

ENVIRONMENTAL

RADIATION

DATA

REPORT 165

January–March 2016

United States Environmental Protection Agency

Office of Radiation and Indoor Air

This page intentionally left blank

Contents

	Page
List of Tables	v
Preface.....	vii
Acknowledgments.....	ix
Data Reporting Conventions.....	xi
1. Air Program	1
Airborne Particulates and Precipitation	1
Plutonium and Uranium in Airborne Particulates.....	17
2. Water Program.....	19

This page intentionally left blank

List of Tables

Table		Page
1	Reporting Units and Minimum Detectable Concentrations	xiii
2	Gross Beta in Airborne Particulates: January 2016	2
3	Gross Beta in Airborne Particulates: February 2016	6
4	Gross Beta in Airborne Particulates: March 2016	10
5	Gamma-Emitters in Precipitation: January 2016	14
6	Gamma-Emitters in Precipitation: February 2016	15
7	Gamma-Emitters in Precipitation: March 2016	16
8	Tritium in Drinking Water: January–March 2016	20

This page intentionally left blank

Preface

Environmental Radiation Data (ERD) contains data from the RadNet monitoring system (formerly ERAMS), which is operated by the Office of Radiation and Indoor Air's National Analytical Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama. ERD is published in electronic format, which is available online at <http://www.epa.gov/narel>. RadNet data are also available online in a searchable database at:

<http://www.epa.gov/enviro/facts/radnet>

The United States Environmental Protection Agency established RadNet in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. RadNet is comprised of a nationwide network of sampling stations that provide air particulate, precipitation, and drinking water samples.

Sampling locations are selected to provide population and geographic coverage for the United States. The radiation analyses performed on RadNet samples may include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for isotopes of uranium, plutonium, strontium, iodine, and radium, and for tritium. This monitoring effort also provides information on natural background levels and possible releases into the environment.

This page intentionally left blank

Acknowledgments

All sampling for the RadNet monitoring system (formerly ERAMS) is performed by volunteer collectors who are frequently members of health departments or related environmental agencies of their respective states. The National Analytical Radiation Environmental Laboratory (NAREL), on behalf of the U.S. Environmental Protection Agency, would like to acknowledge the time and effort of these volunteer collectors, who are so essential to the successful operation of RadNet. The efforts of the sample collectors are especially appreciated during times of emergency operation when sampling frequencies are increased and schedules are sometimes demanding.

This page intentionally left blank

Data Reporting Conventions

Every laboratory measurement involves uncertainty. When there is little or no radioactivity in a sample, one consequence of measurement uncertainty is the possibility of obtaining a measured value that is less than zero. Such a negative result occurs when random effects in the measurement process cause the measured value for the sample to be less than that of the blank or background, which is subtracted from it. From April 1991 to December 1995, negative results were reported as “not detected” or “ND,” and gamma analysis results that were less than their estimated measurement uncertainties were also reported as “ND.” In January 1996, both of these practices were discontinued. Although negative activities are physically impossible, the inclusion of negative results in the report allows better statistical analysis of the data.

Results of gamma analyses are still reported as “ND” when gamma-emitting radionuclides are not detected.

Measurement Uncertainty

Each measured value y is reported with an expanded uncertainty $U = k u_c(y)$, which is determined from the combined standard uncertainty $u_c(y)$ and the coverage factor $k = 2$. The interval from $y - U$ to $y + U$ is estimated to have a level of confidence of approximately 95 %.

Significant Figures

Expanded uncertainties are reported to two significant figures. Measurement results are rounded to the corresponding number of decimal places.

Detection Capability

The minimum detectable concentrations (MDCs) for each radionuclide are shown in Table 1. The MDC is defined as the minimum concentration that gives a 95 % probability of detection when the detection criteria are chosen to give only a 5 % probability of false detection in a sample that is analyte-free.

This page intentionally left blank

Table 1**Reporting Units and Minimum Detectable Concentrations
for Radionuclide Analyses**

Radionuclide	Media	Reporting Unit	Minimum Detectable Concentration
Gross Alpha	Water	pCi/L	1.8
Gross Beta	Air	pCi/m ³	0.0006
	Water	pCi/L	1.4
Tritium	Water	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m ³	6
	Water	pCi/L	0.3
† Uranium-234,238	Air	aCi/m ³	8
	Water	pCi/L	0.4
† Uranium-235	Air	aCi/m ³	8
	Water	pCi/L	0.4
Radium-226	Water	pCi/L	0.4
Strontium-90	Water	pCi/L	1
‡ Iodine-131	Water (gamma)	pCi/L	4
	Water	pCi/L	0.7
Cesium-137	Water	pCi/L	5
‡ Barium-140	Water	pCi/L	15
Potassium-40	Water	pCi/L	50

* The MDC for air is based on an assumed total sample volume of 10,000 m³. Measurement by alpha spectrometry includes combined activities of ²³⁹Pu and ²⁴⁰Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDCs for air are based on an assumed total sample volume of 10,000 m³.

‡ Activity as of the day of counting.

This page intentionally left blank

1. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation. Continuous air samplers collect airborne particulates at field stations representing wide geographic coverage throughout the United States.

Filters (10 cm diameter synthetic fiber) from air samplers are changed routinely, and the exposed filters are sent to NAREL for analysis in a gas proportional counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m³.

All stations routinely submit precipitation samples as rainfall, snow, or sleet occurs. The precipitation samples are composited at NAREL into single monthly samples for each station. Each month that precipitation occurs, an aliquant of the composited sample is analyzed for gamma-emitting radionuclides.

Table 2
Gross Beta in Airborne Particulates
January 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	2	0.006	0.005	0.005
AK: Fairbanks	7	0.017	0.002	0.007
AK: Juneau	4	0.004	0.001	0.002
AL: Birmingham	6	0.010	0.005	0.008
AL: Mobile	3	0.010	0.007	0.008
AL: Montgomery/408	7	0.011	0.005	0.007
AR: Fort Smith	2	0.013	0.011	0.012
AR: Little Rock	5	0.015	0.008	0.012
AZ: Phoenix/956	5	0.013	0.006	0.009
AZ: Tucson	7	0.011	0.005	0.009
AZ: Yuma	1	0.006	0.006	0.006
CA: Anaheim	8	0.013	0.002	0.007
CA: Bakersfield	2	0.017	0.008	0.013
CA: Eureka	4	0.004	0.001	0.002
CA: Fresno	3	0.008	0.006	0.007
CA: Los Angeles	4	0.017	0.004	0.008
CA: Richmond	4	0.012	0.002	0.006
CA: Riverside	8	0.012	0.002	0.008
CA: Sacramento	8	0.026	0.004	0.011
CA: San Bernardino	8	0.015	0.002	0.009
CA: San Diego	2	0.006	0.006	0.006
CA: San Francisco	9	0.018	0.002	0.005
CA: San Jose	6	0.014	0.003	0.005
CO: Colorado Springs	2	0.009	0.006	0.008
CO: Denver	5	0.051	0.004	0.017
CO: Grand Junction	2	0.038	0.020	0.029
CT: Hartford	8	0.008	0.003	0.005
DC: Washington	6	0.013	0.006	0.009
DE: Dover	3	0.008	0.005	0.007
FL: Jacksonville	7	0.009	0.003	0.006
FL: Miami	4	0.007	0.003	0.005
FL: Orlando	8	0.008	0.002	0.005
FL: Tallahassee	4	0.008	0.003	0.005
FL: Tampa	7	0.011	0.005	0.006
GA: Atlanta	4	0.014	0.009	0.011
GA: Augusta	4	0.007	0.003	0.005
HI: Honolulu	8	0.005	0.003	0.004
IA: Des Moines	8	0.010	0.004	0.007

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IA: Mason City	5	0.021	0.009	0.015
ID: Boise	4	0.030	0.003	0.013
ID: Idaho Falls	8	0.027	0.003	0.016
IL: Aurora	4	0.013	0.010	0.011
IL: Champaign	7	0.020	0.010	0.016
IL: Chicago	6	0.011	0.005	0.008
IN: Fort Wayne	3	0.011	0.006	0.008
IN: Indianapolis	9	0.012	0.006	0.009
KS: Kansas City	2	0.014	0.012	0.013
KS: Wichita	7	0.015	0.006	0.011
KY: Lexington	6	0.017	0.009	0.012
KY: Louisville	5	0.013	0.008	0.009
KY: Paducah	7	0.017	0.006	0.012
LA: Baton Rouge	8	0.013	0.007	0.009
LA: Shreveport	3	0.025	0.015	0.019
MA: Boston	8	0.011	0.003	0.006
MA: Worcester	7	0.010	0.006	0.007
MD: Baltimore	4	0.012	0.008	0.009
ME: Orono	3	0.007	0.005	0.006
ME: Portland	6	0.012	0.005	0.008
MI: Bay City 48708	7	0.013	0.005	0.009
MI: Detroit	8	0.013	0.006	0.009
MI: Grand Rapids	4	0.012	0.009	0.010
MN: Duluth	8	0.021	0.011	0.015
MN: St. Paul	4	0.018	0.012	0.016
MO: Jefferson City	8	0.015	0.005	0.010
MO: Springfield	9	0.022	0.009	0.013
MO: St. Louis	3	0.012	0.010	0.011
MS: Jackson/Deq	4	0.015	0.008	0.012
MT: Billings	3	0.031	0.007	0.016
NC: Charlotte	3	0.011	0.008	0.010
NC: Greensboro	1	0.004	0.004	0.004
NC: Raleigh	5	0.007	0.004	0.005
NC: Wilmington	4	0.006	0.004	0.005
ND: Bismarck	7	0.026	0.006	0.016
NE: Kearney	8	0.026	0.009	0.016
NE: Lincoln	8	0.017	0.007	0.012
NE: Omaha	3	0.016	0.014	0.015

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NH: Concord	5	0.007	0.005	0.006
NJ: Edison	7	0.009	0.005	0.007
NM: Albuquerque	4	0.019	0.008	0.013
NM: Carlsbad	5	0.013	0.007	0.009
NM: Navajo Lake	3	0.016	0.006	0.011
NV: Las Vegas/913	8	0.020	0.003	0.010
NY: Albany	7	0.011	0.004	0.008
NY: Lockport	7	0.013	0.004	0.008
NY: New York City	3	0.009	0.007	0.008
NY: Rochester	7	0.017	0.004	0.010
NY: Syracuse	1	0.008	0.008	0.008
NY: Yaphank	4	0.007	0.004	0.006
OH: Cincinnati	8	0.011	0.005	0.008
OH: Cleveland	8	0.019	0.007	0.012
OH: Columbus	8	0.014	0.005	0.010
OH: Toledo	8	0.017	0.007	0.011
OK: Oklahoma City	8	0.022	0.009	0.015
OK: Tulsa	8	0.017	0.008	0.014
OR: Corvallis	8	0.029	0.002	0.009
OR: Portland	8	0.025	0.002	0.009
PA: Bloomsburg	7	0.011	0.003	0.006
PA: Philadelphia	2	0.010	0.008	0.009
PA: Pittsburgh	3	0.011	0.007	0.009
PR: San Juan	6	0.007	0.002	0.004
RI: Providence	4	0.007	0.005	0.005
SC: Columbia	5	0.010	0.007	0.009
SD: Pierre	6	0.027	0.007	0.017
SD: Rapid City	6	0.049	0.005	0.017
TN: Knoxville	3	0.012	0.008	0.010
TN: Memphis	8	0.013	0.006	0.010
TN: Nashville	4	0.014	0.006	0.010
TN: Oak Ridge/Bethel	7	0.017	0.008	0.011
TN: Oak Ridge/K25	7	0.016	0.007	0.011
TN: Oak Ridge/Melton	7	0.013	0.005	0.008
TN: Oak Ridge/Y12 E	7	0.016	0.007	0.011
TN: Oak Ridge/Y12 W	7	0.015	0.006	0.010
TX: Amarillo	6	0.041	0.010	0.018
TX: Austin	5	0.018	0.009	0.013

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Corpus Christi	8	0.016	0.009	0.012
TX: Dallas	5	0.018	0.010	0.015
TX: El Paso	7	0.012	0.005	0.008
TX: Fort Worth	4	0.014	0.010	0.012
TX: Harlingen	2	0.014	0.012	0.013
TX: Houston	8	0.016	0.008	0.011
TX: Laredo	6	0.018	0.006	0.011
TX: Lubbock	4	0.009	0.005	0.007
TX: San Angelo	6	0.025	0.009	0.014
TX: San Antonio	8	0.019	0.009	0.014
UT: Salt Lake City	2	0.012	0.007	0.010
UT: St. George	1	0.010	0.010	0.010
VA: Harrisonburg	5	0.012	0.007	0.010
VA: Richmond	4	0.008	0.006	0.007
VA: Virginia Beach	7	0.011	0.004	0.009
VT: Burlington	6	0.010	0.004	0.008
WA: Olympia	8	0.018	0.002	0.006
WA: Richland	2	0.012	0.011	0.012
WA: Seattle	4	0.015	0.002	0.006
WA: Spokane	7	0.037	0.003	0.013
WI: La Crosse	3	0.014	0.009	0.011
WI: Madison	8	0.022	0.012	0.015
WI: Milwaukee	8	0.016	0.008	0.011
WI: Shawano	8	0.017	0.007	0.011
WV: Charleston	4	0.014	0.007	0.010
WY: Casper	3	0.021	0.004	0.010

Table 3
Gross Beta in Airborne Particulates
February 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	2	0.004	0.004	0.004
AK: Fairbanks	8	0.008	0.003	0.005
AK: Juneau	4	0.004	0.001	0.002
AL: Birmingham	9	0.009	0.004	0.006
AL: Mobile	2	0.005	0.005	0.005
AL: Montgomery/408	9	0.008	0.004	0.006
AR: Little Rock	6	0.012	0.005	0.008
AZ: Phoenix/956	5	0.014	0.004	0.008
AZ: Tucson	3	0.013	0.010	0.012
AZ: Yuma	4	0.012	0.004	0.008
CA: Anaheim	8	0.012	0.005	0.008
CA: Eureka	4	0.005	0.002	0.003
CA: Fresno	4	0.027	0.009	0.016
CA: Los Angeles	3	0.013	0.006	0.009
CA: Richmond	4	0.008	0.004	0.006
CA: Riverside	7	0.010	0.004	0.007
CA: Sacramento	8	0.022	0.006	0.014
CA: San Bernardino	8	0.011	0.004	0.008
CA: San Diego	4	0.009	0.007	0.008
CA: San Francisco	9	0.015	0.002	0.006
CA: San Jose	8	0.021	0.003	0.007
CO: Colorado Springs	3	0.009	0.005	0.008
CO: Denver	7	0.010	0.007	0.008
CO: Grand Junction	2	0.031	0.018	0.025
CT: Hartford	8	0.006	0.003	0.005
DC: Washington	4	0.010	0.005	0.007
DE: Dover	4	0.007	0.004	0.005
FL: Jacksonville	6	0.007	0.004	0.006
FL: Miami	5	0.005	0.004	0.005
FL: Orlando	6	0.006	0.003	0.004
FL: Tallahassee	4	0.007	0.004	0.006
FL: Tampa	8	0.008	0.004	0.006
GA: Atlanta	4	0.010	0.008	0.009
GA: Augusta	6	0.006	0.004	0.005
HI: Honolulu	9	0.006	0.002	0.004
IA: Des Moines	9	0.006	0.003	0.005
IA: Mason City	5	0.012	0.008	0.011
ID: Boise	4	0.013	0.002	0.005

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
ID: Idaho Falls	9	0.019	0.004	0.011
IL: Aurora	2	0.010	0.009	0.010
IL: Champaign	8	0.015	0.008	0.012
IL: Chicago	6	0.010	0.005	0.007
IN: Fort Wayne	5	0.010	0.006	0.008
IN: Indianapolis	9	0.011	0.003	0.007
KS: Kansas City	7	0.009	0.006	0.008
KS: Wichita	9	0.008	0.005	0.007
KY: Lexington	7	0.011	0.006	0.009
KY: Louisville	4	0.010	0.005	0.008
KY: Paducah	9	0.014	0.007	0.009
LA: Baton Rouge	9	0.009	0.004	0.006
LA: Shreveport	5	0.008	0.006	0.007
MA: Boston	9	0.008	0.003	0.005
MA: Worcester	7	0.010	0.005	0.007
MD: Baltimore	6	0.009	0.003	0.006
ME: Orono	3	0.006	0.005	0.005
ME: Portland	4	0.008	0.005	0.006
MI: Bay City 48708	7	0.010	0.005	0.007
MI: Detroit	9	0.011	0.004	0.007
MI: Grand Rapids	4	0.009	0.006	0.008
MN: Duluth	9	0.011	0.006	0.008
MN: St. Paul	4	0.012	0.008	0.010
MO: Jefferson City	9	0.010	0.006	0.008
MO: Springfield	7	0.012	0.006	0.010
MO: St. Louis	4	0.011	0.008	0.009
MS: Jackson/Deq	3	0.011	0.007	0.009
MT: Billings	3	0.006	0.005	0.005
NC: Charlotte	6	0.011	0.004	0.009
NC: Greensboro	1	0.007	0.007	0.007
NC: Raleigh	4	0.007	0.004	0.005
NC: Wilmington	4	0.007	0.004	0.005
ND: Bismarck	8	0.011	0.005	0.008
NE: Kearney	6	0.011	0.004	0.007
NE: Lincoln	7	0.007	0.004	0.006
NE: Omaha	6	0.013	0.007	0.009
NH: Concord	8	0.008	0.003	0.006
NJ: Edison	8	0.009	0.003	0.006

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Albuquerque	1	0.009	0.009	0.009
NM: Carlsbad	7	0.011	0.004	0.007
NM: Navajo Lake	4	0.011	0.006	0.009
NV: Las Vegas/913	4	0.009	0.006	0.007
NV: Reno	3	0.019	0.007	0.013
NY: Albany	9	0.009	0.004	0.007
NY: Lockport	8	0.011	0.004	0.007
NY: New York City	2	0.006	0.005	0.005
NY: Rochester	5	0.013	0.005	0.008
NY: Yaphank	5	0.006	0.004	0.005
OH: Cincinnati	6	0.010	0.004	0.008
OH: Cleveland	9	0.013	0.005	0.008
OH: Columbus	8	0.012	0.004	0.008
OH: Toledo	9	0.011	0.005	0.008
OK: Oklahoma City	8	0.010	0.006	0.008
OK: Tulsa	9	0.010	0.006	0.008
OR: Corvallis	6	0.006	0.001	0.004
OR: Portland	8	0.007	0.002	0.003
PA: Bloomsburg	9	0.007	0.002	0.005
PA: Philadelphia	3	0.008	0.006	0.007
PA: Pittsburgh	5	0.011	0.005	0.008
PR: San Juan	8	0.006	0.002	0.004
RI: Providence	4	0.005	0.004	0.004
SC: Columbia	6	0.008	0.006	0.007
SD: Pierre	4	0.009	0.005	0.006
SD: Rapid City	6	0.009	0.003	0.005
TN: Knoxville	4	0.009	0.006	0.007
TN: Memphis	9	0.009	0.006	0.007
TN: Nashville	5	0.010	0.007	0.009
TN: Oak Ridge/Bethel	7	0.012	0.005	0.009
TN: Oak Ridge/K25	7	0.014	0.005	0.009
TN: Oak Ridge/Melton	3	0.008	0.005	0.007
TN: Oak Ridge/Y12 E	7	0.012	0.005	0.009
TN: Oak Ridge/Y12 W	7	0.010	0.004	0.008
TX: Amarillo	3	0.012	0.007	0.010
TX: Austin	4	0.009	0.005	0.007
TX: Corpus Christi	9	0.011	0.004	0.007
TX: Dallas	6	0.010	0.006	0.008

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min	Avg
TX: El Paso	8	0.013	0.005	0.009
TX: Fort Worth	3	0.009	0.006	0.008
TX: Harlingen	1	0.011	0.011	0.011
TX: Houston	9	0.008	0.004	0.006
TX: Laredo	3	0.009	0.005	0.007
TX: Lubbock	8	0.009	0.004	0.006
TX: San Angelo	9	0.017	0.006	0.008
TX: San Antonio	4	0.010	0.005	0.007
UT: Salt Lake City	4	0.018	0.006	0.010
UT: St. George	1	0.005	0.005	0.005
VA: Harrisonburg	8	0.010	0.002	0.007
VA: Richmond	4	0.007	0.005	0.006
VA: Virginia Beach	4	0.008	0.006	0.007
VT: Burlington	7	0.009	0.003	0.007
WA: Olympia	9	0.007	0.002	0.003
WA: Richland	7	0.019	0.001	0.007
WA: Seattle	4	0.004	0.002	0.003
WA: Spokane	6	0.008	0.002	0.004
WI: Madison	8	0.013	0.009	0.011
WI: Milwaukee	8	0.011	0.007	0.008
WI: Shawano	9	0.014	0.004	0.008
WV: Charleston	5	0.011	0.005	0.008
WY: Casper	3	0.004	0.004	0.004

Table 4
Gross Beta in Airborne Particulates
March 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	1	0.011	0.011	0.011
AK: Fairbanks	7	0.014	0.003	0.008
AK: Juneau	4	0.005	0.001	0.003
AL: Birmingham	9	0.008	0.004	0.006
AL: Mobile	5	0.006	0.005	0.005
AL: Montgomery/408	9	0.008	0.005	0.006
AR: Little Rock	7	0.008	0.005	0.007
AZ: Phoenix/956	1	0.006	0.006	0.006
AZ: Tucson	5	0.015	0.005	0.010
AZ: Yuma	1	0.025	0.025	0.025
CA: Anaheim	10	0.018	0.003	0.009
CA: Bakersfield	2	0.012	0.007	0.009
CA: Eureka	4	0.003	0.001	0.002
CA: Fresno	3	0.011	0.005	0.007
CA: Los Angeles	5	0.014	0.003	0.007
CA: Richmond	5	0.005	0.002	0.004
CA: Riverside	8	0.020	0.004	0.010
CA: Sacramento	8	0.009	0.002	0.006
CA: San Bernardino	6	0.023	0.004	0.012
CA: San Diego	3	0.013	0.003	0.008
CA: San Francisco	8	0.006	0.002	0.004
CA: San Jose	7	0.005	0.003	0.004
CO: Colorado Springs	2	0.010	0.009	0.009
CO: Denver	8	0.012	0.006	0.009
CO: Grand Junction	4	0.012	0.006	0.009
CT: Hartford	9	0.010	0.002	0.005
DC: Washington	5	0.010	0.005	0.007
DE: Dover	5	0.006	0.003	0.004
FL: Jacksonville	9	0.008	0.004	0.006
FL: Miami	4	0.007	0.004	0.005
FL: Orlando	5	0.013	0.004	0.006
FL: Tallahassee	5	0.006	0.003	0.005
FL: Tampa	7	0.008	0.005	0.007
GA: Atlanta	3	0.009	0.007	0.009
GA: Augusta	4	0.006	0.004	0.005
HI: Honolulu	9	0.006	0.003	0.005
IA: Des Moines	6	0.005	0.002	0.004
IA: Mason City	3	0.009	0.008	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
ID: Boise	4	0.003	0.002	0.003
ID: Idaho Falls	9	0.007	0.003	0.005
IL: Aurora	5	0.009	0.006	0.007
IL: Champaign	7	0.012	0.006	0.010
IL: Chicago	8	0.008	0.003	0.006
IN: Fort Wayne	4	0.007	0.004	0.006
IN: Indianapolis	8	0.008	0.003	0.006
KS: Kansas City	8	0.014	0.004	0.009
KS: Wichita	8	0.010	0.005	0.007
KY: Lexington	6	0.009	0.005	0.007
KY: Louisville	6	0.009	0.004	0.007
KY: Paducah	8	0.010	0.006	0.007
LA: Baton Rouge	7	0.008	0.004	0.007
LA: Shreveport	2	0.010	0.007	0.008
MA: Boston	8	0.008	0.002	0.004
MA: Worcester	9	0.013	0.003	0.007
MD: Baltimore	6	0.007	0.003	0.005
ME: Orono	3	0.006	0.005	0.006
ME: Portland	7	0.011	0.001	0.006
MI: Bay City 48708	8	0.007	0.002	0.006
MI: Detroit	9	0.009	0.003	0.006
MI: Grand Rapids	3	0.008	0.005	0.007
MN: Duluth	9	0.009	0.003	0.006
MN: St. Paul	5	0.012	0.006	0.010
MO: Jefferson City	8	0.010	0.005	0.007
MO: Springfield	6	0.010	0.006	0.008
MO: St. Louis	2	0.008	0.006	0.007
MS: Jackson/Deq	3	0.008	0.007	0.008
MT: Billings	4	0.007	0.003	0.005
NC: Charlotte	6	0.014	0.007	0.010
NC: Greensboro	2	0.011	0.005	0.008
NC: Raleigh	3	0.006	0.004	0.005
NC: Wilmington	5	0.005	0.004	0.005
ND: Bismarck	8	0.011	0.006	0.009
NE: Kearney	1	0.007	0.007	0.007
NE: Lincoln	7	0.010	0.004	0.007
NE: Omaha	1	0.011	0.011	0.011
NH: Concord	5	0.006	0.003	0.004

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NJ: Edison	9	0.009	0.002	0.005
NM: Carlsbad	4	0.008	0.007	0.007
NM: Navajo Lake	5	0.008	0.005	0.007
NV: Las Vegas/913	4	0.011	0.004	0.007
NV: Reno	8	0.013	0.002	0.007
NY: Albany	7	0.011	0.003	0.006
NY: Lockport	8	0.009	0.003	0.006
NY: New York City	3	0.009	0.004	0.007
NY: Rochester	7	0.011	0.004	0.008
NY: Yaphank	6	0.009	0.003	0.006
OH: Cincinnati	4	0.009	0.004	0.006
OH: Cleveland	7	0.009	0.005	0.007
OH: Columbus	10	0.015	0.005	0.008
OH: Toledo	9	0.013	0.004	0.008
OK: Oklahoma City	9	0.011	0.006	0.008
OK: Tulsa	8	0.009	0.005	0.007
OR: Corvallis	9	0.006	0.002	0.003
OR: Portland	9	0.004	0.001	0.003
PA: Bloomsburg	8	0.007	0.003	0.004
PA: Philadelphia	5	0.009	0.005	0.007
PA: Pittsburgh	5	0.009	0.005	0.007
PR: San Juan	9	0.004	0.002	0.003
RI: Providence	4	0.006	0.003	0.005
SC: Columbia	3	0.009	0.007	0.007
SD: Pierre	8	0.012	0.003	0.007
SD: Rapid City	6	0.008	0.004	0.006
TN: Knoxville	5	0.009	0.006	0.008
TN: Memphis	9	0.008	0.004	0.006
TN: Nashville	8	0.008	0.005	0.007
TN: Oak Ridge/Bethel	8	0.011	0.006	0.008
TN: Oak Ridge/K25	8	0.010	0.006	0.008
TN: Oak Ridge/Melton	4	0.007	0.005	0.006
TN: Oak Ridge/Y12 E	8	0.010	0.007	0.008
TN: Oak Ridge/Y12 W	8	0.008	0.005	0.007
TX: Amarillo	4	0.014	0.010	0.011
TX: Austin	4	0.009	0.005	0.007
TX: Corpus Christi	5	0.012	0.004	0.008
TX: Dallas	7	0.009	0.004	0.007

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2016

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: El Paso	7	0.012	0.006	0.008
TX: Fort Worth	4	0.007	0.005	0.006
TX: Harlingen	2	0.009	0.007	0.008
TX: Houston	7	0.009	0.005	0.007
TX: Lubbock	5	0.010	0.007	0.008
TX: San Angelo	5	0.013	0.007	0.010
TX: San Antonio	7	0.010	0.004	0.007
UT: Salt Lake City	2	0.007	0.005	0.006
UT: St. George	3	0.011	0.005	0.007
VA: Harrisonburg	8	0.010	0.006	0.007
VA: Richmond	4	0.007	0.005	0.006
VA: Virginia Beach	4	0.008	0.005	0.007
VT: Burlington	7	0.010	0.002	0.007
WA: Ellensburg	3	0.005	0.002	0.003
WA: Olympia	9	0.006	0.001	0.003
WA: Richland	5	0.006	0.003	0.004
WA: Seattle	5	0.005	0.002	0.003
WA: Spokane	9	0.006	0.002	0.003
WI: La Crosse	4	0.007	0.004	0.006
WI: Madison	9	0.011	0.005	0.009
WI: Milwaukee	9	0.009	0.004	0.007
WI: Shawano	9	0.011	0.003	0.007
WV: Charleston	6	0.008	0.005	0.007
WY: Casper	2	0.004	0.003	0.004

Table 5
Gamma-Emitters in Precipitation
January 2016

Location	Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408		ND	
AR: Little Rock	Be-7	40	26
CA: Richmond		ND	
CT: Hartford		ND	
GA: Atlanta	Be-7	30	18
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston		ND	
MN: Welch/510		ND	
NH: Concord	Be-7	29	20
NY: Albany		ND	
OR: Portland	Be-7	29	16
PA: Harrisburg	Ra-228	5.8	5.5
TN: Nashville		ND	
UT: Salt Lake City	Be-7	24	18
VA: Lynchburg		ND	

Table 6
Gamma-Emitters in Precipitation
February 2016

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	32	16
AR: Little Rock		ND	
CA: Richmond	Be-7	20	11
	K-40	10.6	9.5
CT: Hartford	Be-7	72	24
FL: Jacksonville		ND	
GA: Atlanta	Be-7	51	26
ID: Idaho Falls	Be-7	28	22
KS: Kansas City		ND	
MA: Boston		ND	
MN: St. Paul	Be-7	80	27
NC: Wilmington	Be-7	17	11
NY: Albany		ND	
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Knoxville		ND	
TN: Nashville	Be-7	26	16
TN: Oak Ridge/K25	Be-7	79	31
	K-40	14	11
TN: Oak Ridge/Melton	Be-7	61	27
TN: Oak Ridge/Y12 E	Be-7	75	45
TX: Austin		ND	
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 7
Gamma-Emitters in Precipitation
March 2016

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408		ND	
AR: Little Rock	Be-7	59	25
CA: Richmond	Be-7	49	21
CT: Hartford	Be-7	107	31
FL: Jacksonville	Be-7	43	21
	K-40	20	11
GA: Atlanta	Be-7	87	26
HI: Honolulu		ND	
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston		ND	
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NY: Albany	Be-7	32	18
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Knoxville		ND	
TN: Nashville		ND	
TN: Oak Ridge/K25	Be-7	69	25
TN: Oak Ridge/Melton	Be-7	76	22
TN: Oak Ridge/Y12 E	Be-7	52	14
TX: Austin		ND	
UT: Salt Lake City	Ra-228	4.6	4.5
VA: Lynchburg		ND	
WA: Olympia		ND	

Plutonium and Uranium in Airborne Particulates

Environmental radiation levels of plutonium and uranium are determined by the analysis of annually composited samples (air filters) collected from the airborne particulate samplers. Plutonium and uranium results are published in the ERD for the third quarter of the following year.

Concentrations of plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 are determined by alpha-particle spectrometry following chemical separation. The total volume of air represented by all the samples received from one sampling location during a year typically ranges from 120,000 m³ to 500,000 m³. The aliquot analyzed is a fraction of the total volume and is typically between 5,000 m³ and 30,000 m³.

This page intentionally left blank

2. Drinking Water Program

The RadNet drinking water program provides data on radionuclide concentrations in the nation's drinking water supplies. Sampling sites are either major population centers or selected nuclear facility environs.

Drinking water data are used to assess trends and anomalies in concentrations. The analysis scheme for RadNet samples is similar to that of EPA's "National Interim Primary Drinking Water Regulations." The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, and gamma on annual composites; (c) radium-226 if the gross alpha exceeds 2 pCi/L and radium-228 if the radium-226 falls between 3 and 5 pCi/L on annual composites; (d) iodine-131 on one quarterly sample per year for each station; (e) plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 for stations that demonstrate gross alpha levels greater than 2 pCi/L on annual composites; and (f) strontium-90 on one-fourth of the annual composites on a four year rotating schedule. Composite results are published in the ERD for the third quarter of the following year.

RadNet drinking water data should not be used to monitor compliance with drinking water regulations or for comparisons to those data since different procedures for collection and analysis may be used.

Table 8
Tritium in Drinking Water
January–March 2016

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	02/24/16	-22 75
AL: Dothan	01/05/16	-28 76
AL: Montgomery/408	01/08/16	-17 77
AL: Muscle Shoals	01/14/16	33 79
AL: Scottsboro	01/13/16	41 86
AR: Little Rock	03/14/16	14 83
CT: Hartford	03/14/16	4 83
DE: Dover	03/14/16	-39 75
FL: Miami	03/29/16	-22 74
FL: Tampa	03/17/16	8 85
GA: Baxley	01/28/16	48 80
GA: Savannah	03/25/16	-15 75
HI: Honolulu	02/25/16	-90 80
IA: Cedar Rapids	01/22/16	-27 75
ID: Idaho Falls	03/30/16	-6 75
KS: Topeka	03/23/16	24 84
LA: New Orleans	03/28/16	22 77
MD: Baltimore	01/29/16	-26 76
MD: Baltimore	03/16/16	-32 82
MD: Conowingo	03/22/16	7 76
MI: Detroit	01/19/16	113 83
MO: Jefferson City	02/26/16	13 78
MS: Jackson	03/08/16	50 79
MS: Port Gibson	03/08/16	13 77
MT: Helena	03/21/16	-65 80
ND: Bismarck	03/15/16	53 86
NE: Lincoln	01/07/16	33 79
NH: Concord	03/16/16	16 85
NJ: Trenton	03/15/16	2 84
NJ: Waretown	03/16/16	44 85
NM: Santa Fe	02/23/16	15 78
NY: Albany	03/30/16	142 98
NY: New York	03/21/16	24 84
NY: Niagara Falls	03/22/16	55 86
NY: Syracuse	03/08/16	9 78
OH: Cincinnati	03/16/16	-8 83
OH: Columbus	03/15/16	13 77
OH: E. Liverpool	02/04/16	7 78
OH: Painesville	03/16/16	94 87
OH: Toledo	03/29/16	112 81

Table 8 (continued)
Tritium in Drinking Water
January–March 2016

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
OK: Oklahoma City	03/09/16	-33 75
PA: Columbia	02/25/16	24 78
PA: Harrisburg	03/22/16	28 84
PA: Pittsburgh	02/04/16	-22 77
RI: Providence	03/11/16	-4 84
SC: Columbia	01/22/16	-15 76
SC: Jenkinsville	01/12/16	15 78
SC: Seneca	01/12/16	41 79
TN: Knoxville	02/04/16	19 78
TN: Oak Ridge/#360	01/04/16	22 79
TN: Oak Ridge/#371	01/04/16	17 78
TN: Oak Ridge/#768	01/04/16	31 79
TN: Oak Ridge/#772	01/04/16	-7 77
TX: Austin	01/04/16	-6 77
VA: Ashland	03/21/16	1250 140
WA: Richland	03/09/16	24 78
WI: Madison	03/17/16	22 84

This page intentionally left blank

For More Information

Environmental Radiation Data (ERD) is published quarterly by the U.S. Environmental Protection Agency's Office of Radiation and Indoor Air.

Requests for information concerning the operation of RadNet and the data that are generated should be directed as follows:

Requests for information concerning the operation of RadNet, the data that are generated, or publication and distribution of ERD should be directed to:

Charles M. Petko
Office of the Director
National Analytical Radiation Environmental Laboratory
540 South Morris Avenue
Montgomery, Alabama 36115-2601
email: petko.charles@epa.gov

Requests for information concerning policies of the Office of Radiation and Indoor Air should be directed to:

Jonathan Edwards
USEPA - ORIA
Radiation Protection Division (MC6608J)
1200 Pennsylvania Ave. N.W.
Washington, DC 20460
email: edwards.jonathan@epa.gov

This page intentionally left blank