-04	1.45E-06	0.00E+00
CHILD	4.88E-06	8.58E-07	2.63E-05	2.24E-05	1.17E-05	1.07E-03	2.23E-06	0.00E+00
INFANT	6.53E-06	8.27E-07	4.45E-05	4.55E-05	1.96E-05	2.61E-03	4.03E-06	0.00E+00
GOATMILK								
ADULT	1.30E-05	1.04E-06	1.60E-05	2.00E-05	8.57E-06	4.09E-04	2.11E-06	0.00E+00
TEEN	1.27E-05	1.39E-06	2.90E-05	3.52E-05	1.52E-05	6.48E-04	4.35E-06	0.00E+00
CHILD	1.09E-05	1.10E-06	7.01E-05	6.11E-05	2.52E-05	1.29E-03	6.69E-06	0.00E+00
INFANT	1.25E-05	1.09E-06	1.16E-04	1.21E-04	4.15E-05	3.13E-03	1.21E-05	0.00E+00
INHAL								
ADULT	1.92E-07	2.87E-07	3.14E-07	3.77E-07	4.63E-07	4.87E-05	2.41E-06	0.00E+00
TEEN	2.01E-07	3.00E-07	4.43E-07	5.19E-07	6.41E-07	6.29E-05	3.60E-06	0.00E+00
CHILD	1.82E-07	1.47E-07	6.03E-07	5.09E-07	6.01E-07	7.66E-05	2.96E-06	0.00E+00
INFANT	1.19E-07	6.05E-08	4.26E-07	4.41E-07	3.95E-07	7.04E-05	2.02E-06	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .81 MILES SSE

ANNUAL BETA AIR DOSE = 3.77E-07 MILLRADS
ANNUAL GAMMA AIR DOSE = 8.82E-07 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.87E-07	5.87E-07	5.87E-07	5.87E-07	5.87E-07	5.87E-07	5.89E-07	9.95E-07
GROUND	6.35E-05	6.35E-05	6.35E-05	6.35E-05	6.35E-05	6.35E-05	6.35E-05	7.46E-05
VEGET								
ADULT	9.12E-06	9.53E-06	2.63E-05	1.26E-05	6.50E-06	5.42E-04	1.20E-06	0.00E+00
TEEN	9.20E-06	1.07E-05	4.34E-05	2.00E-05	1.01E-05	7.27E-04	2.25E-06	0.00E+00
CHILD	1.10E-05	7.53E-06	1.05E-04	3.41E-05	1.65E-05	1.39E-03	3.42E-06	0.00E+00
MEAT								
ADULT	7.90E-07	1.69E-06	8.34E-07	9.99E-07	3.70E-07	1.44E-05	9.79E-08	0.00E+00
TEEN	4.20E-07	9.14E-07	6.95E-07	8.04E-07	3.00E-07	1.04E-05	9.26E-08	0.00E+00
CHILD	4.09E-07	4.65E-07	1.29E-06	1.06E-06	3.81E-07	1.58E-05	1.09E-07	0.00E+00
COW MILK								
ADULT	5.60E-06	1.04E-06	7.09E-06	8.68E-06	4.76E-06	4.13E-04	8.29E-07	0.00E+00
TEEN	5.84E-06	1.35E-06	1.29E-05	1.53E-05	8.45E-06	6.55E-04	1.71E-06	0.00E+00
CHILD	5.83E-06	1.03E-06	3.12E-05	2.66E-05	1.40E-05	1.30E-03	2.63E-06	0.00E+00
INFANT	7.83E-06	9.92E-07	5.28E-05	5.39E-05	2.35E-05	3.17E-03	4.76E-06	0.00E+00
GOATMILK								
ADULT	1.54E-05	1.24E-06	1.89E-05	2.36E-05	1.02E-05	4.96E-04	2.49E-06	0.00E+00
TEEN	1.51E-05	1.66E-06	3.43E-05	4.17E-05	1.81E-05	7.86E-04	5.14E-06	0.00E+00
CHILD	1.29E-05	1.32E-06	8.29E-05	7.22E-05	3.00E-05	1.56E-03	7.89E-06	0.00E+00
INFANT	1.49E-05	1.30E-06	1.37E-04	1.43E-04	4.93E-05	3.80E-03	1.43E-05	0.00E+00
INHAL								
ADULT	2.00E-07	2.99E-07	3.27E-07	3.93E-07	4.84E-07	5.09E-05	2.51E-06	0.00E+00
TEEN	2.09E-07	3.15E-07	4.61E-07	5.41E-07	6.69E-07	6.57E-05	3.74E-06	0.00E+00
CHILD	1.89E-07	1.71E-07	6.28E-07	5.30E-07	6.28E-07	8.00E-05	3.08E-06	0.00E+00
INFANT	1.25E-07	7.89E-08	4.44E-07	4.60E-07	4.12E-07	7.35E-05	2.10E-06	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.70E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 3.57E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.39E-05	2.39E-05	2.39E-05	2.39E-05	2.39E-05	2.39E-05	2.40E-05	4.25E-05
GROUND	3.83E-05	3.83E-05	3.83E-05	3.83E-05	3.83E-05	3.83E-05	3.83E-05	4.50E-05
VEGET								
ADULT	5.34E-06	5.83E-06	1.56E-05	7.39E-06	4.02E-06	3.69E-04	6.82E-07	0.00E+00
TEEN	5.46E-06	6.51E-06	2.57E-05	1.17E-05	6.24E-06	4.96E-04	1.28E-06	0.00E+00
CHILD	6.66E-06	4.60E-06	6.22E-05	1.99E-05	1.01E-05	9.49E-04	1.94E-06	0.00E+00
MEAT								
ADULT	4.61E-07	1.04E-06	4.82E-07	5.77E-07	2.19E-07	9.83E-06	5.57E-08	0.00E+00
TEEN	2.48E-07	5.62E-07	4.02E-07	4.64E-07	1.78E-07	7.12E-06	5.27E-08	0.00E+00
CHILD	2.46E-07	2.86E-07	7.45E-07	6.10E-07	2.25E-07	1.07E-05	6.19E-08	0.00E+00
COW MILK								
ADULT	3.27E-06	6.59E-07	4.16E-06	5.08E-06	2.96E-06	2.81E-04	4.71E-07	0.00E+00
TEEN	3.46E-06	8.53E-07	7.55E-06	8.98E-06	5.25E-06	4.46E-04	9.74E-07	0.00E+00
CHILD	3.58E-06	6.52E-07	1.83E-05	1.56E-05	8.73E-06	8.87E-04	1.50E-06	0.00E+00
INFANT	4.95E-06	6.29E-07	3.12E-05	3.18E-05	1.46E-05	2.16E-03	2.71E-06	0.00E+00
GOATMILK								
ADULT	8.83E-06	7.69E-07	1.09E-05	1.36E-05	6.10E-06	3.38E-04	1.41E-06	0.00E+00
TEEN	8.75E-06	1.03E-06	1.98E-05	2.40E-05	1.08E-05	5.35E-04	2.92E-06	0.00E+00
CHILD	7.64E-06	8.19E-07	4.79E-05	4.16E-05	1.80E-05	1.06E-03	4.49E-06	0.00E+00
INFANT	9.06E-06	8.12E-07	7.95E-05	8.29E-05	2.96E-05	2.59E-03	8.12E-06	0.00E+00
INHAL								
ADULT	8.10E-08	1.30E-07	1.33E-07	1.61E-07	2.01E-07	2.12E-05	1.02E-06	0.00E+00
TEEN	8.54E-08	1.63E-07	1.87E-07	2.21E-07	2.78E-07	2.74E-05	1.53E-06	0.00E+00
CHILD	7.81E-08	3.35E-07	2.55E-07	2.17E-07	2.61E-07	3.34E-05	1.26E-06	0.00E+00
INFANT	5.16E-08	2.65E-07	1.81E-07	1.88E-07	1.71E-07	3.07E-05	8.73E-07	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 6.71E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.41E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.41E-06	9.41E-06	9.41E-06	9.41E-06	9.41E-06	9.41E-06	9.47E-06	1.67E-05
GROUND	1.73E-06	1.73E-06	1.73E-06	1.73E-06	1.73E-06	1.73E-06	1.73E-06	2.04E-06
VEGET								
ADULT	2.34E-07	2.67E-07	6.91E-07	3.24E-07	1.86E-07	1.85E-05	2.90E-08	0.00E+00
TEEN	2.43E-07	2.98E-07	1.14E-06	5.12E-07	2.88E-07	2.49E-05	5.44E-08	0.00E+00
CHILD	3.03E-07	2.10E-07	2.76E-06	8.73E-07	4.68E-07	4.76E-05	8.28E-08	0.00E+00
MEAT								
ADULT	2.02E-08	4.78E-08	2.09E-08	2.50E-08	9.72E-09	4.93E-07	2.37E-09	0.00E+00
TEEN	1.10E-08	2.58E-08	1.74E-08	2.01E-08	7.88E-09	3.57E-07	2.24E-09	0.00E+00
CHILD	1.12E-08	1.31E-08	3.23E-08	2.64E-08	1.00E-08	5.39E-07	2.64E-09	0.00E+00
COW MILK								
ADULT	1.43E-07	3.10E-08	1.83E-07	2.23E-07	1.37E-07	1.41E-05	2.01E-08	0.00E+00
TEEN	1.54E-07	4.02E-08	3.32E-07	3.94E-07	2.44E-07	2.23E-05	4.15E-08	0.00E+00
CHILD	1.64E-07	3.07E-08	8.03E-07	6.84E-07	4.06E-07	4.44E-05	6.38E-08	0.00E+00
INFANT	2.33E-07	2.97E-08	1.38E-06	1.40E-06	6.83E-07	1.08E-04	1.15E-07	0.00E+00
GOATMILK								
ADULT	3.81E-07	3.56E-08	4.73E-07	5.88E-07	2.74E-07	1.69E-05	6.02E-08	0.00E+00
TEEN	3.80E-07	4.77E-08	8.59E-07	1.04E-06	4.85E-07	2.68E-05	1.24E-07	0.00E+00
CHILD	3.40E-07	3.80E-08	2.08E-06	1.80E-06	8.06E-07	5.33E-05	1.91E-07	0.00E+00
INFANT	4.13E-07	3.77E-08	3.46E-06	3.59E-06	1.33E-06	1.30E-04	3.46E-07	0.00E+00
INHAL								
ADULT	5.11E-09	1.10E-08	8.40E-09	1.05E-08	1.42E-08	1.56E-06	6.85E-08	0.00E+00
TEEN	5.64E-09	2.23E-08	1.18E-08	1.45E-08	1.96E-08	2.02E-06	1.04E-07	0.00E+00
CHILD	5.41E-09	1.13E-07	1.61E-08	1.42E-08	1.84E-08	2.45E-06	8.62E-08	0.00E+00
INFANT	3.65E-09	9.71E-08	1.16E-08	1.26E-08	1.21E-08	2.25E-06	6.26E-08	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 9.30E-07 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.95E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.30E-06	1.30E-06	1.30E-06	1.30E-06	1.30E-06	1.30E-06	1.31E-06	2.32E-06
GROUND	1.84E-06	1.84E-06	1.84E-06	1.84E-06	1.84E-06	1.84E-06	1.84E-06	2.16E-06
VEGET								
ADULT	2.61E-07	2.78E-07	7.57E-07	3.62E-07	1.91E-07	1.66E-05	3.40E-08	0.00E+00
TEEN	2.65E-07	3.11E-07	1.25E-06	5.73E-07	2.96E-07	2.22E-05	6.36E-08	0.00E+00
CHILD	3.19E-07	2.20E-07	3.03E-06	9.78E-07	4.82E-07	4.26E-05	9.68E-08	0.00E+00
MEAT								
ADULT	2.26E-08	4.94E-08	2.38E-08	2.85E-08	1.06E-08	4.41E-07	2.77E-09	0.00E+00
TEEN	1.21E-08	2.67E-08	1.98E-08	2.29E-08	8.64E-09	3.19E-07	2.62E-09	0.00E+00
CHILD	1.18E-08	1.36E-08	3.67E-08	3.01E-08	1.10E-08	4.82E-07	3.08E-09	0.00E+00
COW MILK								
ADULT	1.60E-07	3.09E-08	2.03E-07	2.49E-07	1.40E-07	1.26E-05	2.35E-08	0.00E+00
TEEN	1.68E-07	4.00E-08	3.69E-07	4.39E-07	2.48E-07	2.00E-05	4.85E-08	0.00E+00
CHILD	1.70E-07	3.05E-08	8.94E-07	7.62E-07	4.13E-07	3.99E-05	7.46E-08	0.00E+00
INFANT	2.32E-07	2.94E-08	1.52E-06	1.55E-06	6.91E-07	9.69E-05	1.35E-07	0.00E+00
GOATMILK								
ADULT	4.37E-07	3.64E-08	5.39E-07	6.72E-07	2.95E-07	1.52E-05	7.04E-08	0.00E+00
TEEN	4.31E-07	4.88E-08	9.79E-07	1.19E-06	5.23E-07	2.40E-05	1.46E-07	0.00E+00
CHILD	3.71E-07	3.88E-08	2.36E-06	2.06E-06	8.68E-07	4.78E-05	2.24E-07	0.00E+00
INFANT	4.34E-07	3.84E-08	3.91E-06	4.09E-06	1.43E-06	1.16E-04	4.05E-07	0.00E+00
INHAL								
ADULT	8.85E-09	1.36E-08	1.45E-08	1.76E-08	2.20E-08	2.33E-06	1.09E-07	0.00E+00
TEEN	9.34E-09	1.56E-08	2.04E-08	2.42E-08	3.05E-08	3.01E-06	1.63E-07	0.00E+00
CHILD	8.56E-09	2.06E-08	2.78E-08	2.38E-08	2.86E-08	3.66E-06	1.34E-07	0.00E+00
INFANT	5.66E-09	1.49E-08	1.97E-08	2.07E-08	1.88E-08	3.37E-06	9.23E-08	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 9.60E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.63E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.09E-05	1.09E-05	1.09E-05	1.09E-05	1.09E-05	1.09E-05	1.10E-05	2.11E-05
GROUND	8.57E-05	8.57E-05	8.57E-05	8.57E-05	8.57E-05	8.57E-05	8.57E-05	1.01E-04
VEGET								
ADULT	1.43E-05	1.20E-05	3.40E-05	2.05E-05	1.14E-05	1.06E-03	1.90E-06	0.00E+00
TEEN	1.43E-05	1.34E-05	5.58E-05	3.24E-05	1.76E-05	1.43E-03	3.55E-06	0.00E+00
CHILD	1.66E-05	9.41E-06	1.35E-04	5.54E-05	2.87E-05	2.73E-03	5.41E-06	0.00E+00
MEAT								
ADULT	1.20E-06	2.15E-06	1.25E-06	1.57E-06	6.14E-07	2.83E-05	1.55E-07	0.00E+00
TEEN	6.21E-07	1.16E-06	1.04E-06	1.27E-06	4.98E-07	2.05E-05	1.47E-07	0.00E+00
CHILD	5.78E-07	5.92E-07	1.93E-06	1.66E-06	6.33E-07	3.09E-05	1.72E-07	0.00E+00
COW MILK								
ADULT	9.11E-06	1.62E-06	1.12E-05	1.42E-05	8.36E-06	8.08E-04	1.31E-06	0.00E+00
TEEN	9.66E-06	2.11E-06	2.03E-05	2.51E-05	1.49E-05	1.28E-03	2.71E-06	0.00E+00
CHILD	9.96E-06	1.63E-06	4.90E-05	4.36E-05	2.47E-05	2.55E-03	4.17E-06	0.00E+00
INFANT	1.38E-05	1.58E-06	8.33E-05	8.90E-05	4.14E-05	6.19E-03	7.54E-06	0.00E+00
GOATMILK								
ADULT	2.46E-05	1.99E-06	2.95E-05	3.80E-05	1.71E-05	9.70E-04	3.93E-06	0.00E+00
TEEN	2.44E-05	2.66E-06	5.36E-05	6.70E-05	3.04E-05	1.54E-03	8.13E-06	0.00E+00
CHILD	2.13E-05	2.12E-06	1.29E-04	1.16E-04	5.05E-05	3.06E-03	1.25E-05	0.00E+00
INFANT	2.53E-05	2.09E-06	2.14E-04	2.31E-04	8.32E-05	7.43E-03	2.26E-05	0.00E+00
INHAL								
ADULT	3.63E-07	5.58E-07	5.60E-07	7.31E-07	9.42E-07	1.02E-04	3.72E-06	0.00E+00
TEEN	3.88E-07	1.21E-06	7.89E-07	1.01E-06	1.30E-06	1.32E-04	5.64E-06	0.00E+00
CHILD	3.60E-07	6.75E-06	1.07E-06	9.88E-07	1.22E-06	1.60E-04	4.68E-06	0.00E+00
INFANT	2.40E-07	5.85E-06	7.70E-07	8.64E-07	8.03E-07	1.47E-04	3.40E-06	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 3.08E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.23E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.51E-06	3.51E-06	3.51E-06	3.51E-06	3.51E-06	3.51E-06	3.54E-06	6.77E-06
GROUND	7.33E-05	7.33E-05	7.33E-05	7.33E-05	7.33E-05	7.33E-05	7.33E-05	8.60E-05
VEGET								
ADULT	1.23E-05	1.02E-05	2.89E-05	1.76E-05	9.67E-06	8.96E-04	1.63E-06	0.00E+00
TEEN	1.22E-05	1.14E-05	4.75E-05	2.78E-05	1.50E-05	1.20E-03	3.05E-06	0.00E+00
CHILD	1.41E-05	8.02E-06	1.15E-04	4.75E-05	2.44E-05	2.30E-03	4.65E-06	0.00E+00
MEAT								
ADULT	1.03E-06	1.84E-06	1.07E-06	1.35E-06	5.25E-07	2.39E-05	1.33E-07	0.00E+00
TEEN	5.32E-07	9.93E-07	8.93E-07	1.09E-06	4.26E-07	1.73E-05	1.26E-07	0.00E+00
CHILD	4.94E-07	5.06E-07	1.65E-06	1.43E-06	5.41E-07	2.61E-05	1.48E-07	0.00E+00
COW MILK								
ADULT	7.81E-06	1.38E-06	9.56E-06	1.22E-05	7.11E-06	6.82E-04	1.13E-06	0.00E+00
TEEN	8.26E-06	1.79E-06	1.74E-05	2.15E-05	1.26E-05	1.08E-03	2.33E-06	0.00E+00
CHILD	8.49E-06	1.38E-06	4.20E-05	3.73E-05	2.10E-05	2.15E-03	3.58E-06	0.00E+00
INFANT	1.17E-05	1.34E-06	7.13E-05	7.62E-05	3.52E-05	5.22E-03	6.48E-06	0.00E+00
GOATMILK								
ADULT	2.11E-05	1.69E-06	2.53E-05	3.26E-05	1.46E-05	8.18E-04	3.38E-06	0.00E+00
TEEN	2.09E-05	2.26E-06	4.59E-05	5.75E-05	2.60E-05	1.30E-03	6.99E-06	0.00E+00
CHILD	1.82E-05	1.80E-06	1.11E-04	9.97E-05	4.31E-05	2.58E-03	1.07E-05	0.00E+00
INFANT	2.16E-05	1.78E-06	1.83E-04	1.99E-04	7.11E-05	6.27E-03	1.94E-05	0.00E+00
INHAL								
ADULT	3.50E-07	5.41E-07	5.41E-07	7.02E-07	8.94E-07	9.67E-05	3.68E-06	0.00E+00
TEEN	3.72E-07	1.18E-06	7.61E-07	9.65E-07	1.24E-06	1.25E-04	5.57E-06	0.00E+00
CHILD	3.43E-07	6.65E-06	1.04E-06	9.48E-07	1.16E-06	1.51E-04	4.63E-06	0.00E+00
INFANT	2.28E-07	5.76E-06	7.41E-07	8.27E-07	7.62E-07	1.39E-04	3.36E-06	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 8.94E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.52E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.02E-04	1.02E-04	1.02E-04	1.02E-04	1.02E-04	1.02E-04	1.03E-04	1.97E-04
GROUND	3.82E-05	3.82E-05	3.82E-05	3.82E-05	3.82E-05	3.82E-05	3.82E-05	4.49E-05
VEGET								
ADULT	6.33E-06	5.57E-06	1.64E-05	9.03E-06	5.35E-06	5.51E-04	8.06E-07	0.00E+00
TEEN	6.43E-06	6.21E-06	2.66E-05	1.43E-05	8.29E-06	7.40E-04	1.51E-06	0.00E+00
CHILD	7.71E-06	4.38E-06	6.37E-05	2.43E-05	1.35E-05	1.42E-03	2.30E-06	0.00E+00
MEAT								
ADULT	5.21E-07	9.79E-07	5.57E-07	6.78E-07	2.75E-07	1.47E-05	6.58E-08	0.00E+00
TEEN	2.74E-07	5.30E-07	4.62E-07	5.46E-07	2.23E-07	1.06E-05	6.23E-08	0.00E+00
CHILD	2.60E-07	2.70E-07	8.52E-07	7.19E-07	2.83E-07	1.61E-05	7.32E-08	0.00E+00
COW MILK								
ADULT	4.01E-06	7.78E-07	4.99E-06	6.28E-06	3.96E-06	4.19E-04	5.57E-07	0.00E+00
TEEN	4.33E-06	1.02E-06	9.04E-06	1.11E-05	7.03E-06	6.64E-04	1.15E-06	0.00E+00
CHILD	4.65E-06	7.87E-07	2.18E-05	1.92E-05	1.17E-05	1.32E-03	1.77E-06	0.00E+00
INFANT	6.66E-06	7.64E-07	3.73E-05	3.96E-05	1.97E-05	3.21E-03	3.20E-06	0.00E+00
GOATMILK								
ADULT	1.06E-05	9.44E-07	1.29E-05	1.64E-05	7.76E-06	5.03E-04	1.67E-06	0.00E+00
TEEN	1.06E-05	1.26E-06	2.34E-05	2.90E-05	1.38E-05	7.97E-04	3.45E-06	0.00E+00
CHILD	9.55E-06	1.01E-06	5.64E-05	5.02E-05	2.29E-05	1.58E-03	5.31E-06	0.00E+00
INFANT	1.17E-05	9.98E-07	9.34E-05	1.00E-04	3.79E-05	3.85E-03	9.60E-06	0.00E+00
INHAL								
ADULT	1.21E-07	1.97E-07	1.88E-07	2.44E-07	3.17E-07	3.47E-05	1.26E-06	0.00E+00
TEEN	1.30E-07	4.50E-07	2.65E-07	3.36E-07	4.38E-07	4.47E-05	1.91E-06	0.00E+00
CHILD	1.21E-07	2.60E-06	3.60E-07	3.30E-07	4.11E-07	5.41E-05	1.59E-06	0.00E+00
INFANT	8.13E-08	2.26E-06	2.58E-07	2.89E-07	2.70E-07	4.98E-05	1.17E-06	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 3.97E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 6.75E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.53E-05	4.53E-05	4.53E-05	4.53E-05	4.53E-05	4.53E-05	4.57E-05	8.74E-05
GROUND	1.74E-06	1.74E-06	1.74E-06	1.74E-06	1.74E-06	1.74E-06	1.74E-06	2.04E-06
VEGET								
ADULT	2.85E-07	2.62E-07	7.92E-07	4.05E-07	2.54E-07	2.81E-05	3.49E-08	0.00E+00
TEEN	2.94E-07	2.92E-07	1.28E-06	6.38E-07	3.93E-07	3.77E-05	6.54E-08	0.00E+00
CHILD	3.63E-07	2.07E-07	3.04E-06	1.09E-06	6.38E-07	7.23E-05	9.95E-08	0.00E+00
MEAT								
ADULT	2.31E-08	4.54E-08	2.52E-08	2.99E-08	1.25E-08	7.50E-07	2.85E-09	0.00E+00
TEEN	1.23E-08	2.45E-08	2.08E-08	2.41E-08	1.02E-08	5.43E-07	2.70E-09	0.00E+00
CHILD	1.19E-08	1.25E-08	3.84E-08	3.17E-08	1.29E-08	8.20E-07	3.17E-09	0.00E+00
COW MILK								
ADULT	1.79E-07	3.73E-08	2.26E-07	2.82E-07	1.88E-07	2.13E-05	2.41E-08	0.00E+00
TEEN	1.97E-07	4.88E-08	4.10E-07	4.98E-07	3.35E-07	3.38E-05	4.99E-08	0.00E+00
CHILD	2.19E-07	3.78E-08	9.89E-07	8.64E-07	5.56E-07	6.71E-05	7.67E-08	0.00E+00
INFANT	3.22E-07	3.67E-08	1.70E-06	1.79E-06	9.39E-07	1.63E-04	1.39E-07	0.00E+00
GOATMILK								
ADULT	4.67E-07	4.48E-08	5.74E-07	7.23E-07	3.56E-07	2.56E-05	7.24E-08	0.00E+00
TEEN	4.72E-07	6.01E-08	1.04E-06	1.28E-06	6.33E-07	4.05E-05	1.50E-07	0.00E+00
CHILD	4.35E-07	4.79E-08	2.51E-06	2.21E-06	1.05E-06	8.05E-05	2.30E-07	0.00E+00
INFANT	5.46E-07	4.74E-08	4.17E-06	4.44E-06	1.74E-06	1.96E-04	4.16E-07	0.00E+00
INHAL								
ADULT	9.54E-09	1.78E-08	1.55E-08	1.96E-08	2.66E-08	3.03E-06	9.71E-08	0.00E+00
TEEN	1.06E-08	4.05E-08	2.17E-08	2.69E-08	3.67E-08	3.89E-06	1.48E-07	0.00E+00
CHILD	1.03E-08	2.29E-07	2.93E-08	2.65E-08	3.45E-08	4.69E-06	1.24E-07	0.00E+00
INFANT	7.02E-09	1.98E-07	2.11E-08	2.34E-08	2.27E-08	4.31E-06	9.20E-08	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 5.30E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 9.01E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.04E-06	6.04E-06	6.04E-06	6.04E-06	6.04E-06	6.04E-06	6.09E-06	1.17E-05
GROUND	2.11E-06	2.11E-06	2.11E-06	2.11E-06	2.11E-06	2.11E-06	2.11E-06	2.47E-06
VEGET								
ADULT	3.51E-07	3.00E-07	8.62E-07	5.02E-07	2.86E-07	2.78E-05	4.57E-08	0.00E+00
TEEN	3.53E-07	3.34E-07	1.41E-06	7.93E-07	4.43E-07	3.74E-05	8.57E-08	0.00E+00
CHILD	4.15E-07	2.35E-07	3.39E-06	1.35E-06	7.20E-07	7.16E-05	1.30E-07	0.00E+00
MEAT								
ADULT	2.91E-08	5.33E-08	3.08E-08	3.81E-08	1.51E-08	7.42E-07	3.73E-09	0.00E+00
TEEN	1.52E-08	2.88E-08	2.56E-08	3.07E-08	1.23E-08	5.37E-07	3.53E-09	0.00E+00
CHILD	1.43E-08	1.47E-08	4.72E-08	4.04E-08	1.56E-08	8.11E-07	4.15E-09	0.00E+00
COW MILK								
ADULT	2.23E-07	4.10E-08	2.75E-07	3.48E-07	2.11E-07	2.12E-05	3.16E-08	0.00E+00
TEEN	2.38E-07	5.36E-08	4.99E-07	6.15E-07	3.74E-07	3.36E-05	6.53E-08	0.00E+00
CHILD	2.50E-07	4.14E-08	1.20E-06	1.07E-06	6.22E-07	6.67E-05	1.00E-07	0.00E+00
INFANT	3.50E-07	4.01E-08	2.05E-06	2.19E-06	1.04E-06	1.62E-04	1.82E-07	0.00E+00
GOATMILK								
ADULT	5.97E-07	5.01E-08	7.20E-07	9.21E-07	4.24E-07	2.54E-05	9.48E-08	0.00E+00
TEEN	5.94E-07	6.71E-08	1.31E-06	1.63E-06	7.52E-07	4.03E-05	1.96E-07	0.00E+00
CHILD	5.25E-07	5.34E-08	3.15E-06	2.82E-06	1.25E-06	8.01E-05	3.01E-07	0.00E+00
INFANT	6.31E-07	5.29E-08	5.21E-06	5.63E-06	2.06E-06	1.95E-04	5.45E-07	0.00E+00
INHAL								
ADULT	1.59E-08	2.50E-08	2.47E-08	3.22E-08	4.19E-08	4.58E-06	1.62E-07	0.00E+00
TEEN	1.71E-08	5.54E-08	3.47E-08	4.43E-08	5.79E-08	5.90E-06	2.46E-07	0.00E+00
CHILD	1.60E-08	3.13E-07	4.73E-08	4.36E-08	5.44E-08	7.15E-06	2.04E-07	0.00E+00
INFANT	1.07E-08	2.71E-07	3.40E-08	3.82E-08	3.57E-08	6.58E-06	1.49E-07	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 5.33E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 9.07E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.08E-06	6.08E-06	6.08E-06	6.08E-06	6.08E-06	6.08E-06	6.13E-06	1.17E-05
GROUND	2.70E-03	2.70E-03	2.70E-03	2.70E-03	2.70E-03	2.70E-03	2.70E-03	3.18E-03
VEGET								
ADULT	4.69E-05	3.53E-04	2.32E-05	2.87E-05	9.09E-06	1.32E-03	5.73E-07	0.00E+00
TEEN	7.09E-05	3.77E-04	3.81E-05	4.42E-05	1.39E-05	1.77E-03	1.07E-06	0.00E+00
CHILD	1.39E-04	2.47E-04	9.24E-05	7.02E-05	2.22E-05	3.39E-03	1.63E-06	0.00E+00
MEAT								
ADULT	1.13E-05	9.34E-05	5.62E-07	5.57E-06	3.71E-07	3.51E-05	4.95E-08	0.00E+00
TEEN	8.87E-06	5.03E-05	4.66E-07	4.34E-06	2.98E-07	2.54E-05	4.67E-08	0.00E+00
CHILD	1.37E-05	2.54E-05	8.61E-07	5.21E-06	3.73E-07	3.84E-05	5.47E-08	0.00E+00
COW MILK								
ADULT	6.55E-06	2.18E-05	5.58E-06	7.97E-06	6.76E-06	9.98E-04	3.92E-07	0.00E+00
TEEN	9.44E-06	2.58E-05	1.01E-05	1.40E-05	1.20E-05	1.58E-03	8.10E-07	0.00E+00
CHILD	1.59E-05	1.72E-05	2.45E-05	2.39E-05	1.99E-05	3.14E-03	1.25E-06	0.00E+00
INFANT	2.62E-05	1.61E-05	4.48E-05	5.16E-05	3.41E-05	7.64E-03	2.25E-06	0.00E+00
GOATMILK								
ADULT	9.27E-06	4.09E-06	1.19E-05	1.44E-05	1.01E-05	1.20E-03	1.17E-06	0.00E+00
TEEN	1.05E-05	5.10E-06	2.16E-05	2.54E-05	1.79E-05	1.90E-03	2.43E-06	0.00E+00
CHILD	1.25E-05	3.69E-06	5.22E-05	4.40E-05	2.97E-05	3.77E-03	3.73E-06	0.00E+00
INFANT	1.89E-05	3.54E-06	9.13E-05	9.17E-05	5.03E-05	9.16E-03	6.75E-06	0.00E+00
INHAL								
ADULT	8.54E-07	9.68E-06	6.34E-07	1.27E-06	1.38E-06	1.65E-04	1.91E-04	0.00E+00
TEEN	1.10E-06	9.70E-06	8.94E-07	1.72E-06	1.91E-06	2.12E-04	2.79E-04	0.00E+00
CHILD	1.22E-06	1.15E-05	1.22E-06	1.64E-06	1.80E-06	2.55E-04	2.26E-04	0.00E+00
INFANT	7.27E-07	8.37E-06	9.22E-07	1.36E-06	1.18E-06	2.35E-04	1.45E-04	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 2.07E-06 MILLRADS
ANNUAL GAMMA AIR DOSE = 3.53E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.36E-06	2.36E-06	2.36E-06	2.36E-06	2.36E-06	2.36E-06	2.38E-06	4.56E-06
GROUND	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.00E-03	2.35E-03
VEGET								
ADULT	3.46E-05	2.61E-04	1.64E-05	2.12E-05	6.66E-06	9.64E-04	4.22E-07	0.00E+00
TEEN	5.23E-05	2.78E-04	2.69E-05	3.26E-05	1.01E-05	1.29E-03	7.90E-07	0.00E+00
CHILD	1.02E-04	1.82E-04	6.53E-05	5.18E-05	1.63E-05	2.48E-03	1.20E-06	0.00E+00
MEAT								
ADULT	8.36E-06	6.91E-05	4.03E-07	4.10E-06	2.64E-07	2.57E-05	3.59E-08	0.00E+00
TEEN	6.55E-06	3.72E-05	3.34E-07	3.20E-06	2.13E-07	1.86E-05	3.39E-08	0.00E+00
CHILD	1.01E-05	1.88E-05	6.19E-07	3.84E-06	2.67E-07	2.81E-05	3.97E-08	0.00E+00
COW MILK								
ADULT	4.81E-06	1.60E-05	4.06E-06	5.82E-06	4.93E-06	7.31E-04	2.90E-07	0.00E+00
TEEN	6.91E-06	1.90E-05	7.36E-06	1.02E-05	8.77E-06	1.16E-03	5.98E-07	0.00E+00
CHILD	1.16E-05	1.27E-05	1.78E-05	1.75E-05	1.46E-05	2.30E-03	9.19E-07	0.00E+00
INFANT	1.92E-05	1.17E-05	3.26E-05	3.78E-05	2.49E-05	5.60E-03	1.66E-06	0.00E+00
GOATMILK								
ADULT	6.83E-06	3.00E-06	8.68E-06	1.06E-05	7.38E-06	8.78E-04	8.68E-07	0.00E+00
TEEN	7.74E-06	3.74E-06	1.58E-05	1.87E-05	1.31E-05	1.39E-03	1.79E-06	0.00E+00
CHILD	9.17E-06	2.70E-06	3.82E-05	3.24E-05	2.18E-05	2.76E-03	2.76E-06	0.00E+00
INFANT	1.38E-05	2.58E-06	6.67E-05	6.75E-05	3.70E-05	6.71E-03	4.99E-06	0.00E+00
INHAL								
ADULT	8.54E-07	9.68E-06	6.33E-07	1.27E-06	1.38E-06	1.65E-04	1.91E-04	0.00E+00
TEEN	1.10E-06	9.70E-06	8.92E-07	1.72E-06	1.91E-06	2.12E-04	2.79E-04	0.00E+00
CHILD	1.22E-06	1.15E-05	1.22E-06	1.64E-06	1.79E-06	2.55E-04	2.26E-04	0.00E+00
INFANT	7.27E-07	8.35E-06	9.20E-07	1.36E-06	1.18E-06	2.34E-04	1.45E-04	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 3.11E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.29E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.55E-05	3.55E-05	3.55E-05	3.55E-05	3.55E-05	3.55E-05	3.58E-05	6.84E-05
GROUND	5.06E-04	5.06E-04	5.06E-04	5.06E-04	5.06E-04	5.06E-04	5.06E-04	5.95E-04
VEGET								
ADULT	9.08E-06	6.72E-05	8.78E-06	5.74E-06	2.08E-06	2.96E-04	1.16E-07	0.00E+00
TEEN	1.37E-05	7.17E-05	1.45E-05	8.83E-06	3.15E-06	3.98E-04	2.17E-07	0.00E+00
CHILD	2.69E-05	4.71E-05	3.52E-05	1.40E-05	5.04E-06	7.62E-04	3.29E-07	0.00E+00
MEAT								
ADULT	2.16E-06	1.76E-05	1.82E-07	1.14E-06	1.28E-07	7.91E-06	1.33E-08	0.00E+00
TEEN	1.70E-06	9.47E-06	1.48E-07	8.87E-07	9.98E-08	5.73E-06	1.24E-08	0.00E+00
CHILD	2.61E-06	4.78E-06	2.69E-07	1.06E-06	1.21E-07	8.65E-06	1.44E-08	0.00E+00
COW MILK								
ADULT	1.44E-06	4.33E-06	1.43E-06	1.92E-06	1.67E-06	2.24E-04	7.57E-08	0.00E+00
TEEN	2.13E-06	5.13E-06	2.57E-06	3.36E-06	2.93E-06	3.55E-04	1.56E-07	0.00E+00
CHILD	3.68E-06	3.44E-06	6.18E-06	5.64E-06	4.81E-06	7.05E-04	2.40E-07	0.00E+00
INFANT	5.94E-06	4.18E-06	1.13E-05	1.19E-05	8.06E-06	1.71E-03	4.35E-07	0.00E+00
GOATMILK								
ADULT	1.88E-06	8.96E-07	2.78E-06	2.91E-06	2.16E-06	2.69E-04	2.26E-07	0.00E+00
TEEN	2.18E-06	1.13E-06	5.06E-06	5.14E-06	3.84E-06	4.26E-04	4.66E-07	0.00E+00
CHILD	2.71E-06	8.24E-07	1.23E-05	8.91E-06	6.37E-06	8.46E-04	7.17E-07	0.00E+00
INFANT	4.19E-06	9.11E-07	2.19E-05	1.87E-05	1.08E-05	2.06E-03	1.30E-06	0.00E+00
INHAL								
ADULT	1.18E-07	1.32E-06	9.33E-08	1.75E-07	1.91E-07	2.32E-05	2.59E-05	0.00E+00
TEEN	1.52E-07	1.26E-06	1.32E-07	2.38E-07	2.64E-07	2.97E-05	3.79E-05	0.00E+00
CHILD	1.68E-07	9.63E-07	1.79E-07	2.26E-07	2.48E-07	3.56E-05	3.07E-05	0.00E+00
INFANT	1.00E-07	6.00E-07	1.35E-07	1.87E-07	1.63E-07	3.27E-05	1.97E-05	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 3.41E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.79E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.88E-05	3.88E-05	3.88E-05	3.88E-05	3.88E-05	3.88E-05	3.92E-05	7.50E-05
GROUND	4.86E-05	4.86E-05	4.86E-05	4.86E-05	4.86E-05	4.86E-05	4.86E-05	5.71E-05
VEGET								
ADULT	9.05E-07	6.56E-06	1.31E-06	5.90E-07	2.40E-07	3.39E-05	1.21E-08	0.00E+00
TEEN	1.37E-06	7.01E-06	2.16E-06	9.08E-07	3.64E-07	4.56E-05	2.25E-08	0.00E+00
CHILD	2.69E-06	4.62E-06	5.27E-06	1.44E-06	5.81E-07	8.74E-05	3.40E-08	0.00E+00
MEAT								
ADULT	2.12E-07	1.70E-06	2.55E-08	1.20E-07	1.86E-08	9.07E-07	1.70E-09	0.00E+00
TEEN	1.66E-07	9.15E-07	2.06E-08	9.30E-08	1.42E-08	6.57E-07	1.57E-09	0.00E+00
CHILD	2.56E-07	4.62E-07	3.72E-08	1.11E-07	1.70E-08	9.92E-07	1.81E-09	0.00E+00
COW MILK								
ADULT	1.62E-07	4.44E-07	1.78E-07	2.31E-07	2.04E-07	2.57E-05	7.51E-09	0.00E+00
TEEN	2.43E-07	5.26E-07	3.19E-07	4.01E-07	3.56E-07	4.07E-05	1.55E-08	0.00E+00
CHILD	4.29E-07	3.53E-07	7.64E-07	6.66E-07	5.80E-07	8.08E-05	2.38E-08	0.00E+00
INFANT	6.83E-07	5.25E-07	1.40E-06	1.39E-06	9.58E-07	1.96E-04	4.32E-08	0.00E+00
GOATMILK								
ADULT	1.95E-07	1.00E-07	3.27E-07	3.04E-07	2.39E-07	3.08E-05	2.23E-08	0.00E+00
TEEN	2.32E-07	1.27E-07	5.95E-07	5.37E-07	4.24E-07	4.89E-05	4.60E-08	0.00E+00
CHILD	3.02E-07	9.38E-08	1.45E-06	9.30E-07	7.03E-07	9.70E-05	7.07E-08	0.00E+00
INFANT	4.74E-07	1.14E-07	2.61E-06	1.96E-06	1.19E-06	2.36E-04	1.28E-07	0.00E+00
INHAL								
ADULT	1.74E-08	1.76E-07	2.11E-08	2.85E-08	3.47E-08	4.23E-06	3.16E-06	0.00E+00
TEEN	2.25E-08	1.90E-07	2.98E-08	3.88E-08	4.79E-08	5.41E-06	4.62E-06	0.00E+00
CHILD	2.50E-08	3.16E-07	4.07E-08	3.70E-08	4.49E-08	6.48E-06	3.75E-06	0.00E+00
INFANT	1.54E-08	2.45E-07	2.99E-08	3.14E-08	2.95E-08	5.95E-06	2.43E-06	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 4.30E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 7.30E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.90E-05	4.90E-05	4.90E-05	4.90E-05	4.90E-05	4.90E-05	4.94E-05	9.45E-05
GROUND	9.56E-05	9.56E-05	9.56E-05	9.56E-05	9.56E-05	9.56E-05	9.56E-05	1.12E-04
VEGET								
ADULT	1.75E-06	1.28E-05	2.14E-06	1.12E-06	4.35E-07	6.18E-05	2.29E-08	0.00E+00
TEEN	2.65E-06	1.37E-05	3.53E-06	1.73E-06	6.60E-07	8.30E-05	4.26E-08	0.00E+00
CHILD	5.20E-06	9.00E-06	8.58E-06	2.75E-06	1.05E-06	1.59E-04	6.47E-08	0.00E+00
MEAT								
ADULT	4.13E-07	3.34E-06	4.26E-08	2.26E-07	3.07E-08	1.65E-06	2.95E-09	0.00E+00
TEEN	3.24E-07	1.79E-06	3.46E-08	1.76E-07	2.36E-08	1.20E-06	2.73E-09	0.00E+00
CHILD	4.99E-07	9.06E-07	6.25E-08	2.10E-07	2.83E-08	1.80E-06	3.15E-09	0.00E+00
COW MILK								
ADULT	2.97E-07	8.48E-07	3.12E-07	4.11E-07	3.61E-07	4.68E-05	1.46E-08	0.00E+00
TEEN	4.42E-07	1.00E-06	5.61E-07	7.16E-07	6.32E-07	7.41E-05	3.01E-08	0.00E+00
CHILD	7.73E-07	6.73E-07	1.34E-06	1.19E-06	1.03E-06	1.47E-04	4.62E-08	0.00E+00
INFANT	1.24E-06	9.16E-07	2.46E-06	2.51E-06	1.72E-06	3.58E-04	8.37E-08	0.00E+00
GOATMILK								
ADULT	3.70E-07	1.84E-07	5.87E-07	5.76E-07	4.42E-07	5.61E-05	4.32E-08	0.00E+00
TEEN	4.36E-07	2.32E-07	1.07E-06	1.02E-06	7.84E-07	8.90E-05	8.94E-08	0.00E+00
CHILD	5.56E-07	1.71E-07	2.60E-06	1.76E-06	1.30E-06	1.77E-04	1.37E-07	0.00E+00
INFANT	8.67E-07	2.00E-07	4.66E-06	3.70E-06	2.21E-06	4.29E-04	2.49E-07	0.00E+00
INHAL								
ADULT	2.97E-08	3.10E-07	3.25E-08	4.76E-08	5.67E-08	6.86E-06	5.69E-06	0.00E+00
TEEN	3.84E-08	3.27E-07	4.59E-08	6.47E-08	7.82E-08	8.79E-06	8.34E-06	0.00E+00
CHILD	4.27E-08	5.03E-07	6.25E-08	6.17E-08	7.33E-08	1.06E-05	6.77E-06	0.00E+00
INFANT	2.60E-08	3.85E-07	4.62E-08	5.21E-08	4.82E-08	9.69E-06	4.36E-06	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.04E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 9.43E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.26E-05	6.26E-05	6.26E-05	6.26E-05	6.26E-05	6.26E-05	6.36E-05	1.54E-04
GROUND	3.09E-03	3.09E-03	3.09E-03	3.09E-03	3.09E-03	3.09E-03	3.09E-03	3.64E-03
VEGET								
ADULT	7.34E-05	4.64E-04	4.02E-04	6.24E-05	2.43E-05	1.16E-03	2.06E-06	0.00E+00
TEEN	1.10E-04	4.95E-04	5.60E-04	9.57E-05	3.61E-05	1.56E-03	3.73E-06	0.00E+00
CHILD	2.15E-04	3.26E-04	1.17E-03	1.48E-04	5.49E-05	2.99E-03	5.55E-06	0.00E+00
MEAT								
ADULT	1.89E-05	1.22E-04	9.56E-06	1.98E-05	7.79E-06	3.11E-05	7.33E-07	0.00E+00
TEEN	1.49E-05	6.58E-05	6.87E-06	1.54E-05	5.75E-06	2.25E-05	6.61E-07	0.00E+00
CHILD	2.29E-05	3.33E-05	1.10E-05	1.81E-05	6.56E-06	3.40E-05	7.50E-07	0.00E+00
COW MILK								
ADULT	2.75E-05	5.40E-05	3.66E-05	5.22E-05	3.49E-05	8.69E-04	6.89E-07	0.00E+00
TEEN	4.46E-05	6.25E-05	5.78E-05	8.82E-05	5.71E-05	1.37E-03	1.41E-06	0.00E+00
CHILD	8.51E-05	4.05E-05	1.22E-04	1.36E-04	8.67E-05	2.72E-03	2.16E-06	0.00E+00
INFANT	1.15E-04	1.76E-04	1.65E-04	2.46E-04	1.22E-04	6.61E-03	3.98E-06	0.00E+00
GOATMILK								
ADULT	1.57E-05	8.75E-06	5.20E-05	2.45E-05	1.44E-05	1.04E-03	1.81E-06	0.00E+00
TEEN	1.86E-05	1.06E-05	8.35E-05	4.28E-05	2.49E-05	1.65E-03	3.74E-06	0.00E+00
CHILD	2.45E-05	7.31E-06	1.83E-04	7.22E-05	4.04E-05	3.27E-03	5.75E-06	0.00E+00
INFANT	3.26E-05	2.36E-05	2.46E-04	1.43E-04	6.49E-05	7.94E-03	1.04E-05	0.00E+00
INHAL								
ADULT	1.59E-06	1.60E-05	5.76E-06	2.32E-06	1.56E-06	1.37E-04	2.99E-04	0.00E+00
TEEN	2.03E-06	1.68E-05	6.84E-06	3.08E-06	2.10E-06	1.72E-04	4.37E-04	0.00E+00
CHILD	2.24E-06	2.73E-05	8.13E-06	2.79E-06	1.90E-06	2.00E-04	3.55E-04	0.00E+00
INFANT	1.22E-06	2.16E-05	3.75E-06	2.01E-06	1.16E-06	1.83E-04	2.29E-04	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 5.86E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 4.96E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.28E-05	3.28E-05	3.28E-05	3.28E-05	3.28E-05	3.28E-05	3.34E-05	8.35E-05
GROUND	2.16E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	2.54E-03
VEGET								
ADULT	5.12E-05	3.24E-04	2.79E-04	4.35E-05	1.68E-05	7.84E-04	1.43E-06	0.00E+00
TEEN	7.66E-05	3.46E-04	3.88E-04	6.68E-05	2.50E-05	1.06E-03	2.60E-06	0.00E+00
CHILD	1.50E-04	2.27E-04	8.07E-04	1.04E-04	3.80E-05	2.03E-03	3.86E-06	0.00E+00
MEAT								
ADULT	1.33E-05	8.55E-05	6.65E-06	1.39E-05	5.44E-06	2.11E-05	5.12E-07	0.00E+00
TEEN	1.04E-05	4.60E-05	4.78E-06	1.07E-05	4.02E-06	1.53E-05	4.61E-07	0.00E+00
CHILD	1.60E-05	2.33E-05	7.64E-06	1.27E-05	4.58E-06	2.31E-05	5.23E-07	0.00E+00
COW MILK								
ADULT	1.92E-05	3.77E-05	2.54E-05	3.64E-05	2.43E-05	5.88E-04	4.78E-07	0.00E+00
TEEN	3.11E-05	4.36E-05	4.01E-05	6.15E-05	3.98E-05	9.31E-04	9.80E-07	0.00E+00
CHILD	5.94E-05	2.83E-05	8.45E-05	9.50E-05	6.03E-05	1.84E-03	1.50E-06	0.00E+00
INFANT	7.99E-05	1.23E-04	1.14E-04	1.72E-04	8.51E-05	4.48E-03	2.76E-06	0.00E+00
GOATMILK								
ADULT	1.08E-05	6.06E-06	3.60E-05	1.69E-05	9.89E-06	7.06E-04	1.25E-06	0.00E+00
TEEN	1.29E-05	7.31E-06	5.77E-05	2.96E-05	1.71E-05	1.12E-03	2.59E-06	0.00E+00
CHILD	1.69E-05	5.05E-06	1.26E-04	4.99E-05	2.78E-05	2.21E-03	3.98E-06	0.00E+00
INFANT	2.25E-05	1.64E-05	1.69E-04	9.88E-05	4.46E-05	5.37E-03	7.21E-06	0.00E+00
INHAL								
ADULT	1.32E-06	1.36E-05	4.94E-06	1.88E-06	1.22E-06	1.12E-04	2.59E-04	0.00E+00
TEEN	1.68E-06	1.27E-05	5.84E-06	2.50E-06	1.63E-06	1.40E-04	3.78E-04	0.00E+00
CHILD	1.84E-06	7.44E-06	6.93E-06	2.25E-06	1.47E-06	1.62E-04	3.07E-04	0.00E+00
INFANT	9.86E-07	4.30E-06	3.15E-06	1.58E-06	8.89E-07	1.49E-04	1.97E-04	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.20E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.76E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.18E-04	1.18E-04	1.18E-04	1.18E-04	1.18E-04	1.18E-04	1.19E-04	2.41E-04
GROUND	6.87E-04	6.87E-04	6.87E-04	6.87E-04	6.87E-04	6.87E-04	6.87E-04	8.07E-04
VEGET								
ADULT	1.67E-05	1.03E-04	1.03E-04	1.41E-05	5.80E-06	3.31E-04	4.85E-07	0.00E+00
TEEN	2.48E-05	1.11E-04	1.46E-04	2.17E-05	8.65E-06	4.45E-04	8.80E-07	0.00E+00
CHILD	4.88E-05	7.31E-05	3.11E-04	3.37E-05	1.32E-05	8.53E-04	1.31E-06	0.00E+00
MEAT								
ADULT	4.14E-06	2.65E-05	2.26E-06	4.33E-06	1.71E-06	8.87E-06	1.62E-07	0.00E+00
TEEN	3.24E-06	1.43E-05	1.64E-06	3.36E-06	1.26E-06	6.42E-06	1.46E-07	0.00E+00
CHILD	4.97E-06	7.23E-06	2.66E-06	3.96E-06	1.44E-06	9.70E-06	1.66E-07	0.00E+00
COW MILK								
ADULT	6.23E-06	1.19E-05	8.93E-06	1.17E-05	7.98E-06	2.49E-04	1.76E-07	0.00E+00
TEEN	1.00E-05	1.38E-05	1.43E-05	1.99E-05	1.31E-05	3.94E-04	3.61E-07	0.00E+00
CHILD	1.90E-05	8.97E-06	3.07E-05	3.08E-05	2.00E-05	7.81E-04	5.52E-07	0.00E+00
INFANT	2.57E-05	3.83E-05	4.34E-05	5.62E-05	2.86E-05	1.90E-03	1.01E-06	0.00E+00
GOATMILK								
ADULT	4.02E-06	2.18E-06	1.34E-05	6.24E-06	3.75E-06	2.99E-04	4.72E-07	0.00E+00
TEEN	4.74E-06	2.67E-06	2.19E-05	1.09E-05	6.53E-06	4.73E-04	9.74E-07	0.00E+00
CHILD	6.19E-06	1.90E-06	4.87E-05	1.85E-05	1.06E-05	9.38E-04	1.50E-06	0.00E+00
INFANT	8.42E-06	5.42E-06	6.92E-05	3.69E-05	1.73E-05	2.28E-03	2.71E-06	0.00E+00
INHAL								
ADULT	8.69E-07	3.11E-06	1.64E-06	1.54E-06	1.16E-06	2.59E-05	5.36E-05	0.00E+00
TEEN	1.17E-06	3.90E-06	2.08E-06	2.10E-06	1.59E-06	3.26E-05	7.86E-05	0.00E+00
CHILD	1.40E-06	1.17E-05	2.62E-06	2.02E-06	1.48E-06	3.80E-05	6.38E-05	0.00E+00
INFANT	9.35E-07	1.09E-05	1.60E-06	1.77E-06	9.57E-07	3.48E-05	4.15E-05	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 4.50E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 6.46E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.34E-05	4.34E-05	4.34E-05	4.34E-05	4.34E-05	4.34E-05	4.39E-05	8.92E-05
GROUND	4.50E-05	4.50E-05	4.50E-05	4.50E-05	4.50E-05	4.50E-05	4.50E-05	5.29E-05
VEGET								
ADULT	1.09E-06	6.82E-06	6.38E-06	9.24E-07	3.70E-07	1.94E-05	3.12E-08	0.00E+00
TEEN	1.63E-06	7.29E-06	9.00E-06	1.42E-06	5.52E-07	2.62E-05	5.66E-08	0.00E+00
CHILD	3.20E-06	4.81E-06	1.90E-05	2.21E-06	8.40E-07	5.01E-05	8.43E-08	0.00E+00
MEAT								
ADULT	2.76E-07	1.77E-06	1.45E-07	2.89E-07	1.14E-07	5.22E-07	1.07E-08	0.00E+00
TEEN	2.16E-07	9.55E-07	1.05E-07	2.24E-07	8.39E-08	3.78E-07	9.66E-09	0.00E+00
CHILD	3.32E-07	4.83E-07	1.69E-07	2.64E-07	9.58E-08	5.71E-07	1.10E-08	0.00E+00
COW MILK								
ADULT	4.08E-07	7.89E-07	5.66E-07	7.71E-07	5.20E-07	1.46E-05	1.09E-08	0.00E+00
TEEN	6.58E-07	9.14E-07	9.00E-07	1.30E-06	8.53E-07	2.31E-05	2.24E-08	0.00E+00
CHILD	1.25E-06	5.94E-07	1.92E-06	2.02E-06	1.30E-06	4.58E-05	3.43E-08	0.00E+00
INFANT	1.69E-06	2.56E-06	2.66E-06	3.67E-06	1.85E-06	1.11E-04	6.31E-08	0.00E+00
GOATMILK								
ADULT	2.49E-07	1.37E-07	8.28E-07	3.87E-07	2.30E-07	1.75E-05	2.91E-08	0.00E+00
TEEN	2.94E-07	1.66E-07	1.34E-06	6.77E-07	4.00E-07	2.78E-05	6.00E-08	0.00E+00
CHILD	3.85E-07	1.17E-07	2.97E-06	1.15E-06	6.50E-07	5.50E-05	9.23E-08	0.00E+00
INFANT	5.19E-07	3.52E-07	4.13E-06	2.28E-06	1.05E-06	1.34E-04	1.67E-07	0.00E+00
INHAL								
ADULT	1.99E-07	5.75E-07	3.17E-07	3.65E-07	2.87E-07	5.04E-06	7.45E-06	0.00E+00
TEEN	2.69E-07	1.02E-06	4.14E-07	5.01E-07	3.95E-07	6.40E-06	1.10E-05	0.00E+00
CHILD	3.28E-07	4.87E-06	5.34E-07	4.86E-07	3.68E-07	7.55E-06	8.97E-06	0.00E+00
INFANT	2.25E-07	4.49E-06	3.57E-07	4.37E-07	2.41E-07	6.91E-06	6.00E-06	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 4.14E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 5.79E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.89E-05	3.89E-05	3.89E-05	3.89E-05	3.89E-05	3.89E-05	3.93E-05	8.06E-05
GROUND	8.76E-05	8.76E-05	8.76E-05	8.76E-05	8.76E-05	8.76E-05	8.76E-05	1.03E-04
VEGET								
ADULT	2.10E-06	1.32E-05	1.18E-05	1.78E-06	7.01E-07	3.48E-05	5.94E-08	0.00E+00
TEEN	3.14E-06	1.41E-05	1.65E-05	2.73E-06	1.04E-06	4.68E-05	1.07E-07	0.00E+00
CHILD	6.15E-06	9.29E-06	3.45E-05	4.25E-06	1.59E-06	8.97E-05	1.60E-07	0.00E+00
MEAT								
ADULT	5.38E-07	3.46E-06	2.75E-07	5.63E-07	2.21E-07	9.34E-07	2.09E-08	0.00E+00
TEEN	4.21E-07	1.86E-06	1.98E-07	4.36E-07	1.63E-07	6.77E-07	1.88E-08	0.00E+00
CHILD	6.48E-07	9.43E-07	3.18E-07	5.14E-07	1.86E-07	1.02E-06	2.13E-08	0.00E+00
COW MILK								
ADULT	7.85E-07	1.53E-06	1.06E-06	1.49E-06	1.00E-06	2.61E-05	2.02E-08	0.00E+00
TEEN	1.27E-06	1.78E-06	1.68E-06	2.52E-06	1.64E-06	4.14E-05	4.14E-08	0.00E+00
CHILD	2.42E-06	1.15E-06	3.56E-06	3.89E-06	2.49E-06	8.19E-05	6.34E-08	0.00E+00
INFANT	3.27E-06	4.99E-06	4.86E-06	7.05E-06	3.52E-06	1.99E-04	1.17E-07	0.00E+00
GOATMILK								
ADULT	4.60E-07	2.55E-07	1.52E-06	7.17E-07	4.23E-07	3.14E-05	5.33E-08	0.00E+00
TEEN	5.44E-07	3.09E-07	2.46E-06	1.25E-06	7.35E-07	4.96E-05	1.10E-07	0.00E+00
CHILD	7.16E-07	2.15E-07	5.40E-06	2.12E-06	1.19E-06	9.83E-05	1.69E-07	0.00E+00
INFANT	9.57E-07	6.76E-07	7.37E-06	4.20E-06	1.92E-06	2.39E-04	3.06E-07	0.00E+00
INHAL								
ADULT	1.95E-07	8.42E-07	3.85E-07	3.45E-07	2.67E-07	7.53E-06	1.27E-05	0.00E+00
TEEN	2.61E-07	1.27E-06	4.87E-07	4.70E-07	3.66E-07	9.53E-06	1.87E-05	0.00E+00
CHILD	3.12E-07	5.10E-06	6.13E-07	4.52E-07	3.40E-07	1.12E-05	1.52E-05	0.00E+00
INFANT	2.07E-07	4.59E-06	3.72E-07	3.95E-07	2.20E-07	1.02E-05	1.00E-05	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.15E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.12E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.46E-05	7.46E-05	7.46E-05	7.46E-05	7.46E-05	7.46E-05	7.57E-05	1.78E-04
GROUND	5.98E-03	5.98E-03	5.98E-03	5.98E-03	5.98E-03	5.98E-03	5.98E-03	7.03E-03
VEGET								
ADULT	1.26E-04	8.49E-04	4.84E-04	9.74E-05	3.61E-05	2.51E-03	2.89E-06	0.00E+00
TEEN	1.90E-04	9.06E-04	6.79E-04	1.50E-04	5.40E-05	3.38E-03	5.25E-06	0.00E+00
CHILD	3.72E-04	5.95E-04	1.43E-03	2.34E-04	8.31E-05	6.47E-03	7.85E-06	0.00E+00
MEAT								
ADULT	3.19E-05	2.24E-04	1.15E-05	2.78E-05	9.29E-06	6.73E-05	8.88E-07	0.00E+00
TEEN	2.50E-05	1.21E-04	8.32E-06	2.16E-05	6.88E-06	4.87E-05	8.02E-07	0.00E+00
CHILD	3.85E-05	6.10E-05	1.34E-05	2.55E-05	7.87E-06	7.35E-05	9.11E-07	0.00E+00
COW MILK								
ADULT	3.75E-05	8.16E-05	4.71E-05	6.71E-05	4.62E-05	1.89E-03	1.14E-06	0.00E+00
TEEN	5.97E-05	9.49E-05	7.56E-05	1.14E-04	7.65E-05	3.00E-03	2.35E-06	0.00E+00
CHILD	1.12E-04	6.20E-05	1.62E-04	1.78E-04	1.18E-04	5.95E-03	3.61E-06	0.00E+00
INFANT	1.55E-04	2.17E-04	2.30E-04	3.30E-04	1.71E-04	1.45E-02	6.60E-06	0.00E+00
GOATMILK								
ADULT	2.64E-05	1.37E-05	7.05E-05	4.10E-05	2.56E-05	2.27E-03	3.14E-06	0.00E+00
TEEN	3.08E-05	1.67E-05	1.15E-04	7.19E-05	4.47E-05	3.60E-03	6.48E-06	0.00E+00
CHILD	3.94E-05	1.17E-05	2.57E-04	1.22E-04	7.32E-05	7.14E-03	9.96E-06	0.00E+00
INFANT	5.44E-05	3.03E-05	3.65E-04	2.47E-04	1.20E-04	1.73E-02	1.80E-05	0.00E+00
INHAL								
ADULT	2.59E-06	2.69E-05	6.74E-06	3.82E-06	3.12E-06	3.13E-04	5.13E-04	0.00E+00
TEEN	3.33E-06	2.78E-05	8.15E-06	5.12E-06	4.25E-06	3.98E-04	7.50E-04	0.00E+00
CHILD	3.69E-06	4.13E-05	9.86E-06	4.73E-06	3.92E-06	4.71E-04	6.08E-04	0.00E+00
INFANT	2.08E-06	3.20E-05	4.94E-06	3.61E-06	2.48E-06	4.33E-04	3.91E-04	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 9.00E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 7.83E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.18E-05	5.18E-05	5.18E-05	5.18E-05	5.18E-05	5.18E-05	5.27E-05	1.30E-04
GROUND	4.24E-03	4.24E-03	4.24E-03	4.24E-03	4.24E-03	4.24E-03	4.24E-03	4.99E-03
VEGET								
ADULT	8.95E-05	6.02E-04	3.40E-04	6.90E-05	2.54E-05	1.76E-03	2.04E-06	0.00E+00
TEEN	1.34E-04	6.42E-04	4.76E-04	1.06E-04	3.81E-05	2.36E-03	3.71E-06	0.00E+00
CHILD	2.63E-04	4.22E-04	9.99E-04	1.65E-04	5.86E-05	4.53E-03	5.55E-06	0.00E+00
MEAT								
ADULT	2.26E-05	1.59E-04	8.12E-06	1.97E-05	6.58E-06	4.71E-05	6.29E-07	0.00E+00
TEEN	1.78E-05	8.56E-05	5.87E-06	1.53E-05	4.87E-06	3.41E-05	5.68E-07	0.00E+00
CHILD	2.73E-05	4.33E-05	9.46E-06	1.81E-05	5.58E-06	5.15E-05	6.46E-07	0.00E+00
COW MILK								
ADULT	2.65E-05	5.78E-05	3.32E-05	4.75E-05	3.27E-05	1.33E-03	8.07E-07	0.00E+00
TEEN	4.23E-05	6.73E-05	5.32E-05	8.07E-05	5.40E-05	2.10E-03	1.66E-06	0.00E+00
CHILD	7.94E-05	4.39E-05	1.14E-04	1.26E-04	8.31E-05	4.17E-03	2.54E-06	0.00E+00
INFANT	1.10E-04	1.54E-04	1.61E-04	2.33E-04	1.21E-04	1.01E-02	4.65E-06	0.00E+00
GOATMILK								
ADULT	1.86E-05	9.67E-06	4.95E-05	2.89E-05	1.80E-05	1.59E-03	2.21E-06	0.00E+00
TEEN	2.17E-05	1.18E-05	8.11E-05	5.07E-05	3.14E-05	2.52E-03	4.57E-06	0.00E+00
CHILD	2.77E-05	8.24E-06	1.81E-04	8.63E-05	5.14E-05	5.00E-03	7.02E-06	0.00E+00
INFANT	3.83E-05	2.14E-05	2.55E-04	1.74E-04	8.42E-05	1.21E-02	1.27E-05	0.00E+00
INHAL								
ADULT	2.28E-06	2.44E-05	6.05E-06	3.33E-06	2.73E-06	2.85E-04	4.66E-04	0.00E+00
TEEN	2.92E-06	2.51E-05	7.30E-06	4.46E-06	3.72E-06	3.63E-04	6.82E-04	0.00E+00
CHILD	3.23E-06	3.64E-05	8.81E-06	4.11E-06	3.43E-06	4.30E-04	5.53E-04	0.00E+00
INFANT	1.81E-06	2.79E-05	4.38E-06	3.11E-06	2.17E-06	3.95E-04	3.56E-04	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.89E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 2.88E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.94E-04	1.95E-04	3.89E-04
GROUND	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.46E-03
VEGET								
ADULT	2.70E-05	1.78E-04	1.20E-04	2.09E-05	8.32E-06	6.53E-04	6.39E-07	0.00E+00
TEEN	4.04E-05	1.90E-04	1.72E-04	3.21E-05	1.25E-05	8.78E-04	1.17E-06	0.00E+00
CHILD	7.93E-05	1.26E-04	3.72E-04	5.03E-05	1.93E-05	1.68E-03	1.74E-06	0.00E+00
MEAT								
ADULT	6.60E-06	4.61E-05	2.61E-06	5.79E-06	1.96E-06	1.75E-05	1.87E-07	0.00E+00
TEEN	5.17E-06	2.48E-05	1.91E-06	4.49E-06	1.45E-06	1.27E-05	1.69E-07	0.00E+00
CHILD	7.95E-06	1.25E-05	3.13E-06	5.31E-06	1.67E-06	1.91E-05	1.93E-07	0.00E+00
COW MILK								
ADULT	8.14E-06	1.71E-05	1.11E-05	1.45E-05	1.02E-05	4.93E-04	2.66E-07	0.00E+00
TEEN	1.29E-05	1.99E-05	1.80E-05	2.47E-05	1.70E-05	7.81E-04	5.47E-07	0.00E+00
CHILD	2.40E-05	1.31E-05	3.93E-05	3.88E-05	2.63E-05	1.55E-03	8.39E-07	0.00E+00
INFANT	3.35E-05	4.53E-05	5.82E-05	7.24E-05	3.88E-05	3.77E-03	1.53E-06	0.00E+00
GOATMILK								
ADULT	6.23E-06	3.24E-06	1.72E-05	9.66E-06	6.22E-06	5.92E-04	7.37E-07	0.00E+00
TEEN	7.31E-06	4.01E-06	2.87E-05	1.70E-05	1.09E-05	9.38E-04	1.52E-06	0.00E+00
CHILD	9.39E-06	2.87E-06	6.50E-05	2.89E-05	1.79E-05	1.86E-03	2.34E-06	0.00E+00
INFANT	1.33E-05	6.74E-06	9.68E-05	5.86E-05	2.95E-05	4.52E-03	4.24E-06	0.00E+00
INHAL								
ADULT	1.23E-06	4.50E-06	1.90E-06	2.19E-06	1.74E-06	5.19E-05	7.82E-05	0.00E+00
TEEN	1.65E-06	5.88E-06	2.47E-06	2.99E-06	2.39E-06	6.61E-05	1.15E-04	0.00E+00
CHILD	1.99E-06	1.93E-05	3.18E-06	2.89E-06	2.24E-06	7.85E-05	9.32E-05	0.00E+00
INFANT	1.34E-06	1.78E-05	2.09E-06	2.57E-06	1.46E-06	7.20E-05	6.06E-05	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 1.67E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 2.63E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.76E-04	1.76E-04	1.76E-04	1.76E-04	1.76E-04	1.76E-04	1.78E-04	3.51E-04
GROUND	9.94E-05	9.94E-05	9.94E-05	9.94E-05	9.94E-05	9.94E-05	9.94E-05	1.17E-04
VEGET								
ADULT	2.20E-06	1.43E-05	1.06E-05	1.70E-06	7.07E-07	5.89E-05	5.32E-08	0.00E+00
TEEN	3.28E-06	1.53E-05	1.55E-05	2.62E-06	1.06E-06	7.92E-05	9.72E-08	0.00E+00
CHILD	6.45E-06	1.01E-05	3.38E-05	4.11E-06	1.64E-06	1.52E-04	1.45E-07	0.00E+00
MEAT								
ADULT	5.25E-07	3.65E-06	2.21E-07	4.63E-07	1.58E-07	1.58E-06	1.51E-08	0.00E+00
TEEN	4.11E-07	1.97E-06	1.63E-07	3.59E-07	1.17E-07	1.14E-06	1.37E-08	0.00E+00
CHILD	6.32E-07	9.95E-07	2.69E-07	4.25E-07	1.35E-07	1.72E-06	1.55E-08	0.00E+00
COW MILK								
ADULT	6.69E-07	1.37E-06	9.52E-07	1.19E-06	8.51E-07	4.45E-05	2.28E-08	0.00E+00
TEEN	1.05E-06	1.60E-06	1.56E-06	2.03E-06	1.42E-06	7.05E-05	4.69E-08	0.00E+00
CHILD	1.96E-06	1.05E-06	3.44E-06	3.19E-06	2.20E-06	1.40E-04	7.19E-08	0.00E+00
INFANT	2.75E-06	3.63E-06	5.21E-06	5.99E-06	3.27E-06	3.40E-04	1.31E-07	0.00E+00
GOATMILK								
ADULT	5.38E-07	2.79E-07	1.52E-06	8.32E-07	5.44E-07	5.34E-05	6.35E-08	0.00E+00
TEEN	6.32E-07	3.48E-07	2.55E-06	1.46E-06	9.55E-07	8.46E-05	1.31E-07	0.00E+00
CHILD	8.14E-07	2.52E-07	5.81E-06	2.50E-06	1.57E-06	1.68E-04	2.02E-07	0.00E+00
INFANT	1.16E-06	5.61E-07	8.87E-06	5.07E-06	2.59E-06	4.08E-04	3.65E-07	0.00E+00
INHAL								
ADULT	8.56E-07	9.59E-07	9.86E-07	1.62E-06	1.28E-06	1.04E-05	1.11E-05	0.00E+00
TEEN	1.17E-06	2.13E-06	1.36E-06	2.23E-06	1.77E-06	1.34E-05	1.65E-05	0.00E+00
CHILD	1.45E-06	1.29E-05	1.82E-06	2.19E-06	1.65E-06	1.60E-05	1.36E-05	0.00E+00
INFANT	1.03E-06	1.28E-05	1.39E-06	2.02E-06	1.09E-06	1.46E-05	9.29E-06	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 2.00E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 3.13E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.10E-04	2.10E-04	2.10E-04	2.10E-04	2.10E-04	2.10E-04	2.12E-04	4.19E-04
GROUND	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	1.96E-04	2.31E-04
VEGET								
ADULT	4.28E-06	2.81E-05	1.94E-05	3.31E-06	1.33E-06	1.06E-04	1.02E-07	0.00E+00
TEEN	6.40E-06	3.01E-05	2.80E-05	5.09E-06	1.99E-06	1.42E-04	1.86E-07	0.00E+00
CHILD	1.26E-05	1.99E-05	6.06E-05	7.97E-06	3.09E-06	2.73E-04	2.78E-07	0.00E+00
MEAT								
ADULT	1.04E-06	7.25E-06	4.18E-07	9.14E-07	3.10E-07	2.83E-06	2.96E-08	0.00E+00
TEEN	8.14E-07	3.90E-06	3.07E-07	7.09E-07	2.30E-07	2.05E-06	2.68E-08	0.00E+00
CHILD	1.25E-06	1.97E-06	5.03E-07	8.38E-07	2.64E-07	3.10E-06	3.04E-08	0.00E+00
COW MILK								
ADULT	1.29E-06	2.70E-06	1.78E-06	2.30E-06	1.63E-06	7.99E-05	4.27E-08	0.00E+00
TEEN	2.04E-06	3.15E-06	2.90E-06	3.92E-06	2.71E-06	1.27E-04	8.78E-08	0.00E+00
CHILD	3.81E-06	2.07E-06	6.34E-06	6.15E-06	4.19E-06	2.51E-04	1.35E-07	0.00E+00
INFANT	5.32E-06	7.15E-06	9.43E-06	1.15E-05	6.20E-06	6.10E-04	2.46E-07	0.00E+00
GOATMILK								
ADULT	1.00E-06	5.20E-07	2.78E-06	1.55E-06	1.00E-06	9.59E-05	1.18E-07	0.00E+00
TEEN	1.17E-06	6.45E-07	4.65E-06	2.72E-06	1.76E-06	1.52E-04	2.45E-07	0.00E+00
CHILD	1.51E-06	4.63E-07	1.05E-05	4.65E-06	2.88E-06	3.01E-04	3.76E-07	0.00E+00
INFANT	2.14E-06	1.07E-06	1.58E-05	9.42E-06	4.75E-06	7.32E-04	6.81E-07	0.00E+00
INHAL								
ADULT	9.95E-07	1.42E-06	1.19E-06	1.87E-06	1.48E-06	1.60E-05	1.90E-05	0.00E+00
TEEN	1.36E-06	2.73E-06	1.63E-06	2.58E-06	2.04E-06	2.05E-05	2.80E-05	0.00E+00
CHILD	1.67E-06	1.49E-05	2.17E-06	2.52E-06	1.91E-06	2.45E-05	2.29E-05	0.00E+00
INFANT	1.18E-06	1.47E-05	1.62E-06	2.31E-06	1.26E-06	2.24E-05	1.54E-05	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020

SPECIAL LOCATION NO. 1A Site Boundary
AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.00E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 1.10E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.31E-05	7.31E-05	7.31E-05	7.31E-05	7.31E-05	7.31E-05	7.41E-05	1.66E-04
GROUND	5.32E-03	5.32E-03	5.32E-03	5.32E-03	5.32E-03	5.32E-03	5.32E-03	6.26E-03
VEGET								
ADULT	1.27E-04	7.56E-04	4.64E-04	1.09E-04	4.50E-05	3.47E-03	4.78E-06	0.00E+00
TEEN	1.83E-04	8.07E-04	6.62E-04	1.69E-04	6.82E-05	4.66E-03	8.83E-06	0.00E+00
CHILD	3.44E-04	5.31E-04	1.41E-03	2.70E-04	1.07E-04	8.92E-03	1.33E-05	0.00E+00
MEAT								
ADULT	2.93E-05	1.98E-04	1.15E-05	2.61E-05	8.82E-06	9.26E-05	9.58E-07	0.00E+00
TEEN	2.26E-05	1.07E-04	8.51E-06	2.03E-05	6.58E-06	6.71E-05	8.73E-07	0.00E+00
CHILD	3.43E-05	5.39E-05	1.40E-05	2.42E-05	7.61E-06	1.01E-04	9.99E-07	0.00E+00
COW MILK								
ADULT	4.35E-05	7.31E-05	5.45E-05	7.55E-05	5.03E-05	2.62E-03	2.57E-06	0.00E+00
TEEN	6.36E-05	8.53E-05	9.03E-05	1.29E-04	8.44E-05	4.16E-03	5.29E-06	0.00E+00
CHILD	1.10E-04	5.60E-05	2.00E-04	2.07E-04	1.32E-04	8.25E-03	8.13E-06	0.00E+00
INFANT	1.52E-04	1.91E-04	3.01E-04	3.94E-04	1.99E-04	2.00E-02	1.48E-05	0.00E+00
GOATMILK								
ADULT	5.24E-05	1.44E-05	9.69E-05	8.12E-05	4.28E-05	3.15E-03	7.44E-06	0.00E+00
TEEN	5.61E-05	1.78E-05	1.65E-04	1.43E-04	7.54E-05	4.99E-03	1.54E-05	0.00E+00
CHILD	5.99E-05	1.28E-05	3.80E-04	2.46E-04	1.24E-04	9.90E-03	2.36E-05	0.00E+00
INFANT	7.78E-05	2.89E-05	5.76E-04	4.92E-04	2.04E-04	2.41E-02	4.28E-05	0.00E+00
INHAL								
ADULT	2.39E-06	1.93E-05	5.53E-06	3.86E-06	3.70E-06	3.77E-04	3.57E-04	0.00E+00
TEEN	2.95E-06	2.10E-05	6.87E-06	5.22E-06	5.07E-06	4.83E-04	5.22E-04	0.00E+00
CHILD	3.17E-06	3.95E-05	8.51E-06	4.92E-06	4.71E-06	5.78E-04	4.24E-04	0.00E+00
INFANT	1.87E-06	3.18E-05	4.67E-06	3.95E-06	3.04E-06	5.31E-04	2.73E-04	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 2A Site Boundary
AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 7.11E-05 MILLRADS
ANNUAL GAMMA AIR DOSE = 6.63E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.40E-05	4.40E-05	4.40E-05	4.40E-05	4.40E-05	4.40E-05	4.47E-05	1.07E-04
GROUND	4.07E-03	4.07E-03	4.07E-03	4.07E-03	4.07E-03	4.07E-03	4.07E-03	4.79E-03
VEGET								
ADULT	9.74E-05	5.78E-04	3.51E-04	8.36E-05	3.43E-05	2.62E-03	3.65E-06	0.00E+00
TEEN	1.40E-04	6.17E-04	5.00E-04	1.29E-04	5.19E-05	3.52E-03	6.75E-06	0.00E+00
CHILD	2.63E-04	4.06E-04	1.06E-03	2.06E-04	8.12E-05	6.74E-03	1.02E-05	0.00E+00
MEAT								
ADULT	2.24E-05	1.52E-04	8.78E-06	2.00E-05	6.74E-06	6.99E-05	7.33E-07	0.00E+00
TEEN	1.73E-05	8.16E-05	6.48E-06	1.55E-05	5.03E-06	5.06E-05	6.68E-07	0.00E+00
CHILD	2.63E-05	4.13E-05	1.07E-05	1.85E-05	5.82E-06	7.65E-05	7.64E-07	0.00E+00
COW MILK								
ADULT	3.32E-05	5.59E-05	4.15E-05	5.76E-05	3.83E-05	1.98E-03	1.96E-06	0.00E+00
TEEN	4.86E-05	6.52E-05	6.86E-05	9.87E-05	6.43E-05	3.14E-03	4.04E-06	0.00E+00
CHILD	8.37E-05	4.28E-05	1.52E-04	1.58E-04	1.01E-04	6.23E-03	6.21E-06	0.00E+00
INFANT	1.16E-04	1.46E-04	2.28E-04	3.00E-04	1.51E-04	1.51E-02	1.13E-05	0.00E+00
GOATMILK								
ADULT	4.00E-05	1.09E-05	7.36E-05	6.19E-05	3.25E-05	2.38E-03	5.68E-06	0.00E+00
TEEN	4.27E-05	1.35E-05	1.25E-04	1.09E-04	5.73E-05	3.76E-03	1.17E-05	0.00E+00
CHILD	4.55E-05	9.70E-06	2.88E-04	1.87E-04	9.44E-05	7.47E-03	1.80E-05	0.00E+00
INFANT	5.91E-05	2.20E-05	4.36E-04	3.75E-04	1.55E-04	1.82E-02	3.27E-05	0.00E+00
INHAL								
ADULT	2.15E-06	1.80E-05	5.07E-06	3.45E-06	3.34E-06	3.53E-04	3.33E-04	0.00E+00
TEEN	2.64E-06	1.94E-05	6.29E-06	4.65E-06	4.57E-06	4.52E-04	4.87E-04	0.00E+00
CHILD	2.82E-06	3.56E-05	7.78E-06	4.38E-06	4.25E-06	5.41E-04	3.95E-04	0.00E+00
INFANT	1.64E-06	2.83E-05	4.23E-06	3.49E-06	2.73E-06	4.97E-04	2.55E-04	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 3A Nearest Resident
AT .90 MILES NW

ANNUAL BETA AIR DOSE = 3.00E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 4.72E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.16E-04	3.16E-04	3.16E-04	3.16E-04	3.16E-04	3.16E-04	3.19E-04	6.29E-04
GROUND	1.56E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	1.83E-03
VEGET								
ADULT	3.84E-05	2.23E-04	1.66E-04	3.30E-05	1.47E-05	1.27E-03	1.44E-06	0.00E+00
TEEN	5.50E-05	2.39E-04	2.42E-04	5.11E-05	2.22E-05	1.71E-03	2.66E-06	0.00E+00
CHILD	1.04E-04	1.58E-04	5.30E-04	8.16E-05	3.49E-05	3.28E-03	4.02E-06	0.00E+00
MEAT								
ADULT	8.49E-06	5.71E-05	3.71E-06	7.64E-06	2.63E-06	3.40E-05	2.83E-07	0.00E+00
TEEN	6.54E-06	3.07E-05	2.77E-06	5.94E-06	1.96E-06	2.47E-05	2.58E-07	0.00E+00
CHILD	9.93E-06	1.55E-05	4.62E-06	7.08E-06	2.27E-06	3.72E-05	2.95E-07	0.00E+00
COW MILK								
ADULT	1.33E-05	2.16E-05	1.79E-05	2.30E-05	1.59E-05	9.65E-04	7.83E-07	0.00E+00
TEEN	1.94E-05	2.53E-05	3.00E-05	3.94E-05	2.68E-05	1.53E-03	1.61E-06	0.00E+00
CHILD	3.33E-05	1.67E-05	6.73E-05	6.34E-05	4.21E-05	3.03E-03	2.48E-06	0.00E+00
INFANT	4.67E-05	5.61E-05	1.04E-04	1.21E-04	6.42E-05	7.38E-03	4.50E-06	0.00E+00
GOATMILK								
ADULT	1.64E-05	4.84E-06	3.23E-05	2.54E-05	1.41E-05	1.16E-03	2.27E-06	0.00E+00
TEEN	1.77E-05	6.08E-06	5.54E-05	4.46E-05	2.49E-05	1.83E-03	4.70E-06	0.00E+00
CHILD	1.95E-05	4.46E-06	1.28E-04	7.68E-05	4.10E-05	3.64E-03	7.22E-06	0.00E+00
INFANT	2.62E-05	9.18E-06	2.00E-04	1.55E-04	6.77E-05	8.85E-03	1.31E-05	0.00E+00
INHAL								
ADULT	1.54E-06	4.70E-06	2.28E-06	2.81E-06	2.36E-06	8.69E-05	7.77E-05	0.00E+00
TEEN	2.05E-06	6.63E-06	3.01E-06	3.85E-06	3.25E-06	1.11E-04	1.14E-04	0.00E+00
CHILD	2.44E-06	2.48E-05	3.91E-06	3.73E-06	3.04E-06	1.33E-04	9.28E-05	0.00E+00
INFANT	1.66E-06	2.31E-05	2.65E-06	3.34E-06	1.99E-06	1.22E-04	6.06E-05	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 1.93E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 3.09E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.07E-04	2.07E-04	2.07E-04	2.07E-04	2.07E-04	2.07E-04	2.09E-04	4.09E-04
GROUND	9.37E-05	9.37E-05	9.37E-05	9.37E-05	9.37E-05	9.37E-05	9.37E-05	1.10E-04
VEGET								
ADULT	2.36E-06	1.35E-05	1.13E-05	2.03E-06	9.50E-07	8.78E-05	8.88E-08	0.00E+00
TEEN	3.38E-06	1.45E-05	1.67E-05	3.14E-06	1.44E-06	1.18E-04	1.64E-07	0.00E+00
CHILD	6.41E-06	9.65E-06	3.71E-05	5.03E-06	2.26E-06	2.26E-04	2.48E-07	0.00E+00
MEAT								
ADULT	5.09E-07	3.40E-06	2.39E-07	4.60E-07	1.60E-07	2.35E-06	1.71E-08	0.00E+00
TEEN	3.91E-07	1.83E-06	1.79E-07	3.58E-07	1.20E-07	1.70E-06	1.56E-08	0.00E+00
CHILD	5.93E-07	9.27E-07	3.01E-07	4.27E-07	1.39E-07	2.57E-06	1.79E-08	0.00E+00
COW MILK								
ADULT	8.23E-07	1.31E-06	1.17E-06	1.42E-06	1.01E-06	6.65E-05	4.86E-08	0.00E+00
TEEN	1.20E-06	1.54E-06	1.96E-06	2.44E-06	1.70E-06	1.05E-04	1.00E-07	0.00E+00
CHILD	2.06E-06	1.02E-06	4.44E-06	3.93E-06	2.68E-06	2.09E-04	1.54E-07	0.00E+00
INFANT	2.91E-06	3.39E-06	7.00E-06	7.59E-06	4.12E-06	5.08E-04	2.79E-07	0.00E+00
GOATMILK								
ADULT	1.03E-06	3.19E-07	2.12E-06	1.60E-06	9.16E-07	7.98E-05	1.41E-07	0.00E+00
TEEN	1.13E-06	4.04E-07	3.65E-06	2.81E-06	1.62E-06	1.26E-04	2.92E-07	0.00E+00
CHILD	1.26E-06	2.99E-07	8.49E-06	4.84E-06	2.67E-06	2.51E-04	4.48E-07	0.00E+00
INFANT	1.72E-06	5.83E-07	1.34E-05	9.78E-06	4.42E-06	6.10E-04	8.11E-07	0.00E+00
INHAL								
ADULT	7.57E-07	7.96E-07	8.67E-07	1.44E-06	1.15E-06	1.28E-05	8.54E-06	0.00E+00
TEEN	1.03E-06	1.86E-06	1.20E-06	1.98E-06	1.59E-06	1.64E-05	1.27E-05	0.00E+00
CHILD	1.27E-06	1.16E-05	1.61E-06	1.94E-06	1.49E-06	1.97E-05	1.04E-05	0.00E+00
INFANT	9.03E-07	1.15E-05	1.23E-06	1.79E-06	9.81E-07	1.80E-05	7.24E-06	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 2.48E-04 MILLRADS
ANNUAL GAMMA AIR DOSE = 3.97E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.66E-04	2.66E-04	2.66E-04	2.66E-04	2.66E-04	2.66E-04	2.69E-04	5.27E-04
GROUND	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.85E-04	2.17E-04
VEGET								
ADULT	4.60E-06	2.65E-05	2.06E-05	3.95E-06	1.79E-06	1.59E-04	1.73E-07	0.00E+00
TEEN	6.58E-06	2.85E-05	3.03E-05	6.11E-06	2.71E-06	2.14E-04	3.19E-07	0.00E+00
CHILD	1.24E-05	1.89E-05	6.67E-05	9.77E-06	4.26E-06	4.09E-04	4.81E-07	0.00E+00
MEAT								
ADULT	1.01E-06	6.75E-06	4.52E-07	9.06E-07	3.13E-07	4.25E-06	3.36E-08	0.00E+00
TEEN	7.74E-07	3.63E-06	3.38E-07	7.05E-07	2.34E-07	3.08E-06	3.07E-08	0.00E+00
CHILD	1.17E-06	1.84E-06	5.66E-07	8.41E-07	2.71E-07	4.64E-06	3.51E-08	0.00E+00
COW MILK								
ADULT	1.59E-06	2.57E-06	2.19E-06	2.75E-06	1.92E-06	1.20E-04	9.40E-08	0.00E+00
TEEN	2.32E-06	3.01E-06	3.68E-06	4.72E-06	3.24E-06	1.91E-04	1.94E-07	0.00E+00
CHILD	3.99E-06	1.99E-06	8.27E-06	7.60E-06	5.09E-06	3.78E-04	2.98E-07	0.00E+00
INFANT	5.61E-06	6.66E-06	1.29E-05	1.46E-05	7.79E-06	9.19E-04	5.41E-07	0.00E+00
GOATMILK								
ADULT	1.98E-06	5.94E-07	3.96E-06	3.06E-06	1.72E-06	1.44E-04	2.73E-07	0.00E+00
TEEN	2.15E-06	7.48E-07	6.81E-06	5.38E-06	3.03E-06	2.29E-04	5.64E-07	0.00E+00
CHILD	2.38E-06	5.50E-07	1.58E-05	9.27E-06	5.00E-06	4.54E-04	8.67E-07	0.00E+00
INFANT	3.21E-06	1.11E-06	2.48E-05	1.87E-05	8.27E-06	1.10E-03	1.57E-06	0.00E+00
INHAL								
ADULT	9.47E-07	1.20E-06	1.12E-06	1.79E-06	1.44E-06	2.02E-05	1.48E-05	0.00E+00
TEEN	1.29E-06	2.48E-06	1.54E-06	2.47E-06	1.99E-06	2.58E-05	2.19E-05	0.00E+00
CHILD	1.58E-06	1.43E-05	2.06E-06	2.41E-06	1.86E-06	3.10E-05	1.79E-05	0.00E+00
INFANT	1.12E-06	1.40E-05	1.55E-06	2.22E-06	1.23E-06	2.84E-05	1.21E-05	0.00E+00

TABLE 8. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-MARCH 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.47E-05	7.80E-05
	94.86%	96.25%	91.30%	92.27%	94.15%	23.37%	96.33%	98.48%
GROUND	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.20E-06
	2.85%	2.89%	2.74%	2.77%	2.83%	.70%	2.85%	1.52%
INHAL	3.02E-08	7.81E-08	5.38E-08	6.61E-08	9.34E-08	1.20E-05	1.23E-07	0.00E+00
	.08%	.22%	.14%	.18%	.26%	8.18%	.34%	.00%
VEGET	2.66E-07	1.16E-07	1.07E-06	5.66E-07	1.92E-07	1.18E-06	6.50E-08	0.00E+00
	.74%	.33%	2.86%	1.53%	.53%	.81%	.18%	.00%
COW MILK	4.95E-07	7.83E-08	1.06E-06	1.15E-06	7.87E-07	9.60E-05	1.00E-07	0.00E+00
	1.37%	.22%	2.82%	3.10%	2.17%	65.59%	.28%	.00%
MEAT	3.34E-08	3.31E-08	5.04E-08	5.61E-08	2.65E-08	1.98E-06	5.56E-09	0.00E+00
	.09%	.09%	.13%	.15%	.07%	1.35%	.02%	.00%
TOTAL	3.61E-05	3.55E-05	3.75E-05	3.71E-05	3.63E-05	1.46E-04	3.60E-05	7.92E-05

TABLE 9. DOSES TO POPULATION WITHIN 50 MILES, APRIL-JUNE 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.59E-06	4.62E-06	9.12E-06
	41.77%	44.01%	32.89%	35.55%	41.56%	3.53%	45.38%	62.03%
GROUND	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	4.75E-06	5.58E-06
	43.21%	45.53%	34.02%	36.77%	42.99%	3.65%	46.63%	37.97%
INHAL	3.35E-08	8.32E-08	6.47E-08	7.26E-08	9.43E-08	1.12E-05	4.48E-07	0.00E+00
	.30%	.80%	.46%	.56%	.85%	8.58%	4.40%	.00%
VEGET	6.35E-07	6.57E-07	2.32E-06	1.23E-06	4.03E-07	1.29E-06	1.39E-07	0.00E+00
	5.77%	6.29%	16.62%	9.49%	3.64%	.99%	1.36%	.00%
COW MILK	8.99E-07	1.67E-07	2.13E-06	2.16E-06	1.16E-06	1.06E-04	2.15E-07	0.00E+00
	8.17%	1.60%	15.22%	16.70%	10.54%	81.58%	2.11%	.00%
MEAT	8.47E-08	1.84E-07	1.11E-07	1.21E-07	4.60E-08	2.17E-06	1.19E-08	0.00E+00
	.77%	1.76%	.79%	.93%	.42%	1.67%	.12%	.00%
TOTAL	1.10E-05	1.04E-05	1.40E-05	1.29E-05	1.11E-05	1.30E-04	1.02E-05	1.47E-05

TABLE 10. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-JUNE 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.92E-05	3.92E-05	3.92E-05	3.92E-05	3.92E-05	3.92E-05	3.97E-05	8.86E-05
	82.90%	84.84%	75.86%	78.04%	82.32%	14.12%	85.40%	93.08%
GROUND	5.61E-06	5.61E-06	5.61E-06	5.61E-06	5.61E-06	5.61E-06	5.61E-06	6.59E-06
	11.86%	12.14%	10.85%	11.16%	11.78%	2.02%	12.07%	6.92%
INHAL	6.64E-08	1.62E-07	1.25E-07	1.44E-07	1.93E-07	2.37E-05	6.43E-07	0.00E+00
	.14%	.35%	.24%	.29%	.41%	8.52%	1.38%	.00%
VEGET	9.02E-07	7.72E-07	3.40E-06	1.79E-06	5.95E-07	2.48E-06	2.04E-07	0.00E+00
	1.91%	1.67%	6.57%	3.57%	1.25%	.89%	.44%	.00%
COW MILK	1.40E-06	2.46E-07	3.18E-06	3.31E-06	1.95E-06	2.03E-04	3.15E-07	0.00E+00
	2.95%	.53%	6.16%	6.59%	4.10%	72.94%	.68%	.00%
MEAT	1.18E-07	2.17E-07	1.61E-07	1.77E-07	7.26E-08	4.15E-06	1.75E-08	0.00E+00
	.25%	.47%	.31%	.35%	.15%	1.50%	.04%	.00%
TOTAL	4.73E-05	4.62E-05	5.17E-05	5.03E-05	4.77E-05	2.78E-04	4.65E-05	9.52E-05

TABLE 11. DOSES TO POPULATION WITHIN 50 MILES, JULY-SEPTEMBER 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.28E-05	2.28E-05	2.28E-05	2.28E-05	2.28E-05	2.28E-05	2.31E-05	5.23E-05
	15.13%	13.33%	15.17%	15.27%	15.50%	6.44%	13.49%	26.60%
GROUND	1.23E-04	1.23E-04	1.23E-04	1.23E-04	1.23E-04	1.23E-04	1.23E-04	1.44E-04
	81.25%	71.57%	81.46%	81.97%	83.21%	34.60%	71.47%	73.40%
INHAL	1.33E-07	1.15E-06	1.48E-07	1.99E-07	2.28E-07	3.05E-05	2.57E-05	0.00E+00
	.09%	.67%	.10%	.13%	.15%	8.62%	14.97%	.00%
VEGET	3.27E-06	1.67E-05	3.22E-06	1.77E-06	2.25E-07	2.14E-06	4.61E-08	0.00E+00
	2.17%	9.73%	2.14%	1.18%	.15%	.60%	.03%	.00%
COW MILK	1.16E-06	2.29E-06	1.59E-06	1.70E-06	1.38E-06	1.73E-04	6.70E-08	0.00E+00
	.77%	1.33%	1.06%	1.14%	.94%	48.72%	.04%	.00%
MEAT	8.97E-07	5.76E-06	1.09E-07	4.75E-07	7.10E-08	3.60E-06	6.92E-09	0.00E+00
	.59%	3.37%	.07%	.32%	.05%	1.02%	.00%	.00%
TOTAL	1.51E-04	1.71E-04	1.50E-04	1.50E-04	1.47E-04	3.54E-04	1.71E-04	1.96E-04

TABLE 12. DOSES TO POPULATION WITHIN 50 MILES, OCTOBER-DECEMBER 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.61E-04	1.61E-04	1.61E-04	1.61E-04	1.61E-04	1.61E-04	1.63E-04	3.67E-04
	50.47%	45.75%	44.69%	50.00%	51.24%	27.67%	46.22%	68.47%
GROUND	1.44E-04	1.44E-04	1.44E-04	1.44E-04	1.44E-04	1.44E-04	1.44E-04	1.69E-04
	45.08%	40.86%	39.92%	44.66%	45.77%	24.72%	40.73%	31.53%
INHAL	6.48E-07	5.83E-06	1.46E-06	1.10E-06	9.08E-07	4.09E-05	4.57E-05	0.00E+00
	.20%	1.66%	.41%	.34%	.29%	7.03%	12.94%	.00%
VEGET	6.30E-06	2.58E-05	4.38E-05	4.63E-06	1.40E-06	2.90E-06	1.66E-07	0.00E+00
	1.98%	7.34%	12.17%	1.44%	.44%	.50%	.05%	.00%
COW MILK	5.45E-06	6.35E-06	9.11E-06	9.72E-06	6.41E-06	2.28E-04	1.86E-07	0.00E+00
	1.71%	1.80%	2.53%	3.02%	2.04%	39.24%	.05%	.00%
MEAT	1.77E-06	9.08E-06	1.06E-06	1.76E-06	6.86E-07	4.85E-06	6.91E-08	0.00E+00
	.56%	2.58%	.30%	.55%	.22%	.83%	.02%	.00%
TOTAL	3.19E-04	3.52E-04	3.60E-04	3.22E-04	3.14E-04	5.82E-04	3.53E-04	5.36E-04

TABLE 13. DOSES TO POPULATION WITHIN 50 MILES, JULY-DECEMBER 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.85E-04	1.88E-04	4.24E-04
	39.08%	35.13%	35.96%	38.94%	39.78%	19.65%	35.54%	57.27%
GROUND	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	3.16E-04
	56.76%	51.02%	52.23%	56.54%	57.77%	28.54%	50.92%	42.73%
INHAL	8.58E-07	7.11E-06	1.67E-06	1.44E-06	1.25E-06	7.28E-05	7.09E-05	0.00E+00
	.18%	1.35%	.32%	.30%	.27%	7.73%	13.43%	.00%
VEGET	9.57E-06	4.24E-05	4.72E-05	6.39E-06	1.62E-06	5.05E-06	2.13E-07	0.00E+00
	2.02%	8.05%	9.18%	1.34%	.35%	.54%	.04%	.00%
COW MILK	6.60E-06	8.63E-06	1.07E-05	1.14E-05	7.79E-06	4.02E-04	2.55E-07	0.00E+00
	1.39%	1.64%	2.09%	2.40%	1.67%	42.65%	.05%	.00%
MEAT	2.67E-06	1.48E-05	1.18E-06	2.24E-06	7.56E-07	8.45E-06	7.60E-08	0.00E+00
	.56%	2.81%	.23%	.47%	.16%	.90%	.01%	.00%
TOTAL	4.74E-04	5.27E-04	5.15E-04	4.75E-04	4.65E-04	9.42E-04	5.28E-04	7.40E-04

TABLE 14. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-DECEMBER 2020

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.11E-04	2.11E-04	2.11E-04	2.11E-04	2.11E-04	2.11E-04	2.14E-04	4.82E-04
	42.18%	38.25%	38.65%	41.79%	42.87%	17.63%	39.75%	60.56%
GROUND	2.67E-04	2.67E-04	2.67E-04	2.67E-04	2.67E-04	2.67E-04	2.67E-04	3.14E-04
	53.38%	48.40%	48.91%	52.89%	54.25%	22.30%	49.64%	39.44%
INHAL	8.41E-07	6.25E-06	1.57E-06	1.47E-06	1.37E-06	9.10E-05	5.59E-05	0.00E+00
	.17%	1.13%	.29%	.29%	.28%	7.60%	10.40%	.00%
VEGET	1.05E-05	4.34E-05	5.09E-05	8.20E-06	2.22E-06	7.56E-06	4.17E-07	0.00E+00
	2.10%	7.87%	9.34%	1.63%	.45%	.63%	.08%	.00%
COW MILK	8.02E-06	8.91E-06	1.40E-05	1.48E-05	9.77E-06	6.07E-04	5.71E-07	0.00E+00
	1.60%	1.62%	2.57%	2.93%	1.99%	50.78%	.11%	.00%
MEAT	2.79E-06	1.51E-05	1.34E-06	2.42E-06	8.29E-07	1.26E-05	9.35E-08	0.00E+00
	.56%	2.74%	.25%	.48%	.17%	1.05%	.02%	.00%
TOTAL	5.00E-04	5.51E-04	5.46E-04	5.05E-04	4.92E-04	1.20E-03	5.38E-04	7.96E-04

CARBON-14 GASEOUS EFFLUENT DOSE CALCULATIONS

Doses to the maximum individual resulting from the release of Carbon-14 in gaseous effluents from the Cooper Nuclear Station (CNS) were calculated using the latest version of the GASPAR computer code included as part of NRCDose 2.3.20 (ORNL 2015). Four pathways were selected for individual dose calculations: the nearest site boundary for inhalation, nearest garden for vegetation ingestion, nearest animal for meat ingestion, and the nearest milk animal (cow). Based on the 2020 Land Use Census, there are no meat or milk animals identified within 5 miles of CNS. However, CNS maintains a virtual cow receptor at 3.5 miles north-northwest of the plant and conservatively includes this receptor in dose calculations.

Use of a normalized Carbon-14 source term and scaling factors based on the annual thermal gigawatts (GW_T) power generation were utilized to determine the quantity of Carbon-14 in the CNS gaseous effluent discharge for 2020. Specifically, the Boiling Water Reactor proxy production rate of 5.1 curies Carbon-14 per GW_T generation using the methodology described in EPRI, 2010 was the basis for the CNS total calculated emissions of 11.0 curies of Carbon-14 in 2020.

GASPAR implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground, inhalation, and ingestion. Doses to the maximum individual are calculated as a function of age group and pathway for significant body organs.

Tables 15 through 21 present maximum individual doses. Note that the inhalation pathway was calculated at the closest site boundary receptor and was negligible for Carbon-14 and is not included in the tables. In addition, the doses presented were conservatively calculated based on the annual site X/Qs. These X/Qs result in doses approximately 20% higher than those calculated with the X/Qs based on growing season meteorology.

Additional assumptions and data used for input to the GASPAR code are described in a separate section of this appendix (see page F67).

TABLE 15. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	4.37E-03	4.37E-03	2.19E-02	4.37E-03	4.37E-03	4.37E-03	4.37E-03	4.37E-03
TEEN	7.31E-03	7.31E-03	3.66E-02	7.31E-03	7.31E-03	7.31E-03	7.31E-03	7.31E-03
CHILD	1.78E-02	1.78E-02	8.90E-02	1.78E-02	1.78E-02	1.78E-02	1.78E-02	1.78E-02
MEAT								
ADULT	1.74E-03	1.74E-03	8.72E-03	1.74E-03	1.74E-03	1.74E-03	1.74E-03	1.74E-03
TEEN	1.47E-03	1.47E-03	7.37E-03	1.47E-03	1.47E-03	1.47E-03	1.47E-03	1.47E-03
CHILD	2.77E-03	2.77E-03	1.39E-02	2.77E-03	2.77E-03	2.77E-03	2.77E-03	2.77E-03
COW MILK								
ADULT	1.90E-03	1.90E-03	9.52E-03	1.90E-03	1.90E-03	1.90E-03	1.90E-03	1.90E-03
TEEN	3.51E-03	3.51E-03	1.76E-02	3.51E-03	3.51E-03	3.51E-03	3.51E-03	3.51E-03
CHILD	8.63E-03	8.63E-03	4.32E-02	8.63E-03	8.63E-03	8.63E-03	8.63E-03	8.63E-03
INFANT	1.81E-02	1.81E-02	8.46E-02	1.81E-02	1.81E-02	1.81E-02	1.81E-02	1.81E-02
GOATMILK								
ADULT	1.90E-03	1.90E-03	9.52E-03	1.90E-03	1.90E-03	1.90E-03	1.90E-03	1.90E-03
TEEN	3.51E-03	3.51E-03	1.76E-02	3.51E-03	3.51E-03	3.51E-03	3.51E-03	3.51E-03
CHILD	8.63E-03	8.63E-03	4.32E-02	8.63E-03	8.63E-03	8.63E-03	8.63E-03	8.63E-03
INFANT	1.81E-02	1.81E-02	8.46E-02	1.81E-02	1.81E-02	1.81E-02	1.81E-02	1.81E-02

TABLE 15. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	7.87E-03	7.87E-03	3.93E-02	7.87E-03	7.87E-03	7.87E-03	7.87E-03	7.87E-03
TEEN	1.32E-02	1.32E-02	6.58E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02
CHILD	3.20E-02	3.20E-02	1.60E-01	3.20E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02
MEAT								
ADULT	3.14E-03	3.14E-03	1.57E-02	3.14E-03	3.14E-03	3.14E-03	3.14E-03	3.14E-03
TEEN	2.65E-03	2.65E-03	1.33E-02	2.65E-03	2.65E-03	2.65E-03	2.65E-03	2.65E-03
CHILD	4.99E-03	4.99E-03	2.49E-02	4.99E-03	4.99E-03	4.99E-03	4.99E-03	4.99E-03
COW MILK								
ADULT	3.43E-03	3.43E-03	1.71E-02	3.43E-03	3.43E-03	3.43E-03	3.43E-03	3.43E-03
TEEN	6.32E-03	6.32E-03	3.16E-02	6.32E-03	6.32E-03	6.32E-03	6.32E-03	6.32E-03
CHILD	1.55E-02	1.55E-02	7.77E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02
INFANT	3.25E-02	3.25E-02	1.52E-01	3.25E-02	3.25E-02	3.25E-02	3.25E-02	3.25E-02
GOATMILK								
ADULT	3.43E-03	3.43E-03	1.71E-02	3.43E-03	3.43E-03	3.43E-03	3.43E-03	3.43E-03
TEEN	6.32E-03	6.32E-03	3.16E-02	6.32E-03	6.32E-03	6.32E-03	6.32E-03	6.32E-03
CHILD	1.55E-02	1.55E-02	7.77E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02
INFANT	3.25E-02	3.25E-02	1.52E-01	3.25E-02	3.25E-02	3.25E-02	3.25E-02	3.25E-02

TABLE 16. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	3.21E-03	3.21E-03	1.60E-02	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03
TEEN	5.36E-03	5.36E-03	2.68E-02	5.36E-03	5.36E-03	5.36E-03	5.36E-03	5.36E-03
CHILD	1.31E-02	1.31E-02	6.53E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02
MEAT								
ADULT	1.28E-03	1.28E-03	6.40E-03	1.28E-03	1.28E-03	1.28E-03	1.28E-03	1.28E-03
TEEN	1.08E-03	1.08E-03	5.40E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03	1.08E-03
CHILD	2.03E-03	2.03E-03	1.02E-02	2.03E-03	2.03E-03	2.03E-03	2.03E-03	2.03E-03
COW MILK								
ADULT	1.40E-03	1.40E-03	6.98E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03
TEEN	2.57E-03	2.57E-03	1.29E-02	2.57E-03	2.57E-03	2.57E-03	2.57E-03	2.57E-03
CHILD	6.33E-03	6.33E-03	3.17E-02	6.33E-03	6.33E-03	6.33E-03	6.33E-03	6.33E-03
INFANT	1.32E-02	1.32E-02	6.20E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02
GOATMILK								
ADULT	1.40E-03	1.40E-03	6.98E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03	1.40E-03
TEEN	2.57E-03	2.57E-03	1.29E-02	2.57E-03	2.57E-03	2.57E-03	2.57E-03	2.57E-03
CHILD	6.33E-03	6.33E-03	3.17E-02	6.33E-03	6.33E-03	6.33E-03	6.33E-03	6.33E-03
INFANT	1.32E-02	1.32E-02	6.20E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02

TABLE 16. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	6.27E-03	6.27E-03	3.13E-02	6.27E-03	6.27E-03	6.27E-03	6.27E-03	6.27E-03
TEEN	1.05E-02	1.05E-02	5.24E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02
CHILD	2.55E-02	2.55E-02	1.28E-01	2.55E-02	2.55E-02	2.55E-02	2.55E-02	2.55E-02
MEAT								
ADULT	2.50E-03	2.50E-03	1.25E-02	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03
TEEN	2.11E-03	2.11E-03	1.06E-02	2.11E-03	2.11E-03	2.11E-03	2.11E-03	2.11E-03
CHILD	3.97E-03	3.97E-03	1.99E-02	3.97E-03	3.97E-03	3.97E-03	3.97E-03	3.97E-03
COW MILK								
ADULT	2.73E-03	2.73E-03	1.36E-02	2.73E-03	2.73E-03	2.73E-03	2.73E-03	2.73E-03
TEEN	5.03E-03	5.03E-03	2.52E-02	5.03E-03	5.03E-03	5.03E-03	5.03E-03	5.03E-03
CHILD	1.24E-02	1.24E-02	6.19E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02
INFANT	2.59E-02	2.59E-02	1.21E-01	2.59E-02	2.59E-02	2.59E-02	2.59E-02	2.59E-02
GOATMILK								
ADULT	2.73E-03	2.73E-03	1.36E-02	2.73E-03	2.73E-03	2.73E-03	2.73E-03	2.73E-03
TEEN	5.03E-03	5.03E-03	2.52E-02	5.03E-03	5.03E-03	5.03E-03	5.03E-03	5.03E-03
CHILD	1.24E-02	1.24E-02	6.19E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02
INFANT	2.59E-02	2.59E-02	1.21E-01	2.59E-02	2.59E-02	2.59E-02	2.59E-02	2.59E-02

TABLE 17. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	7.58E-03	7.58E-03	3.79E-02	7.58E-03	7.58E-03	7.58E-03	7.58E-03	7.58E-03
TEEN	1.27E-02	1.27E-02	6.34E-02	1.27E-02	1.27E-02	1.27E-02	1.27E-02	1.27E-02
CHILD	3.09E-02	3.09E-02	1.54E-01	3.09E-02	3.09E-02	3.09E-02	3.09E-02	3.09E-02
MEAT								
ADULT	3.02E-03	3.02E-03	1.51E-02	3.02E-03	3.02E-03	3.02E-03	3.02E-03	3.02E-03
TEEN	2.55E-03	2.55E-03	1.28E-02	2.55E-03	2.55E-03	2.55E-03	2.55E-03	2.55E-03
CHILD	4.80E-03	4.80E-03	2.40E-02	4.80E-03	4.80E-03	4.80E-03	4.80E-03	4.80E-03
COW MILK								
ADULT	3.30E-03	3.30E-03	1.65E-02	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03
TEEN	6.09E-03	6.09E-03	3.04E-02	6.09E-03	6.09E-03	6.09E-03	6.09E-03	6.09E-03
CHILD	1.50E-02	1.50E-02	7.48E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02
INFANT	3.13E-02	3.13E-02	1.47E-01	3.13E-02	3.13E-02	3.13E-02	3.13E-02	3.13E-02
GOATMILK								
ADULT	3.30E-03	3.30E-03	1.65E-02	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03
TEEN	6.09E-03	6.09E-03	3.04E-02	6.09E-03	6.09E-03	6.09E-03	6.09E-03	6.09E-03
CHILD	1.50E-02	1.50E-02	7.48E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02	1.50E-02
INFANT	3.13E-02	3.13E-02	1.47E-01	3.13E-02	3.13E-02	3.13E-02	3.13E-02	3.13E-02

TABLE 17. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 1.70 MILES ENE

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.43E-02	1.43E-02	7.14E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02
TEEN	2.39E-02	2.39E-02	1.19E-01	2.39E-02	2.39E-02	2.39E-02	2.39E-02	2.39E-02
CHILD	5.81E-02	5.81E-02	2.91E-01	5.81E-02	5.81E-02	5.81E-02	5.81E-02	5.81E-02
MEAT								
ADULT	5.70E-03	5.70E-03	2.85E-02	5.70E-03	5.70E-03	5.70E-03	5.70E-03	5.70E-03
TEEN	4.82E-03	4.82E-03	2.41E-02	4.82E-03	4.82E-03	4.82E-03	4.82E-03	4.82E-03
CHILD	9.05E-03	9.05E-03	4.53E-02	9.05E-03	9.05E-03	9.05E-03	9.05E-03	9.05E-03
COW MILK								
ADULT	6.22E-03	6.22E-03	3.11E-02	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03
TEEN	1.15E-02	1.15E-02	5.74E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02
CHILD	2.82E-02	2.82E-02	1.41E-01	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02
INFANT	5.90E-02	5.90E-02	2.76E-01	5.90E-02	5.90E-02	5.90E-02	5.90E-02	5.90E-02
GOATMILK								
ADULT	6.22E-03	6.22E-03	3.11E-02	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03
TEEN	1.15E-02	1.15E-02	5.74E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02
CHILD	2.82E-02	2.82E-02	1.41E-01	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02
INFANT	5.90E-02	5.90E-02	2.76E-01	5.90E-02	5.90E-02	5.90E-02	5.90E-02	5.90E-02

TABLE 18. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	5.89E-03	5.89E-03	2.95E-02	5.89E-03	5.89E-03	5.89E-03	5.89E-03	5.89E-03
TEEN	9.86E-03	9.86E-03	4.93E-02	9.86E-03	9.86E-03	9.86E-03	9.86E-03	9.86E-03
CHILD	2.40E-02	2.40E-02	1.20E-01	2.40E-02	2.40E-02	2.40E-02	2.40E-02	2.40E-02
MEAT								
ADULT	2.35E-03	2.35E-03	1.18E-02	2.35E-03	2.35E-03	2.35E-03	2.35E-03	2.35E-03
TEEN	1.99E-03	1.99E-03	9.93E-03	1.99E-03	1.99E-03	1.99E-03	1.99E-03	1.99E-03
CHILD	3.74E-03	3.74E-03	1.87E-02	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03
COW MILK								
ADULT	2.57E-03	2.57E-03	1.28E-02	2.57E-03	2.57E-03	2.57E-03	2.57E-03	2.57E-03
TEEN	4.73E-03	4.73E-03	2.37E-02	4.73E-03	4.73E-03	4.73E-03	4.73E-03	4.73E-03
CHILD	1.16E-02	1.16E-02	5.82E-02	1.16E-02	1.16E-02	1.16E-02	1.16E-02	1.16E-02
INFANT	2.43E-02	2.43E-02	1.14E-01	2.43E-02	2.43E-02	2.43E-02	2.43E-02	2.43E-02
GOATMILK								
ADULT	2.57E-03	2.57E-03	1.28E-02	2.57E-03	2.57E-03	2.57E-03	2.57E-03	2.57E-03
TEEN	4.73E-03	4.73E-03	2.37E-02	4.73E-03	4.73E-03	4.73E-03	4.73E-03	4.73E-03
CHILD	1.16E-02	1.16E-02	5.82E-02	1.16E-02	1.16E-02	1.16E-02	1.16E-02	1.16E-02
INFANT	2.43E-02	2.43E-02	1.14E-01	2.43E-02	2.43E-02	2.43E-02	2.43E-02	2.43E-02

TABLE 18. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.06E-02	1.06E-02	5.30E-02	1.06E-02	1.06E-02	1.06E-02	1.06E-02	1.06E-02
TEEN	1.77E-02	1.77E-02	8.87E-02	1.77E-02	1.77E-02	1.77E-02	1.77E-02	1.77E-02
CHILD	4.32E-02	4.32E-02	2.16E-01	4.32E-02	4.32E-02	4.32E-02	4.32E-02	4.32E-02
MEAT								
ADULT	4.23E-03	4.23E-03	2.12E-02	4.23E-03	4.23E-03	4.23E-03	4.23E-03	4.23E-03
TEEN	3.58E-03	3.58E-03	1.79E-02	3.58E-03	3.58E-03	3.58E-03	3.58E-03	3.58E-03
CHILD	6.72E-03	6.72E-03	3.36E-02	6.72E-03	6.72E-03	6.72E-03	6.72E-03	6.72E-03
COW MILK								
ADULT	4.62E-03	4.62E-03	2.31E-02	4.62E-03	4.62E-03	4.62E-03	4.62E-03	4.62E-03
TEEN	8.52E-03	8.52E-03	4.26E-02	8.52E-03	8.52E-03	8.52E-03	8.52E-03	8.52E-03
CHILD	2.09E-02	2.09E-02	1.05E-01	2.09E-02	2.09E-02	2.09E-02	2.09E-02	2.09E-02
INFANT	4.38E-02	4.38E-02	2.05E-01	4.38E-02	4.38E-02	4.38E-02	4.38E-02	4.38E-02
GOATMILK								
ADULT	4.62E-03	4.62E-03	2.31E-02	4.62E-03	4.62E-03	4.62E-03	4.62E-03	4.62E-03
TEEN	8.52E-03	8.52E-03	4.26E-02	8.52E-03	8.52E-03	8.52E-03	8.52E-03	8.52E-03
CHILD	2.09E-02	2.09E-02	1.05E-01	2.09E-02	2.09E-02	2.09E-02	2.09E-02	2.09E-02
INFANT	4.38E-02	4.38E-02	2.05E-01	4.38E-02	4.38E-02	4.38E-02	4.38E-02	4.38E-02

TABLE 19. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	9.43E-03	9.43E-03	4.71E-02	9.43E-03	9.43E-03	9.43E-03	9.43E-03	9.43E-03
TEEN	1.58E-02	1.58E-02	7.89E-02	1.58E-02	1.58E-02	1.58E-02	1.58E-02	1.58E-02
CHILD	3.84E-02	3.84E-02	1.92E-01	3.84E-02	3.84E-02	3.84E-02	3.84E-02	3.84E-02
MEAT								
ADULT	3.76E-03	3.76E-03	1.88E-02	3.76E-03	3.76E-03	3.76E-03	3.76E-03	3.76E-03
TEEN	3.18E-03	3.18E-03	1.59E-02	3.18E-03	3.18E-03	3.18E-03	3.18E-03	3.18E-03
CHILD	5.98E-03	5.98E-03	2.99E-02	5.98E-03	5.98E-03	5.98E-03	5.98E-03	5.98E-03
COW MILK								
ADULT	4.11E-03	4.11E-03	2.05E-02	4.11E-03	4.11E-03	4.11E-03	4.11E-03	4.11E-03
TEEN	7.57E-03	7.57E-03	3.79E-02	7.57E-03	7.57E-03	7.57E-03	7.57E-03	7.57E-03
CHILD	1.86E-02	1.86E-02	9.31E-02	1.86E-02	1.86E-02	1.86E-02	1.86E-02	1.86E-02
INFANT	3.89E-02	3.89E-02	1.82E-01	3.89E-02	3.89E-02	3.89E-02	3.89E-02	3.89E-02
GOATMILK								
ADULT	4.11E-03	4.11E-03	2.05E-02	4.11E-03	4.11E-03	4.11E-03	4.11E-03	4.11E-03
TEEN	7.57E-03	7.57E-03	3.79E-02	7.57E-03	7.57E-03	7.57E-03	7.57E-03	7.57E-03
CHILD	1.86E-02	1.86E-02	9.31E-02	1.86E-02	1.86E-02	1.86E-02	1.86E-02	1.86E-02
INFANT	3.89E-02	3.89E-02	1.82E-01	3.89E-02	3.89E-02	3.89E-02	3.89E-02	3.89E-02

TABLE 19. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.62E-02	1.62E-02	8.10E-02	1.62E-02	1.62E-02	1.62E-02	1.62E-02	1.62E-02
TEEN	2.71E-02	2.71E-02	1.36E-01	2.71E-02	2.71E-02	2.71E-02	2.71E-02	2.71E-02
CHILD	6.60E-02	6.60E-02	3.30E-01	6.60E-02	6.60E-02	6.60E-02	6.60E-02	6.60E-02
MEAT								
ADULT	6.47E-03	6.47E-03	3.23E-02	6.47E-03	6.47E-03	6.47E-03	6.47E-03	6.47E-03
TEEN	5.46E-03	5.46E-03	2.73E-02	5.46E-03	5.46E-03	5.46E-03	5.46E-03	5.46E-03
CHILD	1.03E-02	1.03E-02	5.14E-02	1.03E-02	1.03E-02	1.03E-02	1.03E-02	1.03E-02
COW MILK								
ADULT	7.06E-03	7.06E-03	3.53E-02	7.06E-03	7.06E-03	7.06E-03	7.06E-03	7.06E-03
TEEN	1.30E-02	1.30E-02	6.51E-02	1.30E-02	1.30E-02	1.30E-02	1.30E-02	1.30E-02
CHILD	3.20E-02	3.20E-02	1.60E-01	3.20E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02
INFANT	6.69E-02	6.69E-02	3.13E-01	6.69E-02	6.69E-02	6.69E-02	6.69E-02	6.69E-02
GOATMILK								
ADULT	7.06E-03	7.06E-03	3.53E-02	7.06E-03	7.06E-03	7.06E-03	7.06E-03	7.06E-03
TEEN	1.30E-02	1.30E-02	6.51E-02	1.30E-02	1.30E-02	1.30E-02	1.30E-02	1.30E-02
CHILD	3.20E-02	3.20E-02	1.60E-01	3.20E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02
INFANT	6.69E-02	6.69E-02	3.13E-01	6.69E-02	6.69E-02	6.69E-02	6.69E-02	6.69E-02

TABLE 20. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.59E-02	1.59E-02	7.96E-02	1.59E-02	1.59E-02	1.59E-02	1.59E-02	1.59E-02
TEEN	2.66E-02	2.66E-02	1.33E-01	2.66E-02	2.66E-02	2.66E-02	2.66E-02	2.66E-02
CHILD	6.48E-02	6.48E-02	3.24E-01	6.48E-02	6.48E-02	6.48E-02	6.48E-02	6.48E-02
MEAT								
ADULT	6.35E-03	6.35E-03	3.18E-02	6.35E-03	6.35E-03	6.35E-03	6.35E-03	6.35E-03
TEEN	5.36E-03	5.36E-03	2.68E-02	5.36E-03	5.36E-03	5.36E-03	5.36E-03	5.36E-03
CHILD	1.01E-02	1.01E-02	5.04E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02	1.01E-02
COW MILK								
ADULT	6.93E-03	6.93E-03	3.46E-02	6.93E-03	6.93E-03	6.93E-03	6.93E-03	6.93E-03
TEEN	1.28E-02	1.28E-02	6.39E-02	1.28E-02	1.28E-02	1.28E-02	1.28E-02	1.28E-02
CHILD	3.14E-02	3.14E-02	1.57E-01	3.14E-02	3.14E-02	3.14E-02	3.14E-02	3.14E-02
INFANT	6.57E-02	6.57E-02	3.08E-01	6.57E-02	6.57E-02	6.57E-02	6.57E-02	6.57E-02
GOATMILK								
ADULT	6.93E-03	6.93E-03	3.46E-02	6.93E-03	6.93E-03	6.93E-03	6.93E-03	6.93E-03
TEEN	1.28E-02	1.28E-02	6.39E-02	1.28E-02	1.28E-02	1.28E-02	1.28E-02	1.28E-02
CHILD	3.14E-02	3.14E-02	1.57E-01	3.14E-02	3.14E-02	3.14E-02	3.14E-02	3.14E-02
INFANT	6.57E-02	6.57E-02	3.08E-01	6.57E-02	6.57E-02	6.57E-02	6.57E-02	6.57E-02

TABLE 20. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	2.77E-02	2.77E-02	1.38E-01	2.77E-02	2.77E-02	2.77E-02	2.77E-02	2.77E-02
TEEN	4.63E-02	4.63E-02	2.32E-01	4.63E-02	4.63E-02	4.63E-02	4.63E-02	4.63E-02
CHILD	1.13E-01	1.13E-01	5.64E-01	1.13E-01	1.13E-01	1.13E-01	1.13E-01	1.13E-01
MEAT								
ADULT	1.11E-02	1.11E-02	5.53E-02	1.11E-02	1.11E-02	1.11E-02	1.11E-02	1.11E-02
TEEN	9.34E-03	9.34E-03	4.67E-02	9.34E-03	9.34E-03	9.34E-03	9.34E-03	9.34E-03
CHILD	1.76E-02	1.76E-02	8.78E-02	1.76E-02	1.76E-02	1.76E-02	1.76E-02	1.76E-02
COW MILK								
ADULT	1.21E-02	1.21E-02	6.03E-02	1.21E-02	1.21E-02	1.21E-02	1.21E-02	1.21E-02
TEEN	2.22E-02	2.22E-02	1.11E-01	2.22E-02	2.22E-02	2.22E-02	2.22E-02	2.22E-02
CHILD	5.47E-02	5.47E-02	2.73E-01	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02
INFANT	1.14E-01	1.14E-01	5.36E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
GOATMILK								
ADULT	1.21E-02	1.21E-02	6.03E-02	1.21E-02	1.21E-02	1.21E-02	1.21E-02	1.21E-02
TEEN	2.22E-02	2.22E-02	1.11E-01	2.22E-02	2.22E-02	2.22E-02	2.22E-02	2.22E-02
CHILD	5.47E-02	5.47E-02	2.73E-01	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02
INFANT	1.14E-01	1.14E-01	5.36E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01

TABLE 21. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020

SPECIAL LOCATION NO. 4A Nearest Cow
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	2.35E-02	2.35E-02	1.17E-01	2.35E-02	2.35E-02	2.35E-02	2.35E-02	2.35E-02
TEEN	3.93E-02	3.93E-02	1.96E-01	3.93E-02	3.93E-02	3.93E-02	3.93E-02	3.93E-02
CHILD	9.56E-02	9.56E-02	4.78E-01	9.56E-02	9.56E-02	9.56E-02	9.56E-02	9.56E-02
MEAT								
ADULT	9.37E-03	9.37E-03	4.69E-02	9.37E-03	9.37E-03	9.37E-03	9.37E-03	9.37E-03
TEEN	7.92E-03	7.92E-03	3.96E-02	7.92E-03	7.92E-03	7.92E-03	7.92E-03	7.92E-03
CHILD	1.49E-02	1.49E-02	7.44E-02	1.49E-02	1.49E-02	1.49E-02	1.49E-02	1.49E-02
COW MILK								
ADULT	1.02E-02	1.02E-02	5.11E-02	1.02E-02	1.02E-02	1.02E-02	1.02E-02	1.02E-02
TEEN	1.89E-02	1.89E-02	9.43E-02	1.89E-02	1.89E-02	1.89E-02	1.89E-02	1.89E-02
CHILD	4.64E-02	4.64E-02	2.32E-01	4.64E-02	4.64E-02	4.64E-02	4.64E-02	4.64E-02
INFANT	9.70E-02	9.70E-02	4.54E-01	9.70E-02	9.70E-02	9.70E-02	9.70E-02	9.70E-02
GOATMILK								
ADULT	1.02E-02	1.02E-02	5.11E-02	1.02E-02	1.02E-02	1.02E-02	1.02E-02	1.02E-02
TEEN	1.89E-02	1.89E-02	9.43E-02	1.89E-02	1.89E-02	1.89E-02	1.89E-02	1.89E-02
CHILD	4.64E-02	4.64E-02	2.32E-01	4.64E-02	4.64E-02	4.64E-02	4.64E-02	4.64E-02
INFANT	9.70E-02	9.70E-02	4.54E-01	9.70E-02	9.70E-02	9.70E-02	9.70E-02	9.70E-02

TABLE 21. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2020 (Continued)

SPECIAL LOCATION NO. 5A Nearest Garden
AT 2.60 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	4.11E-02	4.11E-02	2.06E-01	4.11E-02	4.11E-02	4.11E-02	4.11E-02	4.11E-02
TEEN	6.87E-02	6.87E-02	3.44E-01	6.87E-02	6.87E-02	6.87E-02	6.87E-02	6.87E-02
CHILD	1.67E-01	1.67E-01	8.37E-01	1.67E-01	1.67E-01	1.67E-01	1.67E-01	1.67E-01
MEAT								
ADULT	1.64E-02	1.64E-02	8.20E-02	1.64E-02	1.64E-02	1.64E-02	1.64E-02	1.64E-02
TEEN	1.39E-02	1.39E-02	6.93E-02	1.39E-02	1.39E-02	1.39E-02	1.39E-02	1.39E-02
CHILD	2.61E-02	2.61E-02	1.30E-01	2.61E-02	2.61E-02	2.61E-02	2.61E-02	2.61E-02
COW MILK								
ADULT	1.79E-02	1.79E-02	8.95E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02
TEEN	3.30E-02	3.30E-02	1.65E-01	3.30E-02	3.30E-02	3.30E-02	3.30E-02	3.30E-02
CHILD	8.12E-02	8.12E-02	4.06E-01	8.12E-02	8.12E-02	8.12E-02	8.12E-02	8.12E-02
INFANT	1.70E-01	1.70E-01	7.95E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01
GOATMILK								
ADULT	1.79E-02	1.79E-02	8.95E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02
TEEN	3.30E-02	3.30E-02	1.65E-01	3.30E-02	3.30E-02	3.30E-02	3.30E-02	3.30E-02
CHILD	8.12E-02	8.12E-02	4.06E-01	8.12E-02	8.12E-02	8.12E-02	8.12E-02	8.12E-02
INFANT	1.70E-01	1.70E-01	7.95E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01	1.70E-01

DOSE CALCULATION MODELS

To evaluate the radiological consequences of the routine release of liquid and gaseous effluents from the Cooper Nuclear Station, the latest versions of two computer codes were used: LADTAP II for liquid doses and GASPAR for gaseous doses included as part of NRCDose 2.3.20 (ORNL 2015). Both of these computer codes implement the dose calculational methodologies of U.S. NRC Regulatory Guide 1.109, Revision 1.

Source terms for each quarter are combined with station-specific demographic data and either hydrological dilution factors, for liquid dose calculations, or atmospheric diffusion estimates, for gaseous dose calculations.

For liquid dose calculations, the hydrological dilution factors used for input to LADTAP II, as well as other input parameters, are listed in Table 22. Other inputs not specifically listed in this table are taken from Regulatory Guide 1.109, Revision 1. Semiannual doses are obtained by summing the contributions from the appropriate quarters.

For gaseous dose calculations, atmospheric diffusion estimates are obtained from the reduction and processing of onsite meteorological data, as described in Appendix B. Source terms for the semiannual period are obtained by summing source terms for the appropriate quarters. Additional input to GASPAR includes the following station-supplied data:

- 0 to 50 mile population distribution
- 0 to 50 mile meat, milk, and vegetable distributions
- Absolute humidity at Cooper Nuclear Station (14.61 g/m^3)
- The fraction of the year that the vegetables are grown (0.5)
- The fraction of the daily feed intake derived from pasture for milk and meat animals (0.5)

Other values used for input to GASPAR are default values from Regulatory Guide 1.109, Rev. 1.

TABLE 22. Values of Parameters Used to Make Dose Estimates Resulting From Liquid Discharges at Cooper Nuclear Station January-December 2020

Parameter		Values Assigned	
		Individual	Population
Cooling flow rate (cfs) *	Q1	1263	1263
(Average daily value)	Q2	1378	1387
	Q3	1392	1392
	Q4	937	937
Dilution factor*	Q1	1	1.70
	Q2	1	1.70
	Q3	1	1.05
	Q4	1	1.27
Holding time:			
Fish		24 hr ***	168 hr ***
Drinking water		12 hr ***	22.4 hr **
Shoreline exposure		0 hr ***	22.4 hr **
Swimming		0 hr ***	22.4 hr **
Boating		0 hr ***	22.4 hr **

* Q1, Q2, Q3, and Q4 represent first, second, third and fourth quarter station data for 2020, respectively.

** Based on an average Missouri River water flow of 5.5 ft/sec, 84 miles down the river.

*** Values from Regulatory Guide 1.109, Revision 1.

NR- No release

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U.S. Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision 1, 1977.

APPENDIX G
REMP SAMPLE STATION DESCRIPTIONS

REMP SAMPLE STATION DESCRIPTIONS

The following pages contain descriptions of the CNS REMP Sample Stations that were active or were used for part or all of 2020.

REMP SAMPLE STATION DESCRIPTIONS
SAMPLE TYPES AND SAMPLE LOCATIONS

Sample Station (a)	Sample Description – Type and Location
No. 1	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Outside the northwest edge of fence, east of the gate to the LLRW storage pad on the CNS site, NW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.634 W – Lat. 40.21.523 N
No. 2	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: North side of county road to the south portion of CNS site, SW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.954 W – Lat. 40.21.126 N
No. 3	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Located in Brownville, Nebraska, south of Hwy 136 but north Main Street, near Brownville State Recreation Park, SE¼, S18, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.13.4 W – Lat. 40.23.50.5 N
No. 4	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Located ½ mile south of Phelps City, Missouri, on west side of highway "U", NE ¼, S2, T64N, R42W, Atchison County, Missouri. Lon. 095.35.792 W – Lat. 40.23.797 N
No. 5	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Located ¼ mile south and ¼ mile east of Langdon, Missouri, on north side of road, west of railroad tracks, SW ¼, T64N, R41W, Atchison County, Missouri. Lon. 095.34.434 W – Lat. 40.21.151 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 6	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: One mile west of the end of Missouri State Highway "U", SW corner of the intersection, NW ¼, S34, T64N, R42W, Atchison County, Missouri. Lon. 095.37.620 W – Lat. 40.19.459 N
No 7	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: 300 yards east of Highway 67 on north side of road, SW ¼, S6, T4N, R16E, Nemaha, Nebraska. Lon. 095.40.207 W – Lat. 40.20.287 N
No. 8	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: ½ mile north, ¾ mile west and ¾ mile north of Nemaha, on west side of road adjacent to transmission line, NE ¼, S35, T5N, R15E, Nemaha County, Nebraska. Lon. 095.41.220 W – Lat. 40.21.570 N
No. 9	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Four miles north of Highway 136, on Highway 67. Then 1 mile east of Highway 67 and ½ mile north on west side of road, SW ¼, S26, T6N, R15E, Nemaha County, Nebraska. Lon. 095.41.810 W – Lat. 40.27.259 N
No. 10	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: One mile north of Barada, Nebraska, in SW corner of intersection, NE ¼, S14, T3N, R16E, Richardson County, Nebraska. Lon. 095.34.723 W – Lat. 40.13.970 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 11	Type: (1) Water – Ground Location: Plant well water supply header at well pits, NW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.53.866 W – Lat. 40.18.970 N
No.20	Type: (1) Environmental Thermoluminescent Dosimetry Location: On NNW boundary of NPPD property, east side of county road, SE, S30, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.226 W – Lat. 40.22.260 N
No.28	Type: (1) Water – River (2) Fish (3) Sediment from Shoreline Location: Samples (1) and (3) are taken from the Missouri River or its shore, downstream, near River Mile 530, Sample (2) is taken from the Missouri River ½ to 3 miles downstream of the plant site. Lon. 095.37.301 W – Lat. 40.20.336 N
No. 35	Type: (1) Fish (2) Water – River (Alternate Site) (3) Food Products – Broadleaf Vegetation Location: Sample (1) will be taken from the Missouri River about 1 to 3 miles above the CNS intake structure. During periods when unsafe conditions warrant, Station 35 may be used as an alternate to Station 12 (upstream collection site) for sample type (2). Sample (3) is taken about ¼ mile south of the Brownville State Recreation Area in Sector A. Lon. 095.39.046 W – Lat. 40.23.737 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 44	Type: (1) Environmental Thermoluminescent Dosimetry Location: ¼ mile south of Auburn Country Club on Highway 75, then ½ mile east of Highway 75 at fence line north of county road, SE1/4, S27, T5N, R14E, Nemaha County, Nebraska. Lon. 095.49.759 W – Lat. 40.21.840 N
No. 47	Type: (1) Water – Ground Location: At Falls City Municipal water supply well. Lon. 095.25.537 W – Lat. 40.01.939 N
No. 56	Type: (1) Environmental Thermoluminescent Dosimetry Location: 1 ¼ miles SW of Langdon, Missouri, on Highway "U", on the right side of the highway, NW ¼, S23, T64N, R42W, Atchison County, Missouri. Lon. 095.36.383 W – Lat. 40.21.157 N
No. 58	Type: (1) Environmental Thermoluminescent Dosimetry Location: Three miles south of Brownville, Nebraska, on county road, at the SE corner of the intersection with the farm road leading to Sample Station No. 2, SE1/4, S31, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.338 W – Lat. 40.21.126 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 59	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile SSE of the CNS Elevated Release Point, in the vicinity of the levee at the south boundary of NPPD property, SE ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.223 W – Lat. 40.20.986 N
No. 66	Type: (1) Environmental Thermoluminescent Dosimetry Location: Two miles south of Nemaha, Nebraska, on Highway 67 east side of road, NW1/4, S19, T4N, R16E, Nemaha County, Nebraska. Lon. 095.40.307 W – Lat. 40.18.277 N
No. 67	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 miles west of Brownville, Nebraska, on Highway 136, then north 1 ½ miles on county road and east ½ mile, on north side of road, NE1/4, S11, T5N, R15E, Nemaha County, Nebraska. Lon. 095.41.520 W – Lat. 40.24.898 N
No. 71	Type: (1) Environmental Thermoluminescent Dosimetry Location: Two miles east of Phelps City, Missouri, on Highway 36, then south 1 ½ miles on county road and west ¼ mile, SE1/4, S6, T64N, R41W, Atchison County, Missouri. Lon. 095.34.727 W – Lat. 40.21.664 N
No. 79	Type: (1) Environmental Thermoluminescent Dosimetry Location: 1 7/8 miles south of Brownville, NE, on east side of paved road, NPPD property, SE1/4, S30, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.238 W – Lat. 40.22.006 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 80	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 1/8 miles south of Brownville, on east side of paved road, NPPD property, NE1/4, S31, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.259 W – Lat. 40.21.834 N
No. 81	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 3/8 miles south of Brownville, Nebraska, in the NE corner of the intersection of the paved county road and CNS access road, NPPD property, NE1/4, S31, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.291 W – Lat. 40.21.582 N
No. 82	Type: (1) Environmental Thermoluminescent Dosimetry Location: 7/8 mile south of CNS in a field, on NPPD property, SW1/4, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.395 W – Lat. 40.20.961 N
No. 83	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 ¼ miles south of Nemaha, Nebraska, on Highway 67, then east 1 mile to the junction of the driveway and county road (east side of drive), NE1/4, S19, T4N, R16E, Nemaha County, Nebraska. Lon. 095.39.411 W – Lat. 40.18.119 N
No. 84	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 ½ miles west of Brownville, NE, south side of Highway 136 west of Locust Grove School, NW1/4, S22, T5N, R15E, Nemaha County, Nebraska. Lon. 095.42.993 W – Lat. 40.23.564 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 85	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile east of Brownville, Nebraska, on Highway 136, then north ¼ mile on the east side of the county road, NE1/4, S33, T65N, R42W, Atchison County, Missouri. Lon. 095.38.309 W – Lat. 40.24.508 N
No. 86	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Phelps City, Missouri, on Highway 136, then north 1 ½ miles on Highway "D" on west side, SE1/4, S22, T65N, R42W, Atchison County, Missouri. Lon. 095.36.938 W – Lat. 40.25.563 N
No. 87	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Phelps City, Missouri, on Highway 136, then south ½ mile on county road and ¾ mile west on county road to the end of the road, NW1/4, S3, T64N, R42W, Atchison County, Missouri. Lon. 095.37.806 W – Lat. 40.23.818 N
No. 88	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Phelps City, Missouri, on Highway 136, then south 2 miles at the end of the county road, NW1/4, S11, T64N, R42W, Atchison County, Missouri. Lon. 095.37.771 W – Lat. 40.24.762 N
No. 89	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2 ½ miles south of Phelps City, Missouri, on Highway "U", then ½ mile west in the SE corner of the county road intersection, NE1/4, S14, T64N, R42W, Atchison County, Missouri. Lon. 095.36.361 W – Lat. 40.21.962 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 90	Type: (1) Environmental Thermoluminescent Dosimetry Location: 1 ½ miles west and ¾ mile south of Langdon, Missouri, on Highway "U", then ¼ mile west, SW1/4, S23, T64N, R42W, Atchison County, Missouri. Lon. 095.35.808 W – Lat. 40.19.472 N
No. 91	Type: (1) Environmental Thermoluminescent Dosimetry Location: ½ mile west of Rockport, Missouri, on the south side of the intersection of U.S. Highway 136 and U.S. Highway 275, at the south side of the water tower, NW1/4, S28, T65N, R41W, Atchison County, Missouri. Lon. 095.32.217 W – Lat. 40.25.181 N
No. 94	Type: (1) Environmental Thermoluminescent Dosimetry Location: ¼ mile of Langdon, Missouri, on the west side of the road, NE1/4, S24, T64N, R42W, Atchison County, Missouri. Lon. 095.34.673 W – Lat. 40.20.931 N
No. 96	Type: (1) Food products – Broadleaf Vegetation Location: Approximately 1 mile south of Brownville, Nebraska, along the paved road, in the road ditch in Sector R, SW1/4, S19, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.318 W – Lat. 40.23.144 N
No. 99	Type: (1) Milk (Nearest and Other Producer) Location: 1 ¼ mile south of Shubert, Nebraska, on the west side of Highway 67, NE1/4, S24, T3N, R15E, Richardson County, Nebraska. Lon. 095.40.368 W – Lat. 40.12.850 N

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 101	Type: (1) Food Products – Broadleaf Vegetation Location: 5 ½ miles east and ½ mile north of Rock Port, Missouri, near the junction of Highway 136 and Highway 59, in Sector D, encompasses portions of several sections, Athison County, Missouri. Lon. 095.23.822 W – Lat. 40.25.222 N
No. 111	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry Location: Five miles south of Auburn, Nebraska at junction of Hwy 75 and Howe Rd. In northwest corner of intersection. (40.3196, -95.84167)
N01	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Phelps City, Missouri, on Highway 136, then 2.5 miles north on Highway D, then 0.7 miles west on 200th St. (40.4406, -95.62873)
N02	Type: (1) Environmental Thermoluminescent Dosimetry Location: From junction of Main St. and N 4th St. in Brownville, Nebraska, then north 0.25 miles. In parking lot on east side. (40.40062, -95.65980)
N03	Type: (1) Environmental Thermoluminescent Dosimetry Location: 1.25 miles southeast of Peru, Nebraska, On Hwy 67, then north on county road 645A Avenue 0.75 miles. On west side of road. (40.47236, -95.71675)
N04	Type: (1) Environmental Thermoluminescent Dosimetry Location: Five and 1/2 miles South of Phelps City, Missouri on Hwy U, then 0.5 miles west on 280th St., then 0.4 miles south on D Ave. (40.31793, -95.61650)

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
N05	Type: (1) Environmental Thermoluminescent Dosimetry Location: At the entrance to Indian Cave State Park, located approximately 50 yards west of Main Office. (40.26555, -95.57936)
N06	Type: (1) Environmental Thermoluminescent Dosimetry Location: Five miles south of Auburn, Nebraska, then 1.25 miles east on Howe Rd. Site is on west side of resident's driveway, north side of road. (40.31975, -95.81673)
N07	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 0.75 miles north of Nemaha, Nebraska on Hwy 67, then 0.75 miles west on 726 Rd. On north side of road. (40.34936, -95.68569)
N08	Type: (1) Environmental Thermoluminescent Dosimetry Location: From junction of Hwy 136 and Hwy 111 in Rock Port, Missouri then south 1.0 mile on Hwy 111. On east side of Hwy 111. (40.40224, -95.51313)
N09	Type: (1) Environmental Thermoluminescent Dosimetry Location: Two miles west of Rock Port, Missouri on Hwy 136, then 3.6 miles north on Outer Rd. On west side of road. (40.45553, -95.58272)
N10	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Brownville, Nebraska, at junction of Hwy 136 and Main Street. In northwest corner of junction. (40.39283, -95.67590)
N11	Type: (1) Environmental Thermoluminescent Dosimetry Location: Located in Brownville, Nebraska, at the junction of Nebraska St. and N 1st St. In the southwest corner of junction. (40.40055, -95.65518)

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
N12	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 0.3 miles west of Watson, Missouri, near the junction of Highway A and C Ave. Located west of junction. (40.47706, -95.62920)
N13	Type: (1) Environmental Thermoluminescent Dosimetry Location: Two miles east of Auburn, Nebraska, on Hwy 136, then 0.6 miles north on 641 Ave. On east side of road. (40.40208, -95.80033)
N14	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 1.25 miles south of Nemaha, Nebraska on Hwy 67, then 0.6 miles west on 724 Rd, then 0.1 miles west on 647 Ave. Located on Jarvis Creek levee. (40.31998, -95.68995)
N15	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 4.1 miles northwest of Corning, Missouri on Hwy 111, then 2 miles west on Route Z, then 0.3 miles north on Golden Ave., then 0.5 miles west on 297th street to levee. (40.29750, -95.55442)
N16	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of Brownville, Nebraska on Hwy 136, then 1.25 miles south on Hwy 67. Located on west side of highway. (40.37526, -95.67331)
N17	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 0.4 miles west of Shubert, Nebraska on Hwy 62, then north 0.5 miles on 647 Ave. (40.24026, -95.69086)

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
N18	Type: (1) Environmental Thermoluminescent Dosimetry Location: Approximately 0.75 miles west of Rock Port, Missouri, on Hwy 136, then 350 feet on Burke Rd. On southwest side of Burke Rd. (40.41705, -95.50112)
N19	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile west of entrance to Indian Cave State Park on Hwy 64E, then 1.5 miles north on 652 Ave., then 0.1 miles west on 721A Rd. Located east of residence. (40.28341, -95.60014)
N20	Type: (1) Environmental Thermoluminescent Dosimetry Location: One mile south of Nemaha, Nebraska on Hwy 67, then 0.9 miles east on the levee. On north side of levee. (40.32331, -95.66007)
N21	Type: (1) Environmental Thermoluminescent Dosimetry Location: From entrance to Indian Cave State Park, follow Indian Cave Recreation Road for 2.5 miles. Located on east side of road on siren pole. (40.25270, -95.55357)
N22	Type: (1) Environmental Thermoluminescent Dosimetry Location: 1.5 miles southwest of CNS on 648A Ave., follow access road into Langdon Bend Wildlife Management Area 1.5 miles to levee. In southeast corner of parking lot. (40.34198, -95.63790)
N23	Type: (1) Environmental Thermoluminescent Dosimetry Location: 2.1 miles east of Phelps City, Missouri, on Hwy 136 at the former City of Rock Port Water Treatment Plant. South side of Hwy 136. (40.40330, -95.55858)
N24	Type: (1) Environmental Thermoluminescent Dosimetry Location: Two miles east of Watson, Missouri at Charity Lake. Located on the southwest corner of the lake near the boat ramp. (40.47547, -95.58370)

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
N25	Type: (1) Environmental Thermoluminescent Dosimetry Location: Three miles south of Rock Port, Missouri on Hwy 111, then 0.6 miles south on Outer Rd. Located on west side of road, across from Hunter Cemetery. (40.36291, -95.52197)

NOTES:
(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

APPENDIX H
NON-ODAM REQUIRED SAMPLING, SUPPLEMENTARY STATIONS

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

Non-ODAM Required Sampling, Supplementary Stations

2020 Annual Report

January 1, 2020 to December 31, 2020

Prepared by
Teledyne Brown Engineering
2508 Quality Lane
Knoxville, TN 37931-3133

TABLE OF CONTENTS

APPENDICES

SECTION I. INTRODUCTION

I. INTRODUCTION

This report contains a complete tabulation of data for non-ODAM required sampling stations collected during the period January 1 through December 31, 2020 by Teledyne Brown Engineering - Environmental Services.

In assessing all the data gathered for this report, it was concluded that the operation of CNS had no adverse radiological impact on the environment.

SECTION II. SUMMARY

II. Summary

Data from the radiological analyses of environmental media collected during 2020 for non-ODAM required stations are tabulated and discussed below.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The "less than" values in the data tables were calculated from each specific analysis and are dependent on sample size, detector efficiency, length of counting time, chemical yield (when appropriate) and the radioactive decay factor from time of counting to time of collection. Teledyne Brown Engineering meets the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, Radiological Monitoring Acceptable Program (November 1979, Revision 1).

SECTION III. RESULTS and Discussion of 2020 Analytical Results

III. Results and Discussion of 2020 Analytical Results

A. *Airborne Particulates*

Gross beta activity was observed in 19 of the 19 samples collected during 2020. The average concentration was 0.023 pCi/m^3 with a range of 0.011 to 0.032 pCi/m^3. The results of the gross beta activities are presented in Table B-1. The gross beta activities for 2020 were comparable to levels measured in the previous several years. Prior to that period the gross beta activities were higher due to atmospheric nuclear weapons testing performed in other countries. The preoperational period of 1971 through 1974 averaged 0.098 pCi/m^3 gross beta.

Air particulate filters were collected weekly and composited by locations on a quarterly basis, unless otherwise specified in Table B-1. They were analyzed by gamma ray spectroscopy. Beryllium-7 was observed in all of the composites. The average concentration was 0.136 pCi/m^3 with a range of 0.099 to 0.173 pCi/m^3. The results are presented in Table B-2. All other gamma emitters were below the detection limits.

B. Airborne Iodine

Charcoal cartridges used to collect airborne iodine were collected weekly and analyzed by gamma spectrometry for iodine-131. The results are presented in Table B-1. All results are below the lower limit of detection.

APPENDIX A
NON-ODAM REQUIRED SAMPLING STATIONS

TABLE A-1: **NON-ODAM SAMPLE STATION DESCRIPTION, SAMPLE TYPE AND SAMPLE LOCATION, NEBRASKA PUBLIC POWER DISTRICT, COOPER NUCLEAR STATION, 2020**

Sample Station	Sample Description – Type and Location	
SOL 2	Type: (1)	Air Particulate and Charcoal Filters
	Location:	1.86 miles from CNS at 338.2 degrees. 0.7 miles south of Brownville on 648A Avenue. On east side of road, on top of levee. (40.38700, -95.65451)

APPENDIX B
DATA TABLES OF NON-ODAM REQUIRED SAMPLING LOCATIONS

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
EXPOSURE PATHWAY - AIRBORNE
AIR PARTICULATE AND CHARCOAL FILTERS

STATION NUMBER SOL 2

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
12/31/19	01/07/20	7.37E+03	CU.FT.	2.87E-02 ± 5.79E-03	< 1.E-02
01/07/20	01/21/20	1.42E+04	CU.FT.	2.22E-02 ± 3.49E-03	< 2.E-02
01/21/20	01/28/20	7.07E+03	CU.FT.	3.20E-02 ± 6.76E-03	< 2.E-02
01/28/20	02/04/20	7.28E+03	CU.FT.	1.77E-02 ± 5.22E-03	< 4.E-02
02/04/20	02/11/20	7.02E+03	CU.FT.	2.68E-02 ± 5.38E-03	< 3.E-02
02/11/20	02/18/20	7.16E+03	CU.FT.	2.33E-02 ± 5.17E-03	< 4.E-02
02/18/20	02/25/20	7.28E+03	CU.FT.	2.81E-02 ± 5.97E-03	< 4.E-02
02/25/20	03/03/20	7.12E+03	CU.FT.	2.79E-02 ± 6.09E-03	< 2.E-02
03/03/20	03/10/20	7.16E+03	CU.FT.	1.69E-02 ± 4.70E-03	< 3.E-02
03/10/20	03/17/20	7.16E+03	CU.FT.	1.11E-02 ± 4.53E-03	< 5.E-02
03/17/20	03/24/20	7.16E+03	CU.FT.	2.64E-02 ± 5.97E-03	< 3.E-02
03/24/20	03/31/20	7.16E+03	CU.FT.	1.98E-02 ± 5.15E-03	< 2.E-02
03/31/20	04/07/20	7.16E+03	CU.FT.	3.01E-02 ± 6.33E-03	< 4.E-02
04/07/20	04/14/20	7.16E+03	CU.FT.	2.30E-02 ± 5.65E-03	< 3.E-02
04/14/20	04/21/20	7.16E+03	CU.FT.	1.76E-02 ± 4.89E-03	< 2.E-02
04/21/20	04/28/20	7.16E+03	CU.FT.	2.75E-02 ± 5.62E-03	< 3.E-02
04/28/20	05/05/20	7.16E+03	CU.FT.	2.19E-02 ± 5.47E-03	< 2.E-02
05/05/20	05/12/20	7.16E+03	CU.FT.	1.77E-02 ± 4.88E-03	< 3.E-02
05/12/20	05/19/20	7.16E+03	CU.FT.	2.19E-02 ± 5.33E-03	< 2.E-02
05/19/20	12/28/20			(a)	(a)

(a) Solar Station 2 was a temporary alternate sample point due to Missouri River flooding and was removed from service 05/19/20.

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
EXPOSURE PATHWAY - AIRBORNE
COMPOSITE AIR PARTICULATE FILTERS
(PCI/CU.M.)

STATION NUMBER SOL 2

DATE COLLECTED	12/31-03/31/2020	03/31-05/19/2020	06/30-09/29/2020	09/29-12/28/2020
GAMMA SPECTRUM ANALYSIS:			(a)	(a)
BE-7	9.92E-02 ± 3.92E-02	1.73E-01 ± 6.25E-02		
K-40	< 4.E-02	< 1.E-01		
MN-54	< 3.E-03	< 5.E-03		
CO-58	< 4.E-03	< 1.E-02		
FE-59	< 2.E-02	< 4.E-02		
CO-60	< 3.E-03	< 7.E-03		
ZN-65	< 5.E-03	< 2.E-02		
ZR-95	< 8.E-03	< 3.E-02		
RU-103	< 6.E-03	< 2.E-02		
RU-106	< 2.E-02	< 5.E-02		
I-131	< 5.E-01	< 6.E+00		
CS-134	< 3.E-03	< 7.E-03		
CS-137	< 2.E-03	< 5.E-03		
BA-140	< 3.E-01	< 2.E+00		
LA-140	< 1.E-01	< 5.E-01		
CE-141	< 1.E-02	< 3.E-02		
CE-144	< 1.E-02	< 3.E-02		
RA-226	< 4.E-02	< 1.E-01		
TH-228	< 4.E-03	< 1.E-02		

(a) Solar Station 2 was a temporary alternate sample point due to Missouri River flooding and was removed from service 05/19/20.