

ENVIRONMENTAL

RADIATION

DATA

REPORT 157

January–March 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
January 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.005	0.001	0.003
AK: Fairbanks	8	0.012	0.003	0.007
AK: Juneau	6	0.002	0.001	0.001
AL: Birmingham	9	0.019	0.004	0.008
AL: Montgomery/408	7	0.015	0.004	0.008
AR: Little Rock	3	0.010	0.003	0.006
AZ: Phoenix/956	7	0.024	0.012	0.019
AZ: Tucson	8	0.025	0.014	0.017
CA: Anaheim	9	0.027	0.008	0.017
CA: Eureka	5	0.009	0.005	0.008
CA: Los Angeles	9	0.040	0.009	0.023
CA: Richmond	4	0.035	0.007	0.025
CA: Riverside	8	0.038	0.014	0.021
CA: Sacramento	5	0.031	0.012	0.024
CA: San Bernardino Cty.	6	0.041	0.013	0.022
CA: San Diego	1	0.016	0.016	0.016
CA: San Francisco	9	0.032	0.002	0.019
CA: San Jose	7	0.036	0.003	0.022
CO: Denver	9	0.012	0.004	0.008
CO: Grand Junction	2	0.020	0.019	0.019
CT: Hartford	9	0.010	0.006	0.008
DC: Washington	9	0.013	0.006	0.009
DE: Dover	6	0.008	0.005	0.006
FL: Jacksonville	5	0.011	0.004	0.007
FL: Orlando	4	0.008	0.003	0.006
FL: Tallahassee	4	0.010	0.004	0.006
FL: Tampa	8	0.010	0.004	0.006
GA: Atlanta	3	0.012	0.005	0.008
GA: Augusta	6	0.007	0.002	0.004
HI: Honolulu	9	0.003	0.001	0.002
IA: Des Moines	8	0.023	0.005	0.010
IA: Mason City	5	0.019	0.008	0.014
ID: Boise	5	0.036	0.012	0.025
ID: Idaho Falls	9	0.032	0.003	0.019
IL: Aurora	2	0.011	0.008	0.009
IL: Champaign	8	0.013	0.005	0.009
IL: Chicago	5	0.014	0.007	0.011
IN: Fort Wayne	4	0.014	0.006	0.010

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IN: Indianapolis	8	0.015	0.005	0.010
KS: Kansas City	5	0.015	0.005	0.010
KS: Wichita	8	0.017	0.004	0.010
KY: Lexington	5	0.012	0.006	0.010
LA: Baton Rouge	7	0.022	0.004	0.009
LA: Shreveport	4	0.015	0.003	0.008
MA: Boston	5	0.008	0.007	0.008
MA: Worcester	6	0.012	0.008	0.010
MD: Baltimore	7	0.012	0.007	0.009
ME: Orono	1	0.008	0.008	0.008
ME: Portland	8	0.007	0.003	0.005
MI: Bay City 48708	8	0.016	0.005	0.010
MI: Detroit	9	0.015	0.007	0.010
MI: Grand Rapids	5	0.014	0.006	0.011
MN: Duluth	8	0.015	0.005	0.009
MN: St. Paul	4	0.022	0.009	0.017
MO: Jefferson City	9	0.014	0.005	0.008
MO: Springfield	1	0.014	0.014	0.014
MO: St. Louis	4	0.011	0.005	0.008
MS: Jackson/Deq	4	0.015	0.005	0.009
MT: Billings	5	0.009	0.003	0.007
NC: Charlotte	9	0.007	0.004	0.005
NC: Greensboro	2	0.009	0.007	0.008
NC: Raleigh	2	0.005	0.003	0.004
NC: Wilmington	5	0.005	0.003	0.004
ND: Bismarck	5	0.016	0.004	0.008
NE: Lincoln	9	0.015	0.003	0.007
NE: Omaha	4	0.014	0.004	0.009
NH: Concord	7	0.010	0.004	0.006
NJ: Edison	8	0.010	0.005	0.007
NM: Albuquerque	1	0.017	0.017	0.017
NM: Carlsbad	6	0.013	0.007	0.009
NM: Navajo Lake St Park	3	0.015	0.007	0.011
NV: Las Vegas/913	8	0.014	0.007	0.011
NV: Reno	7	0.052	0.006	0.029
NY: Albany	7	0.013	0.005	0.010
NY: Lockport	7	0.011	0.007	0.009
NY: New York City	5	0.009	0.005	0.007

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Rochester	5	0.008	0.003	0.005
NY: Yaphank	5	0.006	0.004	0.005
OH: Cincinnati	8	0.013	0.006	0.009
OH: Cleveland	9	0.015	0.007	0.011
OH: Columbus	1	0.012	0.012	0.012
OH: Painesville	7	0.012	0.006	0.009
OH: Toledo	8	0.014	0.003	0.007
OK: Oklahoma City	9	0.018	0.005	0.010
OK: Tulsa	9	0.021	0.003	0.009
OR: Corvallis	9	0.013	0.002	0.007
OR: Portland	9	0.014	0.003	0.007
PA: Bloomsburg	7	0.007	0.005	0.006
PA: Philadelphia	4	0.009	0.005	0.008
PA: Pittsburgh	5	0.010	0.005	0.009
PR: San Juan	8	0.005	0.001	0.002
RI: Providence	3	0.008	0.005	0.006
SC: Columbia	8	0.011	0.005	0.009
SD: Pierre	8	0.020	0.004	0.010
SD: Rapid City	8	0.018	0.003	0.007
TN: Knoxville	4	0.013	0.008	0.010
TN: Memphis	7	0.017	0.005	0.008
TN: Nashville	5	0.013	0.005	0.007
TN: Oak Ridge/Bethel	7	0.013	0.008	0.010
TN: Oak Ridge/K25	7	0.014	0.008	0.011
TN: Oak Ridge/Melton	7	0.011	0.006	0.008
TN: Oak Ridge/Y12 E	7	0.013	0.008	0.010
TN: Oak Ridge/Y12 W	7	0.014	0.007	0.011
TX: Amarillo	4	0.019	0.008	0.012
TX: Austin	4	0.011	0.007	0.009
TX: Dallas	5	0.014	0.006	0.011
TX: El Paso	1	0.017	0.017	0.017
TX: Ft. Worth	4	0.015	0.007	0.010
TX: Houston	9	0.024	0.004	0.009
TX: Lubbock	7	0.002	0.002	0.002
TX: San Angelo	2	0.009	0.008	0.009
TX: San Antonio	6	0.015	0.004	0.008
UT: Salt Lake City	9	0.040	0.004	0.022
UT: St. George	1	0.028	0.028	0.028

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Harrisonburg	6	0.009	0.005	0.007
VA: Lynchburg	9	0.009	0.006	0.008
VA: Richmond	9	0.007	0.005	0.006
VA: Virginia Beach	6	0.008	0.004	0.006
VT: Burlington	6	0.010	0.007	0.009
WA: Olympia	7	0.016	0.001	0.007
WA: Richland	7	0.037	0.002	0.019
WA: Seattle	3	0.004	0.003	0.003
WA: Spokane	7	0.037	0.002	0.020
WI: Lacrosse	2	0.015	0.014	0.014
WI: Madison	9	0.019	0.009	0.015
WI: Shawano	9	0.015	0.005	0.009
WV: Charleston	5	0.008	0.006	0.007
WY: Casper	3	0.014	0.005	0.008

Table 3
Gross Beta in Airborne Particulates
February 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.008	0.003	0.005
AK: Fairbanks	8	0.021	0.007	0.012
AK: Juneau	5	0.014	0.003	0.005
AL: Birmingham	8	0.017	0.005	0.011
AL: Montgomery/408	7	0.010	0.004	0.006
AR: Fort Smith	3	0.012	0.003	0.009
AR: Little Rock	1	0.011	0.011	0.011
AZ: Phoenix/956	6	0.015	0.006	0.010
AZ: Tucson	8	0.020	0.005	0.011
CA: Anaheim	8	0.011	0.002	0.006
CA: Eureka	3	0.002	0.001	0.001
CA: Los Angeles	5	0.020	0.006	0.012
CA: Richmond	4	0.005	0.002	0.003
CA: Riverside	8	0.029	0.011	0.016
CA: Sacramento	8	0.012	0.002	0.006
CA: San Bernardino Cty.	8	0.023	0.009	0.017
CA: San Francisco	8	0.007	0.001	0.003
CA: San Jose	7	0.008	0.002	0.004
CO: Denver	5	0.027	0.009	0.018
CO: Grand Junction	4	0.013	0.006	0.010
CT: Hartford	8	0.013	0.003	0.009
DC: Washington	8	0.022	0.005	0.011
DE: Dover	4	0.014	0.004	0.008
FL: Jacksonville	5	0.013	0.006	0.010
FL: Orlando	3	0.008	0.003	0.005
FL: Tallahassee	4	0.007	0.004	0.005
FL: Tampa	8	0.030	0.003	0.008
GA: Atlanta	3	0.008	0.005	0.007
GA: Augusta	4	0.006	0.002	0.004
HI: Honolulu	8	0.003	0.001	0.002
IA: Des Moines	8	0.014	0.004	0.009
IA: Mason City	5	0.014	0.007	0.010
ID: Boise	4	0.011	0.002	0.005
ID: Idaho Falls	8	0.011	0.003	0.006
IL: Champaign	7	0.018	0.006	0.010
IL: Chicago	7	0.016	0.009	0.012
IN: Fort Wayne	4	0.015	0.009	0.012
IN: Indianapolis	8	0.024	0.007	0.013

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
KS: Kansas City	7	0.019	0.005	0.012
KS: Wichita	8	0.019	0.006	0.012
KY: Lexington	8	0.024	0.005	0.014
KY: Louisville	6	0.013	0.004	0.009
LA: Baton Rouge	8	0.016	0.005	0.009
LA: Shreveport	4	0.009	0.004	0.006
MA: Boston	6	0.011	0.003	0.007
MA: Worcester	6	0.014	0.005	0.010
MD: Baltimore	7	0.020	0.005	0.010
ME: Portland	7	0.008	0.003	0.005
MI: Bay City 48708	8	0.019	0.008	0.011
MI: Detroit	8	0.015	0.008	0.011
MI: Grand Rapids	4	0.014	0.010	0.012
MN: Duluth	5	0.013	0.002	0.008
MN: St. Paul	4	0.019	0.010	0.014
MO: Jefferson City	8	0.020	0.007	0.012
MO: St. Louis	4	0.014	0.006	0.010
MS: Jackson/Deq	4	0.014	0.007	0.010
MT: Billings	4	0.015	0.003	0.009
NC: Charlotte	7	0.012	0.003	0.008
NC: Greensboro	1	0.010	0.010	0.010
NC: Raleigh	1	0.003	0.003	0.003
NC: Wilmington	2	0.007	0.003	0.005
ND: Bismarck	6	0.015	0.003	0.010
NE: Kearney	3	0.011	0.003	0.007
NE: Lincoln	7	0.012	0.003	0.009
NE: Omaha	5	0.014	0.006	0.009
NH: Concord	6	0.009	0.002	0.006
NJ: Edison	6	0.014	0.005	0.009
NM: Albuquerque	2	0.018	0.012	0.015
NM: Carlsbad	7	0.024	0.005	0.012
NM: Navajo Lake St Park	4	0.011	0.007	0.009
NV: Las Vegas/913	7	0.008	0.002	0.005
NV: Reno	7	0.026	0.002	0.009
NY: Albany	3	0.011	0.010	0.010
NY: New York City	4	0.010	0.005	0.007
NY: Rochester	7	0.009	0.005	0.006
NY: Yaphank	3	0.005	0.003	0.004

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
OH: Cincinnati	8	0.016	0.005	0.010
OH: Cleveland	8	0.020	0.008	0.013
OH: Columbus	1	0.012	0.012	0.012
OH: Painesville	6	0.013	0.009	0.012
OH: Toledo	8	0.009	0.006	0.008
OK: Oklahoma City	8	0.028	0.007	0.015
OK: Tulsa	8	0.018	0.007	0.012
OR: Corvallis	8	0.011	0.001	0.003
OR: Portland	7	0.011	0.001	0.005
PA: Bloomsburg	6	0.009	0.003	0.007
PA: Philadelphia	4	0.012	0.006	0.008
PA: Pittsburgh	5	0.014	0.006	0.009
PR: San Juan	5	0.002	0.001	0.001
RI: Providence	2	0.009	0.008	0.009
SC: Columbia	5	0.010	0.000	0.006
SD: Pierre	7	0.022	0.003	0.012
SD: Rapid City	6	0.016	0.003	0.009
TN: Knoxville	4	0.019	0.007	0.012
TN: Memphis	8	0.022	0.005	0.015
TN: Nashville	4	0.013	0.009	0.011
TN: Oak Ridge/Bethel	7	0.016	0.003	0.010
TN: Oak Ridge/K25	7	0.017	0.004	0.011
TN: Oak Ridge/Melton	7	0.012	0.003	0.008
TN: Oak Ridge/Y12 E	7	0.017	0.004	0.011
TN: Oak Ridge/Y12 W	7	0.017	0.004	0.011
TX: Amarillo	6	0.021	0.008	0.012
TX: Austin	3	0.012	0.009	0.010
TX: El Paso	3	0.016	0.010	0.013
TX: Ft. Worth	3	0.013	0.009	0.011
TX: Houston	8	0.018	0.005	0.010
TX: Lubbock	7	0.009	0.001	0.003
TX: San Angelo	4	0.014	0.011	0.013
TX: San Antonio	8	0.013	0.007	0.011
UT: Salt Lake City	8	0.007	0.003	0.005
UT: St. George	4	0.021	0.011	0.014
VA: Harrisonburg	5	0.013	0.005	0.008
VA: Lynchburg	6	0.016	0.004	0.009
VA: Richmond	7	0.015	0.003	0.007

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Virginia Beach	6	0.014	0.004	0.007
VT: Burlington	7	0.012	0.006	0.009
WA: Olympia	8	0.009	0.001	0.004
WA: Richland	8	0.019	0.001	0.008
WA: Seattle	2	0.006	0.001	0.003
WA: Spokane	6	0.013	0.002	0.008
WI: Lacrosse	1	0.015	0.015	0.015
WI: Madison	8	0.021	0.008	0.016
WI: Milwaukee	3	0.014	0.014	0.014
WI: Shawano	8	0.015	0.006	0.010
WV: Charleston	3	0.016	0.008	0.013
WY: Casper	5	0.010	0.005	0.008

Table 4
Gross Beta in Airborne Particulates
March 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	5	0.009	0.003	0.005
AK: Fairbanks	8	0.014	0.006	0.008
AK: Juneau	7	0.008	0.001	0.005
AL: Birmingham	9	0.013	0.006	0.010
AL: Montgomery/408	8	0.010	0.004	0.007
AR: Fort Smith	4	0.019	0.008	0.013
AR: Little Rock	4	0.010	0.006	0.008
AZ: Phoenix/956	5	0.012	0.004	0.009
AZ: Tucson	7	0.011	0.002	0.007
CA: Anaheim	8	0.006	0.001	0.004
CA: Eureka	4	0.003	0.001	0.002
CA: Los Angeles	6	0.010	0.002	0.007
CA: Richmond	4	0.004	0.003	0.003
CA: Riverside	8	0.015	0.002	0.009
CA: Sacramento	8	0.008	0.002	0.005
CA: San Bernardino Cty.	8	0.016	0.003	0.009
CA: San Francisco	9	0.004	0.002	0.003
CA: San Jose	7	0.006	0.002	0.004
CO: Colorado Springs	2	0.011	0.006	0.008
CO: Denver	8	0.027	0.006	0.011
CO: Grand Junction	3	0.006	0.005	0.005
CT: Hartford	8	0.014	0.005	0.009
DC: Washington	7	0.013	0.005	0.009
DE: Dover	4	0.009	0.005	0.006
FL: Jacksonville	6	0.011	0.004	0.008
FL: Orlando	8	0.010	0.002	0.006
FL: Tallahassee	3	0.008	0.003	0.005
FL: Tampa	8	0.010	0.002	0.007
GA: Atlanta	4	0.009	0.005	0.008
GA: Augusta	2	0.006	0.003	0.004
HI: Honolulu	9	0.006	0.002	0.003
IA: Des Moines	9	0.012	0.005	0.009
IA: Mason City	4	0.016	0.007	0.011
ID: Boise	6	0.004	0.001	0.003
ID: Idaho Falls	7	0.013	0.004	0.007
IL: Aurora	1	0.005	0.005	0.005
IL: Champaign	9	0.013	0.006	0.009
IL: Chicago	8	0.011	0.007	0.009

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IN: Fort Wayne	5	0.017	0.008	0.012
IN: Indianapolis	7	0.018	0.008	0.012
KS: Kansas City	7	0.016	0.006	0.011
KS: Wichita	7	0.021	0.006	0.012
KY: Lexington	8	0.016	0.009	0.012
KY: Louisville	4	0.011	0.006	0.007
LA: Baton Rouge	7	0.009	0.006	0.007
LA: Shreveport	2	0.008	0.003	0.006
MA: Boston	9	0.012	0.004	0.007
MA: Worcester	4	0.012	0.009	0.010
MD: Baltimore	6	0.016	0.008	0.011
ME: Portland	6	0.014	0.006	0.008
MI: Bay City 48708	8	0.016	0.006	0.011
MI: Detroit	7	0.016	0.009	0.013
MI: Grand Rapids	4	0.015	0.008	0.012
MN: Duluth	8	0.011	0.007	0.009
MN: St. Paul	4	0.018	0.013	0.015
MO: Jefferson City	8	0.019	0.007	0.012
MO: St. Louis	5	0.014	0.007	0.010
MS: Jackson/Deq	5	0.011	0.007	0.009
MT: Billings	4	0.015	0.005	0.010
NC: Greensboro	2	0.010	0.007	0.008
NC: Raleigh	4	0.008	0.003	0.005
NC: Wilmington	4	0.009	0.003	0.006
ND: Bismarck	6	0.014	0.007	0.009
NE: Kearney	8	0.015	0.005	0.009
NE: Lincoln	7	0.011	0.005	0.009
NE: Omaha	4	0.014	0.006	0.010
NH: Concord	7	0.013	0.004	0.007
NJ: Edison	5	0.012	0.005	0.008
NM: Albuquerque	2	0.009	0.007	0.008
NM: Carlsbad	3	0.012	0.009	0.010
NM: Navajo Lake St Park	4	0.011	0.006	0.008
NV: Las Vegas/913	8	0.008	0.002	0.004
NV: Reno	8	0.015	0.002	0.007
NY: Lockport	7	0.015	0.008	0.011
NY: New York City	4	0.011	0.005	0.008
NY: Rochester	5	0.013	0.008	0.009

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Syracuse	1	0.008	0.008	0.008
NY: Yaphank	1	0.006	0.006	0.006
OH: Cincinnati	7	0.015	0.007	0.010
OH: Cleveland	9	0.016	0.006	0.012
OH: Painesville	1	0.013	0.013	0.013
OH: Toledo	9	0.010	0.004	0.008
OK: Oklahoma City	8	0.026	0.007	0.014
OK: Tulsa	9	0.020	0.006	0.012
OR: Corvallis	7	0.006	0.001	0.003
OR: Portland	8	0.008	0.001	0.003
PA: Bloomsburg	9	0.011	0.002	0.005
PA: Philadelphia	4	0.014	0.007	0.009
PA: Pittsburgh	5	0.012	0.007	0.009
PR: San Juan	9	0.007	0.001	0.003
RI: Providence	1	0.009	0.009	0.009
SC: Columbia	6	0.016	0.004	0.010
SD: Pierre	9	0.019	0.005	0.012
SD: Rapid City	7	0.014	0.005	0.010
TN: Knoxville	4	0.012	0.007	0.010
TN: Memphis	4	0.018	0.011	0.014
TN: Nashville	9	0.011	0.006	0.008
TN: Oak Ridge/Bethel	9	0.013	0.006	0.009
TN: Oak Ridge/K25	9	0.036	0.007	0.013
TN: Oak Ridge/Melton	9	0.011	0.004	0.008
TN: Oak Ridge/Y12 E	9	0.016	0.006	0.011
TN: Oak Ridge/Y12 W	9	0.015	0.006	0.010
TX: Amarillo	3	0.019	0.010	0.013
TX: Austin	4	0.010	0.008	0.009
TX: Ft. Worth	2	0.009	0.006	0.007
TX: Houston	8	0.012	0.007	0.009
TX: Lubbock	6	0.003	0.001	0.002
TX: San Angelo	2	0.018	0.017	0.017
TX: San Antonio	8	0.021	0.006	0.011
UT: Salt Lake City	9	0.007	0.002	0.004
UT: St. George	3	0.009	0.005	0.007
VA: Harrisonburg	9	0.017	0.007	0.009
VA: Lynchburg	8	0.013	0.006	0.008
VA: Richmond	7	0.015	0.007	0.009

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

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
VA: Virginia Beach	8	0.013	0.005	0.007
VT: Burlington	7	0.014	0.007	0.010
WA: Olympia	9	0.006	0.001	0.002
WA: Richland	9	0.017	0.001	0.004
WA: Spokane	7	0.022	0.001	0.006
WI: Lacrosse	4	0.013	0.007	0.009
WI: Madison	8	0.016	0.009	0.013
WI: Milwaukee	3	0.014	0.009	0.012
WI: Shawano	9	0.013	0.007	0.010
WV: Charleston	5	0.015	0.006	0.011
WY: Casper	3	0.010	0.005	0.008

Table 5
Specific Gamma in Precipitation
January 2014

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408	Be-7	13	13
AR: Little Rock	Be-7	50	20
CT: Hartford	Be-7	67	22
FL: Jacksonville	Be-7	35	20
HI: Honolulu	Ra-228	3.0	2.9
ID: Idaho Falls		ND	
KS: Kansas City	Be-7	16	15
MA: Boston	Be-7	46	22
MN: St. Paul		ND	
NC: Charlotte	Be-7	38	18
NC: Wilmington	Be-7	17.4	9.7
NH: Concord		ND	
NY: Albany	Be-7	19	18
PA: Harrisburg	Be-7	35	16
TN: Nashville	Be-7	43	20
TN: Oak Ridge/K25	Be-7	64	23
TN: Oak Ridge/Melton	Be-7	65	21
TN: Oak Ridge/Y12 E	Be-7	37	20
UT: Salt Lake City	Be-7	46	25
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 6
Specific Gamma in Precipitation
February 2014

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408		ND	
CA: Richmond	Be-7	20	15
CT: Hartford	Be-7	52	14
FL: Jacksonville	Be-7	52	18
GA: Atlanta	Be-7	20	10
HI: Honolulu	Be-7	38	14
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	59	17
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NY: Albany	Be-7	12.4	9.9
OH: Painesville	Be-7	29	16
	Ra-228	3.8	3.5
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Nashville	Be-7	32	15
TN: Oak Ridge/K25	Be-7	46	19
TN: Oak Ridge/Melton	Be-7	42	18
TN: Oak Ridge/Y12 E	Be-7	51	19
UT: Salt Lake City	Ra-228	4.0	3.8
VA: Lynchburg		ND	
WA: Olympia	Be-7	29	16

Table 7
Specific Gamma in Precipitation
March 2014

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	35	13
AR: Little Rock	Be-7	45	20
AZ: Phoenix		ND	
CA: Richmond	Be-7	48	18
CT: Hartford	Be-7	42	16
FL: Jacksonville	Be-7	39	16
GA: Atlanta	Be-7	35	15
HI: Honolulu		ND	
ID: Idaho Falls	Be-7	13.0	9.7
KS: Kansas City		ND	
MA: Boston	Be-7	63	22
MN: St. Paul		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NH: Concord		ND	
OR: Portland	Be-7	19	16
PA: Harrisburg		ND	
TN: Nashville	Be-7	28.0	9.4
TN: Oak Ridge/K25	Be-7	55	17
TN: Oak Ridge/Melton	Be-7	52	12
TN: Oak Ridge/Y12 E	Be-7	45	18
TX: Austin	Be-7	20	16
UT: Salt Lake City	Be-7	23.1	9.9
VA: Lynchburg		ND	
WA: Olympia	Be-7	40	18

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
January–March 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	01/15/14	-26 78
AL: Dothan	01/02/14	-14 85
AL: Montgomery	02/19/14	-43 86
AL: Muscle Shoals	01/09/14	18 88
AL: Scottsboro	01/08/14	20 88
AR: Little Rock	01/08/14	0 88
CA: Richmond	02/20/14	-30 86
CO: Denver	01/21/14	30 82
CT: Hartford	01/15/14	7 81
DE: Dover	01/09/14	-67 83
FL: Tampa	01/30/14	259 99
GA: Baxley	03/04/14	-14 87
GA: Savannah	03/05/14	4 89
HI: Honolulu	02/18/14	-10 87
IA: Cedar Rapids	01/17/14	24 88
ID: Boise	01/09/14	-61 77
ID: Idaho Falls	01/21/14	-33 78
IL: Chicago	03/03/14	22 90
KS: Topeka	02/07/14	22 89
LA: New Orleans	01/10/14	-32 86
MD: Baltimore	01/06/14	-64 85
MD: Conowingo	01/10/14	-14 87
MI: Detroit	01/09/14	70 90
MN: St. Paul	01/08/14	22 88
MN: Welch	01/08/14	-32 85
MO: Jefferson City	01/21/14	-26 79
MS: Jackson	01/29/14	40 90
MS: Port Gibson	01/29/14	4 87
MT: Helena	01/24/14	33 82
ND: Bismarck	02/06/14	8 88
NE: Lincoln	01/07/14	-32 85
NH: Concord	03/06/14	76 83
NJ: Trenton	01/21/14	39 83
NJ: Waretown	01/21/14	-30 79
NY: Albany	03/28/14	32 81
NY: New York City	03/31/14	9 78
NY: Niagara Falls	01/14/14	66 83
NY: Syracuse	02/04/14	59 90
OH: Cincinnati	01/27/14	58 84
OH: Columbus	01/28/14	6 82

Table 8 (continued)
Tritium in Drinking Water
January–March 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
OH: E. Liverpool	02/26/14	-38 87
OH: Painesville	01/23/14	84 85
OH: Toledo	01/10/14	24 87
OK: Oklahoma City	02/19/14	-69 84
OR: Portland	03/17/14	28 79
PA: Columbia	01/08/14	-9 81
PA: Harrisburg	01/02/14	-32 86
PA: Pittsburgh	02/25/14	34 89
SC: Barnwell	02/04/14	113 93
SC: Columbia	03/24/14	33 79
SC: Jenkinsville	01/16/14	-39 84
SC: Seneca	03/21/14	33 80
TN: Chattanooga	01/17/14	-8 81
TN: Knoxville	01/08/14	-38 85
TN: Oak Ridge/#360	01/14/14	9 81
TN: Oak Ridge/#371	01/14/14	-22 80
TN: Oak Ridge/#4442	01/14/14	-35 78
TN: Oak Ridge/#768	01/14/14	52 83
TN: Oak Ridge/#772	01/14/14	34 79
TX: Austin	01/14/14	35 88
VA: Ashland	02/20/14	2320 190
VA: Lynchburg	02/27/14	8 88
WA: Richland	02/12/14	-4 88
WI: Madison	01/27/14	48 90

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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
January–March 2014

Location	Date Collected	K		¹³⁷ Cs	¹⁴⁰ Ba	¹³¹ I
		g/L	± 2u	pCi/L ± 2u	pCi/L ± 2u	pCi/L ± 2u
AR: Little Rock	02/18/14	1.60	0.19	ND	ND	ND
AZ: Phoenix	02/13/14	1.68	0.20	ND	ND	ND
CA: Los Angeles	03/25/14	1.58	0.18	ND	ND	ND
CA: Oakland	01/09/14	1.68	0.20	ND	ND	ND
CT: Hartford	03/06/14	1.65	0.19	ND	ND	ND
FL: Plant City	01/14/14	1.66	0.19	ND	ND	ND
HI: Hilo	01/13/14	1.64	0.20	ND	ND	ND
IA: Des Moines	03/10/14	1.71	0.20	ND	ND	ND
KS: Wichita	02/28/14	1.50	0.19	ND	ND	ND
KY: Louisville	01/13/14	1.74	0.20	ND	ND	ND
MA: Boston	03/13/14	1.78	0.21	ND	ND	ND
MD: Baltimore	01/14/14	1.64	0.19	ND	ND	ND
MO: Jefferson City	01/08/14	1.59	0.19	ND	ND	ND
NJ: Trenton	01/09/14	1.60	0.18	ND	ND	ND
NM: Albuquerque	03/04/14	1.57	0.18	ND	ND	ND
NV: Las Vegas	02/03/14	1.65	0.20	ND	ND	ND
NV: Reno	03/26/14	1.74	0.20	ND	ND	ND
NY: Buffalo	02/24/14	1.65	0.19	ND	ND	ND
NY: Syracuse	01/06/14	1.73	0.20	ND	ND	ND
OH: Cincinnati	02/10/14	1.70	0.19	ND	ND	ND
OH: Cleveland	03/03/14	1.65	0.20	ND	ND	ND
OR: Portland	01/13/14	1.64	0.20	ND	ND	ND
PA: Pittsburgh	02/10/14	1.72	0.20	ND	ND	ND
TN: Knoxville	02/11/14	1.61	0.18	ND	ND	ND
TN: Memphis	01/22/14	1.57	0.19	ND	ND	ND
TX: Dallas	01/13/14	1.60	0.20	ND	ND	ND
TX: San Antonio	01/07/14	1.55	0.18	ND	ND	NR
VT: Montpelier	02/04/14	1.70	0.21	ND	ND	ND
WA: Spokane	02/11/14	1.69	0.19	ND	ND	ND
WA: Tacoma	03/30/14	1.63	0.19	ND	ND	ND
WV: Charleston	01/08/14	1.69	0.20	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:

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

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