

ENVIRONMENTAL

RADIATION

DATA

REPORT 158

April–June 2014

United States Environmental Protection Agency

Office of Radiation and Indoor Air

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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 both hard-copy and electronic formats. Electronic reports are 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, drinking water, and milk 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, radium, and tritium. This monitoring effort also provides information on natural background levels and possible accidental releases into the environment.

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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.

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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.

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

Radionuclide	Media	Reporting Unit	Minimum Detectable Concentration
Gross Alpha	Water	pCi/L	2
Gross Beta	Air	pCi/m ³	0.0006
	Water	pCi/L	2
	Precipitation	pCi/L	2
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	7.5
	Water	pCi/L	0.35
† Uranium-235	Air	aCi/m ³	9
	Water	pCi/L	0.4
Radium-226	Water	pCi/L	0.02
Strontium-90	Milk	pCi/L	2
	Water	pCi/L	1
‡ Iodine-131	Milk (gamma)	pCi/L	4
	Water (gamma)	pCi/L	4
	Water	pCi/L	0.3
Cesium-137	Milk	pCi/L	5
	Water	pCi/L	5
‡ Barium-140	Milk	pCi/L	15
	Water	pCi/L	15
Potassium	Milk	g/L	0.06
	Water	g/L	0.06
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.

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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 generally field measurements are made with a dual-phosphor scintillation counter at least 5 hours after collection to allow ^{222}Rn progeny to decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found; however, as of the first quarter of 2012, NAREL no longer reports field estimates in *Environmental Radiation Data*.

The filters are sent to NAREL for more sensitive 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. NAREL discontinued gross beta analysis of precipitation in January 2010 and discontinued tritium analysis of precipitation in January 2012.

Table 2
Gross Beta in Airborne Particulates
April 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	5	0.009	0.003	0.006
AK: Fairbanks	9	0.014	0.005	0.009
AK: Juneau	7	0.007	0.001	0.004
AL: Birmingham	8	0.012	0.005	0.008
AL: Montgomery/408	6	0.009	0.005	0.007
AR: Fort Smith	3	0.013	0.008	0.010
AR: Little Rock	2	0.008	0.007	0.008
AZ: Phoenix/956	7	0.013	0.006	0.009
AZ: Tucson	8	0.012	0.006	0.009
CA: Anaheim	9	0.007	0.001	0.005
CA: Eureka	4	0.005	0.001	0.003
CA: Los Angeles	5	0.013	0.003	0.006
CA: Richmond	4	0.006	0.003	0.004
CA: Riverside	8	0.016	0.003	0.010
CA: Sacramento	9	0.009	0.003	0.006
CA: San Bernardino Cty.	7	0.019	0.004	0.010
CA: San Francisco	8	0.006	0.002	0.004
CA: San Jose	7	0.009	0.003	0.006
CO: Colorado Springs	2	0.012	0.008	0.010
CO: Denver	5	0.014	0.009	0.011
CO: Grand Junction	2	0.010	0.009	0.009
CT: Hartford	9	0.007	0.004	0.006
DC: Washington	9	0.009	0.005	0.008
DE: Dover	5	0.005	0.005	0.005
FL: Jacksonville	7	0.013	0.004	0.008
FL: Miami	1	0.006	0.006	0.006
FL: Orlando	8	0.009	0.002	0.006
FL: Tallahassee	3	0.007	0.003	0.005
FL: Tampa	7	0.013	0.002	0.007
GA: Atlanta	3	0.009	0.006	0.008
GA: Augusta	6	0.007	0.004	0.006
HI: Honolulu	7	0.004	0.002	0.003
IA: Des Moines	8	0.011	0.005	0.008
IA: Mason City	6	0.014	0.006	0.009
ID: Boise	6	0.006	0.003	0.004
ID: Idaho Falls	5	0.010	0.005	0.008
IL: Champaign	8	0.012	0.005	0.007
IL: Chicago	8	0.013	0.004	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IN: Fort Wayne	3	0.012	0.007	0.009
IN: Indianapolis	8	0.014	0.006	0.009
KS: Kansas City	7	0.016	0.007	0.010
KS: Wichita	2	0.012	0.010	0.011
KY: Lexington	8	0.016	0.006	0.010
KY: Louisville	5	0.010	0.005	0.007
LA: Baton Rouge	7	0.011	0.005	0.008
LA: Shreveport	4	0.008	0.003	0.006
MA: Boston	8	0.008	0.004	0.006
MA: Worcester	7	0.009	0.005	0.007
MD: Baltimore	7	0.010	0.006	0.007
ME: Portland	9	0.008	0.005	0.007
MI: Bay City 48708	7	0.009	0.006	0.008
MI: Detroit	9	0.014	0.008	0.011
MI: Grand Rapids	4	0.012	0.011	0.011
MN: Duluth	8	0.009	0.005	0.007
MN: St. Paul	3	0.014	0.010	0.011
MO: Jefferson City	8	0.014	0.006	0.009
MO: Springfield	2	0.007	0.006	0.006
MO: St. Louis	4	0.011	0.005	0.007
MS: Jackson/Deq	4	0.009	0.006	0.008
MT: Billings	2	0.011	0.009	0.010
NC: Charlotte	5	0.014	0.007	0.012
NC: Greensboro	1	0.007	0.007	0.007
NC: Raleigh	2	0.004	0.004	0.004
NC: Wilmington	5	0.005	0.004	0.004
ND: Bismarck	4	0.009	0.003	0.007
NE: Kearney	9	0.012	0.003	0.008
NE: Lincoln	8	0.010	0.006	0.008
NH: Concord	6	0.007	0.003	0.005
NJ: Edison	8	0.008	0.001	0.005
NM: Carlsbad	8	0.013	0.008	0.010
NM: Navajo Lake St Park	2	0.015	0.010	0.013
NV: Las Vegas/913	6	0.010	0.002	0.006
NV: Reno	8	0.020	0.005	0.012
NY: Albany	9	0.012	0.005	0.008
NY: Lockport	8	0.010	0.007	0.009
NY: New York City	4	0.007	0.005	0.006

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Rochester	7	0.009	0.007	0.008
NY: Syracuse	2	0.008	0.006	0.007
NY: Yaphank	1	0.003	0.003	0.003
OH: Cincinnati	4	0.007	0.005	0.006
OH: Cleveland	7	0.013	0.008	0.011
OH: Columbus	2	0.012	0.010	0.011
OH: Toledo	9	0.010	0.004	0.007
OK: Oklahoma City	8	0.015	0.009	0.012
OK: Tulsa	8	0.013	0.007	0.009
OR: Corvallis	8	0.004	0.001	0.002
OR: Portland	7	0.005	0.001	0.002
PA: Bloomsburg	5	0.005	0.003	0.004
PA: Philadelphia	5	0.008	0.005	0.006
PA: Pittsburgh	4	0.011	0.006	0.008
PR: San Juan	7	0.007	0.002	0.004
RI: Providence	5	0.010	0.004	0.007
SC: Columbia	1	0.007	0.007	0.007
SD: Pierre	3	0.008	0.006	0.007
SD: Rapid City	5	0.011	0.007	0.009
TN: Knoxville	3	0.010	0.008	0.009
TN: Memphis	6	0.015	0.008	0.010
TN: Nashville	7	0.009	0.004	0.006
TN: Oak Ridge/Bethel	7	0.011	0.006	0.008
TN: Oak Ridge/K25	7	0.012	0.006	0.009
TN: Oak Ridge/Melton	7	0.008	0.005	0.007
TN: Oak Ridge/Y12 E	7	0.011	0.007	0.009
TN: Oak Ridge/Y12 W	7	0.011	0.006	0.008
TX: Austin	4	0.011	0.008	0.009
TX: Dallas	1	0.010	0.010	0.010
TX: Ft. Worth	4	0.011	0.006	0.008
TX: Harlingen	4	0.009	0.006	0.008
TX: Houston	8	0.013	0.006	0.009
TX: Lubbock	8	0.003	0.001	0.002
TX: San Angelo	2	0.010	0.010	0.010
TX: San Antonio	7	0.011	0.005	0.009
UT: Salt Lake City	7	0.009	0.004	0.007
VA: Harrisonburg	7	0.012	0.005	0.009
VA: Lynchburg	2	0.005	0.005	0.005

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Richmond	8	0.009	0.005	0.007
VA: Virginia Beach	8	0.008	0.005	0.006
VT: Burlington	6	0.010	0.006	0.008
WA: Olympia	7	0.005	0.001	0.003
WA: Richland	5	0.006	0.002	0.003
WA: Seattle	1	0.002	0.002	0.002
WA: Spokane	8	0.006	0.003	0.005
WI: Lacrosse	3	0.010	0.006	0.007
WI: Madison	9	0.015	0.008	0.012
WI: Milwaukee	4	0.012	0.007	0.010
WI: Shawano	8	0.010	0.004	0.008
WV: Charleston	6	0.013	0.005	0.008
WY: Casper	4	0.010	0.008	0.009

Table 3
Gross Beta in Airborne Particulates
May 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.010	0.005	0.007
AK: Fairbanks	4	0.006	0.003	0.005
AK: Juneau	8	0.007	0.002	0.004
AL: Birmingham	9	0.018	0.006	0.012
AL: Montgomery/408	7	0.018	0.004	0.010
AR: Fort Smith	1	0.011	0.011	0.011
AR: Little Rock	2	0.012	0.011	0.011
AZ: Phoenix/956	5	0.012	0.007	0.009
AZ: Tucson	6	0.014	0.009	0.011
CA: Anaheim	8	0.007	0.002	0.005
CA: Eureka	5	0.003	0.002	0.002
CA: Los Angeles	3	0.016	0.006	0.009
CA: Richmond	4	0.005	0.002	0.004
CA: Riverside	6	0.015	0.005	0.010
CA: Sacramento	5	0.011	0.003	0.006
CA: San Bernardino Cty.	4	0.013	0.006	0.010
CA: San Francisco	9	0.007	0.002	0.004
CA: San Jose	9	0.012	0.003	0.005
CO: Colorado Springs	2	0.011	0.006	0.008
CO: Denver	5	0.018	0.012	0.015
CO: Grand Junction	4	0.010	0.006	0.008
CT: Hartford	9	0.009	0.002	0.005
DC: Washington	7	0.011	0.006	0.008
DE: Dover	4	0.007	0.004	0.006
FL: Jacksonville	8	0.014	0.007	0.012
FL: Orlando	7	0.011	0.005	0.008
FL: Tallahassee	3	0.013	0.005	0.010
FL: Tampa	9	0.020	0.007	0.012
GA: Atlanta	4	0.014	0.010	0.012
GA: Augusta	4	0.011	0.005	0.008
HI: Honolulu	9	0.006	0.002	0.004
IA: Des Moines	7	0.009	0.003	0.006
IA: Mason City	4	0.009	0.003	0.006
ID: Idaho Falls	8	0.010	0.004	0.007
IL: Champaign	9	0.008	0.003	0.005
IL: Chicago	9	0.012	0.005	0.007
IN: Fort Wayne	3	0.010	0.005	0.008
IN: Indianapolis	5	0.012	0.004	0.008

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
KS: Kansas City	7	0.015	0.005	0.010
KS: Wichita	3	0.015	0.008	0.011
KY: Lexington	8	0.016	0.006	0.011
KY: Louisville	8	0.013	0.004	0.008
LA: Baton Rouge	8	0.014	0.008	0.010
LA: Shreveport	4	0.008	0.005	0.007
MA: Boston	9	0.009	0.002	0.004
MA: Worcester	9	0.008	0.002	0.005
MD: Baltimore	5	0.009	0.003	0.007
ME: Portland	8	0.006	0.002	0.004
MI: Bay City 48708	9	0.010	0.002	0.005
MI: Detroit	10	0.013	0.004	0.007
MI: Grand Rapids	5	0.009	0.006	0.007
MN: Duluth	7	0.010	0.001	0.004
MN: St. Paul	2	0.014	0.004	0.009
MO: Jefferson City	9	0.017	0.005	0.009
MO: Springfield	9	0.012	0.005	0.009
MO: St. Louis	4	0.010	0.006	0.007
MS: Jackson/Deq	5	0.017	0.008	0.011
MT: Billings	4	0.008	0.004	0.006
NC: Charlotte	7	0.023	0.010	0.016
NC: Greensboro	1	0.011	0.011	0.011
NC: Wilmington	4	0.008	0.005	0.006
ND: Bismarck	3	0.006	0.004	0.006
NE: Kearney	7	0.014	0.004	0.009
NE: Lincoln	9	0.010	0.004	0.007
NE: Omaha	2	0.014	0.007	0.011
NH: Concord	6	0.006	0.002	0.004
NJ: Edison	4	0.009	0.005	0.007
NM: Carlsbad	4	0.015	0.009	0.012
NM: Navajo Lake St Park	2	0.011	0.009	0.010
NV: Las Vegas/913	7	0.007	0.004	0.006
NV: Reno	7	0.014	0.006	0.010
NY: Albany	8	0.008	0.002	0.006
NY: Lockport	9	0.011	0.003	0.007
NY: New York City	3	0.010	0.007	0.008
NY: Rochester	8	0.012	0.005	0.009
NY: Syracuse	1	0.005	0.005	0.005

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Yaphank	6	0.006	0.004	0.005
OH: Cincinnati	8	0.013	0.004	0.008
OH: Cleveland	9	0.013	0.003	0.007
OH: Columbus	2	0.010	0.006	0.008
OH: Toledo	7	0.008	0.003	0.005
OK: Oklahoma City	9	0.015	0.007	0.011
OK: Tulsa	8	0.015	0.004	0.009
OR: Corvallis	8	0.006	0.001	0.004
OR: Portland	7	0.005	0.001	0.003
PA: Bloomsburg	7	0.010	0.002	0.005
PA: Philadelphia	4	0.008	0.004	0.007
PA: Pittsburgh	5	0.010	0.004	0.008
PR: San Juan	6	0.008	0.003	0.005
RI: Providence	4	0.006	0.003	0.005
SD: Pierre	8	0.010	0.005	0.007
SD: Rapid City	4	0.011	0.006	0.009
TN: Knoxville	4	0.013	0.008	0.011
TN: Memphis	8	0.015	0.005	0.010
TN: Nashville	8	0.013	0.006	0.009
TN: Oak Ridge/Bethel	8	0.012	0.005	0.009
TN: Oak Ridge/K25	8	0.013	0.005	0.010
TN: Oak Ridge/Melton	8	0.009	0.004	0.007
TN: Oak Ridge/Y12 E	8	0.013	0.006	0.010
TN: Oak Ridge/Y12 W	8	0.013	0.005	0.010
TX: Amarillo	2	0.010	0.010	0.010
TX: Austin	4	0.009	0.006	0.008
TX: Dallas	7	0.014	0.007	0.011
TX: Ft. Worth	4	0.009	0.006	0.008
TX: Harlingen	4	0.010	0.006	0.008
TX: Houston	9	0.012	0.005	0.009
TX: Lubbock	9	0.008	0.001	0.004
TX: San Angelo	1	0.009	0.009	0.009
TX: San Antonio	8	0.010	0.005	0.007
UT: Salt Lake City	9	0.011	0.004	0.008
UT: St. George	2	0.008	0.008	0.008
VA: Harrisonburg	9	0.013	0.003	0.008
VA: Lynchburg	8	0.009	0.002	0.005
VA: Richmond	9	0.016	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Virginia Beach	8	0.011	0.006	0.008
VT: Burlington	9	0.007	0.002	0.004
WA: Olympia	8	0.005	0.001	0.003
WA: Richland	8	0.007	0.003	0.005
WA: Seattle	1	0.002	0.002	0.002
WA: Spokane	9	0.008	0.003	0.006
WI: Lacrosse	2	0.004	0.003	0.003
WI: Madison	9	0.016	0.002	0.008
WI: Milwaukee	4	0.009	0.004	0.007
WI: Shawano	9	0.008	0.002	0.005
WV: Charleston	4	0.014	0.008	0.011
WY: Casper	4	0.009	0.004	0.007

Table 4
Gross Beta in Airborne Particulates
June 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.002	0.001	0.001
AK: Fairbanks	7	0.004	0.001	0.003
AK: Juneau	5	0.002	0.001	0.001
AL: Birmingham	7	0.015	0.006	0.010
AL: Montgomery/408	9	0.017	0.004	0.008
AR: Little Rock	7	0.012	0.004	0.008
AZ: Phoenix/956	1	0.015	0.015	0.015
AZ: Tucson	7	0.015	0.006	0.010
CA: Anaheim	8	0.007	0.004	0.005
CA: Eureka	4	0.002	0.001	0.001
CA: Fresno	1	0.010	0.010	0.010
CA: Los Angeles	5	0.010	0.007	0.008
CA: Richmond	4	0.003	0.003	0.003
CA: Riverside	8	0.015	0.006	0.012
CA: Sacramento	2	0.005	0.003	0.004
CA: San Bernardino Cty.	6	0.016	0.007	0.012
CA: San Francisco	7	0.004	0.002	0.003
CA: San Jose	7	0.006	0.002	0.005
CO: Colorado Springs	3	0.012	0.010	0.010
CO: Denver	1	0.015	0.015	0.015
CO: Grand Junction	1	0.011	0.011	0.011
CT: Hartford	8	0.007	0.003	0.005
DC: Washington	7	0.012	0.004	0.007
DE: Dover	3	0.004	0.004	0.004
FL: Jacksonville	8	0.011	0.005	0.008
FL: Orlando	8	0.008	0.004	0.006
FL: Tallahassee	4	0.008	0.005	0.007
FL: Tampa	7	0.019	0.004	0.010
GA: Atlanta	3	0.009	0.006	0.008
GA: Augusta	5	0.009	0.004	0.007
HI: Honolulu	9	0.004	0.001	0.002
IA: Des Moines	2	0.007	0.006	0.006
IA: Mason City	6	0.010	0.004	0.007
ID: Boise	5	0.006	0.002	0.004
ID: Idaho Falls	6	0.013	0.005	0.009
IL: Aurora	1	0.007	0.007	0.007
IL: Champaign	9	0.012	0.004	0.006
IL: Chicago	7	0.009	0.004	0.007

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IN: Fort Wayne	5	0.012	0.009	0.009
IN: Indianapolis	3	0.011	0.008	0.010
KS: Kansas City	8	0.015	0.006	0.010
KS: Wichita	6	0.010	0.006	0.009
KY: Lexington	7	0.015	0.007	0.010
KY: Louisville	7	0.011	0.005	0.008
KY: Paducah	5	0.011	0.004	0.008
LA: Baton Rouge	10	0.012	0.003	0.007
LA: Shreveport	5	0.010	0.003	0.006
MA: Boston	9	0.005	0.002	0.004
MA: Worcester	9	0.009	0.003	0.006
ME: Portland	9	0.006	0.002	0.004
MI: Bay City 48708	8	0.006	0.003	0.005
MI: Detroit	9	0.011	0.006	0.009
MI: Grand Rapids	3	0.010	0.007	0.009
MN: Duluth	7	0.011	0.002	0.005
MN: St. Paul	1	0.009	0.009	0.009
MO: Jefferson City	7	0.011	0.005	0.007
MO: Springfield	1	0.008	0.008	0.008
MO: St. Louis	4	0.007	0.006	0.007
MS: Jackson/Deq	5	0.015	0.004	0.009
MT: Billings	3	0.005	0.004	0.005
NC: Charlotte	6	0.017	0.010	0.012
NC: Greensboro	1	0.011	0.011	0.011
NC: Raleigh	3	0.008	0.004	0.006
NC: Wilmington	4	0.006	0.004	0.005
ND: Bismarck	1	0.006	0.006	0.006
NE: Kearney	8	0.009	0.006	0.008
NE: Lincoln	9	0.011	0.005	0.008
NE: Omaha	5	0.007	0.006	0.007
NH: Concord	8	0.005	0.002	0.004
NJ: Edison	4	0.008	0.004	0.005
NM: Carlsbad	6	0.014	0.007	0.011
NV: Las Vegas/913	4	0.015	0.008	0.012
NV: Reno	6	0.014	0.006	0.009
NY: Albany	5	0.007	0.004	0.005
NY: Lockport	9	0.010	0.002	0.007
NY: New York City	4	0.007	0.005	0.006

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Rochester	6	0.012	0.007	0.008
NY: Syracuse	1	0.011	0.011	0.011
NY: Yaphank	3	0.004	0.003	0.003
OH: Cincinnati	8	0.011	0.004	0.008
OH: Cleveland	9	0.010	0.005	0.007
OH: Columbus	1	0.008	0.008	0.008
OH: Toledo	9	0.009	0.004	0.006
OK: Oklahoma City	9	0.014	0.005	0.009
OK: Tulsa	9	0.012	0.005	0.008
OR: Corvallis	8	0.004	0.000	0.003
OR: Portland	9	0.004	0.000	0.002
PA: Bloomsburg	8	0.006	0.002	0.004
PA: Philadelphia	4	0.008	0.004	0.005
PA: Pittsburgh	4	0.011	0.007	0.009
PR: San Juan	9	0.014	0.004	0.008
RI: Providence	5	0.006	0.005	0.005
SD: Pierre	9	0.009	0.005	0.007
SD: Rapid City	5	0.009	0.005	0.007
TN: Knoxville	3	0.017	0.009	0.013
TN: Memphis	1	0.004	0.004	0.004
TN: Nashville	8	0.013	0.004	0.007
TN: Oak Ridge/Bethel	9	0.013	0.004	0.008
TN: Oak Ridge/K25	9	0.014	0.005	0.009
TN: Oak Ridge/Melton	5	0.010	0.003	0.006
TN: Oak Ridge/Y12 E	9	0.014	0.005	0.009
TN: Oak Ridge/Y12 W	9	0.016	0.005	0.010
TX: Amarillo	4	0.012	0.007	0.010
TX: Austin	5	0.011	0.006	0.008
TX: Dallas	7	0.013	0.004	0.008
TX: Ft. Worth	3	0.009	0.005	0.006
TX: Harlingen	1	0.012	0.012	0.012
TX: Houston	9	0.014	0.003	0.009
TX: Lubbock	4	0.009	0.004	0.007
TX: San Angelo	2	0.008	0.008	0.008
TX: San Antonio	9	0.013	0.003	0.009
UT: Salt Lake City	8	0.011	0.005	0.008
UT: St. George	4	0.011	0.007	0.009
VA: Harrisonburg	8	0.018	0.006	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Lynchburg	8	0.008	0.003	0.005
VA: Richmond	8	0.014	0.005	0.008
VA: Virginia Beach	7	0.013	0.003	0.007
VT: Burlington	8	0.007	0.004	0.005
WA: Olympia	4	0.005	0.001	0.002
WA: Richland	7	0.006	0.002	0.004
WA: Seattle	2	0.001	0.001	0.001
WA: Spokane	9	0.009	0.002	0.005
WI: Lacrosse	3	0.005	0.005	0.005
WI: Madison	8	0.012	0.006	0.009
WI: Milwaukee	4	0.007	0.006	0.006
WI: Shawano	9	0.007	0.004	0.006
WV: Charleston	4	0.010	0.006	0.008
WY: Casper	5	0.013	0.007	0.009

Table 5
Specific Gamma in Precipitation
April 2014

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	8.9	7.9
AR: Little Rock	Be-7	28	16
CA: Richmond	Be-7	20	15
CT: Hartford	Be-7	53	20
FL: Jacksonville	Be-7	36	15
GA: Atlanta	Be-7	30	12
HI: Honolulu		ND	
ID: Idaho Falls	Be-7	15	10
KS: Kansas City		ND	
MA: Boston	Be-7	68	18
MI: Lansing	Be-7	30	13
MN: St. Paul	Be-7	38	16
NC: Charlotte	Be-7	19	13
NC: Wilmington		ND	
NH: Concord		ND	
NY: Albany	Be-7	21	10
NY: Yaphank		ND	
OR: Portland	Be-7	49	17
PA: Harrisburg	Be-7	16.9	9.2
TN: Knoxville		ND	
TN: Nashville	Be-7	29	12
TN: Oak Ridge/K25	Be-7	26	15
TN: Oak Ridge/Melton	Be-7	46	18
TN: Oak Ridge/Y12 E	Be-7	25	14
TX: Austin		ND	
UT: Salt Lake City	Be-7	29	12
VA: Lynchburg		ND	
WA: Olympia	Be-7	24	10

Table 6
Specific Gamma in Precipitation
May 2014

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408		ND	
AR: Little Rock		ND	
CT: Hartford	Be-7	29	16
FL: Jacksonville	Be-7	34	18
GA: Atlanta	Be-7	32	17
HI: Honolulu	Be-7	47	20
ID: Idaho Falls		ND	
KS: Kansas City	Be-7	18	16
MA: Boston	Be-7	31	16
MI: Lansing	Be-7	24	17
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NH: Concord		ND	
NY: Albany		ND	
NY: Yaphank	Be-7	29	16
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Nashville	Be-7	28	16
TN: Oak Ridge/K25	Be-7	20	17
TN: Oak Ridge/Melton	Be-7	32	14
TN: Oak Ridge/Y12 E	Be-7	31	16
TX: Austin		ND	
UT: Salt Lake City	Be-7	44	16
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 7
Specific Gamma in Precipitation
June 2014

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	21	14
AR: Little Rock		ND	
CT: Hartford	Be-7	65	18
FL: Jacksonville	Be-7	23.8	8.9
GA: Atlanta	Be-7	52	18
HI: Honolulu		ND	
ID: Idaho Falls	Be-7	95	26
KS: Kansas City		ND	
MA: Boston	Be-7	53	19
MI: Lansing	Be-7	28	12
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte	Be-7	29	10
NC: Wilmington		ND	
NY: Albany		ND	
PA: Harrisburg	Be-7	27	15
TN: Nashville	Be-7	37	15
TN: Oak Ridge/K25	Be-7	60	18
TN: Oak Ridge/Melton	Be-7	35	14
TN: Oak Ridge/Y12 E	Be-7	51	18
TX: Austin		ND	
UT: Salt Lake City	Be-7	78	25
VA: Lynchburg		ND	
WA: Olympia	Be-7	25	14

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.

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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
April–June 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	05/09/14	47 80
AL: Dothan	04/01/14	-14 76
AL: Montgomery	04/04/14	9 78
AL: Muscle Shoals	04/03/14	242 88
AL: Scottsboro	04/02/14	457 98
AR: Little Rock	05/19/14	22 84
CT: Hartford	04/02/14	2 80
DE: Dover	04/29/14	-14 75
FL: Miami	06/30/14	-33 75
FL: Tampa	06/11/14	0 83
GA: Baxley	06/17/14	0 81
GA: Savannah	06/23/14	39 78
HI: Honolulu	05/15/14	49 84
IA: Cedar Rapids	04/01/14	44 80
ID: Boise	05/30/14	26 84
ID: Idaho Falls	04/22/14	13 77
KS: Topeka	05/19/14	-18 80
LA: New Orleans	05/30/14	24 83
MD: Baltimore	04/01/14	58 80
MD: Conowingo	04/01/14	59 81
MI: Detroit	05/08/14	93 80
MN: St. Paul	04/01/14	2 79
MN: Welch	04/01/14	62 82
MO: Jefferson City	06/11/14	52 79
MS: Jackson	05/21/14	4 81
MS: Port Gibson	05/20/14	16 83
MT: Helena	05/27/14	14 83
ND: Bismarck	05/22/14	-41 79
NE: Lincoln	04/04/14	-29 76
NJ: Trenton	04/22/14	18 77
NJ: Waretown	04/22/14	32 78
NY: Albany	06/27/14	-25 92
NY: New York City	06/24/14	30 77
NY: Niagara Falls	04/01/14	33 79
NY: Syracuse	06/05/14	14 82
OH: Cincinnati	05/20/14	-28 81
OH: Columbus	05/13/14	36 78
OH: E. Liverpool	05/28/14	0 83
OH: Painesville	05/22/14	86 87
OH: Toledo	04/02/14	83 82

Table 8 (continued)
Tritium in Drinking Water
April–June 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
OR: Portland	06/17/14	31 83
PA: Columbia	04/02/14	2 79
PA: Harrisburg	04/01/14	52 79
PA: Pittsburgh	05/27/14	20 84
RI: Providence	04/26/14	27 78
SC: Columbia	04/10/14	-7 77
SC: Jenkinsville	04/09/14	12 77
SC: Jenkinsville	06/25/14	2 85
SC: Seneca	04/21/14	4 76
SC: Seneca	06/30/14	-25 84
TN: Knoxville	04/30/14	30 78
TN: Oak Ridge/#360	04/01/14	65 82
TN: Oak Ridge/#371	04/01/14	9 78
TN: Oak Ridge/#4442	04/03/14	368 95
TN: Oak Ridge/#768	04/01/14	-7 79
TN: Oak Ridge/#772	04/03/14	49 80
TX: Austin	04/23/14	49 80
VA: Lynchburg	05/16/14	-55 79
WA: Richland	05/07/14	-58 80
WI: Madison	04/02/14	24 79

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3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of certain radionuclides since it is consumed fresh by a large segment of the population and can contain several of the biologically significant radionuclides that result from environmental releases from nuclear activities. A primary function of this program is to obtain reliable monitoring data relative to current radionuclide concentrations and determine any long-term trends.

Milk samples are collected quarterly at each of the sampling sites. The samples are analyzed for gamma-emitting nuclides, including iodine-131, barium-140, cesium-137, and potassium-40. Total potassium concentrations in g/L are determined from potassium-40 activities assuming natural isotopic abundances. During the third quarter collection, one-fourth of the samples are also analyzed for strontium-90 on a four year rotating schedule.

Table 9
Radionuclides in Pasteurized Milk
April–June 2014

Location	Date Collected	K g/L ± 2u	¹³⁷ Cs pCi/L ± 2u	¹⁴⁰ Ba pCi/L ± 2u	¹³¹ I pCi/L ± 2u
AR: Little Rock	05/12/14	1.63 0.20	ND	ND	NR
AZ: Phoenix	05/19/14	1.69 0.20	ND	ND	ND
CA: Los Angeles	06/25/14	1.57 0.19	ND	ND	NR
CA: Oakland	04/15/14	1.70 0.21	ND	ND	ND
CT: Hartford	06/16/14	1.82 0.21	ND	ND	ND
FL: Plant City	04/22/14	1.75 0.20	ND	ND	ND
HI: Hilo	04/10/14	1.67 0.20	ND	NR	NR
IA: Des Moines	06/24/14	1.60 0.19	ND	ND	NR
KY: Louisville	04/15/14	1.65 0.20	ND	ND	ND
MA: Boston	06/25/14	1.61 0.19	ND	ND	NR
MD: Baltimore	04/04/14	1.63 0.19	ND	ND	ND
MO: Jefferson City	04/25/14	1.64 0.19	ND	ND	ND
NJ: Trenton	04/22/14	1.71 0.21	ND	ND	ND
NV: Las Vegas	05/12/14	1.67 0.20	ND	ND	NR
NY: Buffalo	06/04/14	1.65 0.19	ND	ND	ND
NY: Syracuse	04/07/14	1.67 0.19	ND	ND	ND
OH: Cincinnati	04/14/14	1.62 0.19	ND	ND	ND
OH: Cleveland	05/28/14	1.71 0.20	ND	ND	ND
OR: Portland	04/15/14	1.64 0.20	ND	ND	ND
PA: Pittsburgh	04/11/14	1.63 0.19	ND	ND	ND
TN: Chattanooga	05/28/14	1.66 0.20	ND	ND	ND
TN: Knoxville	04/08/14	1.75 0.21	ND	ND	ND
TN: Memphis	04/07/14	1.64 0.20	ND	ND	ND
TX: Dallas	04/22/14	1.65 0.19	ND	ND	ND
TX: San Antonio	05/05/14	1.55 0.19	ND	ND	NR
WA: Spokane	05/15/14	1.62 0.19	ND	ND	NR
WA: Tacoma	06/28/14	1.59 0.19	ND	ND	NR
WV: Charleston	04/08/14	1.67 0.19	ND	ND	ND

Note: ND = Not detected
NR = No result (not analyzed within 5 half-lives of collection)

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:

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email: edwards.jonathan@epa.gov

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