

ENVIRONMENTAL

RADIATION

DATA

REPORT 154

April–June 2013

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	0.0015
	Water	pCi/L	2
	Precipitation	pCi/L	2
Tritium	Water	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
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 120,000 m³. Measurement by alpha spectrometry includes combined activities of ²³⁹Pu and ²⁴⁰Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDC for air is based on an assumed total sample volume of 120,000 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 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	6	0.009	0.004	0.006
AK: Fairbanks	9	0.015	0.005	0.010
AK: Juneau	3	0.003	0.002	0.003
AL: Birmingham	9	0.011	0.006	0.007
AL: Montgomery/408	6	0.007	0.004	0.006
AR: Fort Smith	4	0.010	0.008	0.009
AR: Little Rock	8	0.010	0.006	0.008
AZ: Phoenix/956	7	0.011	0.006	0.008
AZ: Tucson	7	0.014	0.009	0.011
CA: Anaheim	9	0.011	0.003	0.005
CA: Bakersfield	6	0.010	0.004	0.006
CA: Eureka	1	0.001	0.001	0.001
CA: Fresno	4	0.011	0.004	0.007
CA: Richmond	4	0.005	0.002	0.003
CA: Riverside	9	0.017	0.005	0.009
CA: Sacramento	6	0.004	0.002	0.003
CA: San Bernardino Cty.	9	0.016	0.005	0.009
CA: San Diego	5	0.009	0.004	0.006
CA: San Francisco	7	0.005	0.001	0.003
CA: San Jose	9	0.010	0.002	0.005
CO: Colorado Springs	4	0.019	0.007	0.012
CO: Denver	7	0.016	0.004	0.009
CO: Grand Junction	4	0.016	0.006	0.012
CT: Hartford	9	0.008	0.003	0.006
DC: Washington	9	0.010	0.006	0.008
DE: Dover	5	0.008	0.004	0.005
FL: Jacksonville	8	0.008	0.004	0.005
FL: Miami	3	0.006	0.002	0.004
FL: Orlando	3	0.008	0.004	0.006
FL: Tallahassee	2	0.008	0.005	0.007
FL: Tampa	7	0.012	0.005	0.006
GA: Atlanta	4	0.009	0.006	0.007
GA: Augusta	7	0.010	0.006	0.009
HI: Hilo	4	0.006	0.001	0.004
HI: Honolulu	8	0.005	0.002	0.004
IA: Des Moines	9	0.018	0.004	0.011
IA: Mason City	4	0.013	0.003	0.008
ID: Boise	6	0.011	0.004	0.007

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
ID: Idaho Falls	8	0.013	0.006	0.009
IL: Aurora	9	0.019	0.004	0.010
IL: Champaign	8	0.009	0.004	0.007
IL: Chicago	5	0.013	0.006	0.009
IN: Fort Wayne	4	0.014	0.006	0.009
IN: Indianapolis	8	0.013	0.007	0.009
KS: Kansas City	8	0.016	0.005	0.011
KS: Topeka	2	0.013	0.012	0.012
KS: Wichita	9	0.014	0.006	0.009
KY: Lexington	7	0.017	0.007	0.010
KY: Louisville	7	0.014	0.006	0.009
LA: Baton Rouge	9	0.011	0.005	0.007
LA: Shreveport	9	0.007	0.004	0.006
MA: Boston	9	0.009	0.002	0.005
MA: Worcester	9	0.012	0.004	0.008
MD: Baltimore	8	0.012	0.007	0.009
ME: Portland	9	0.016	0.005	0.010
MI: Bay City 48708	6	0.009	0.005	0.008
MI: Detroit	8	0.010	0.004	0.007
MI: Grand Rapids	4	0.008	0.004	0.006
MN: Duluth	4	0.010	0.004	0.007
MN: St. Paul	5	0.009	0.004	0.007
MO: Jefferson City	9	0.012	0.006	0.008
MO: Springfield	8	0.011	0.007	0.010
MO: St. Louis	2	0.009	0.007	0.008
MT: Billings	4	0.009	0.005	0.007
NC: Charlotte	9	0.009	0.006	0.007
NC: Wilmington	3	0.006	0.005	0.006
ND: Bismarck	5	0.013	0.006	0.010
NE: Lincoln	8	0.011	0.003	0.008
NE: Omaha	5	0.012	0.006	0.009
NJ: Edison	6	0.006	0.004	0.005
NM: Carlsbad	8	0.013	0.010	0.011
NM: Navajo Lake St Park	4	0.012	0.008	0.011
NV: Las Vegas/913	8	0.011	0.005	0.008
NV: Reno	9	0.014	0.004	0.008
NY: Albany	7	0.013	0.003	0.007
NY: Lockport	9	0.010	0.003	0.006

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: New York City	4	0.007	0.004	0.005
NY: Rochester	8	0.008	0.003	0.006
NY: Syracuse	3	0.009	0.004	0.007
NY: Yaphank	7	0.006	0.003	0.005
OH: Cincinnati	7	0.014	0.006	0.009
OH: Cleveland	8	0.012	0.005	0.008
OH: Painesville	7	0.010	0.006	0.009
OH: Toledo	9	0.009	0.004	0.006
OK: Oklahoma City	8	0.011	0.008	0.010
OK: Tulsa	9	0.012	0.007	0.009
OR: Corvallis	9	0.006	0.002	0.003
OR: Portland	9	0.005	0.002	0.003
PA: Bloomsburg	8	0.009	0.005	0.006
PA: Philadelphia	4	0.009	0.005	0.008
PA: Pittsburgh	5	0.011	0.005	0.008
PR: San Juan	9	0.004	0.002	0.003
RI: Providence	4	0.005	0.003	0.005
SC: Barnwell	2	0.013	0.010	0.011
SC: Columbia	7	0.012	0.007	0.009
SD: Pierre	7	0.018	0.007	0.012
SD: Rapid City	7	0.012	0.005	0.009
TN: Knoxville	7	0.011	0.009	0.011
TN: Memphis	6	0.009	0.006	0.007
TN: Nashville	4	0.009	0.006	0.007
TN: Oak Ridge/Bethel	9	0.010	0.006	0.009
TN: Oak Ridge/K25	9	0.012	0.008	0.010
TN: Oak Ridge/Melton	9	0.011	0.008	0.009
TN: Oak Ridge/Y12 E	8	0.011	0.007	0.009
TN: Oak Ridge/Y12 W	8	0.013	0.008	0.009
TX: Austin	5	0.013	0.005	0.009
TX: Dallas	8	0.013	0.007	0.010
TX: El Paso	4	0.020	0.012	0.016
TX: Ft. Worth	3	0.013	0.008	0.010
TX: Harlingen	2	0.018	0.009	0.014
TX: Houston	9	0.011	0.005	0.008
TX: Lubbock	8	0.002	0.001	0.002
TX: San Angelo	4	0.011	0.010	0.010
TX: San Antonio	9	0.013	0.003	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
April 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
UT: Salt Lake City	9	0.011	0.004	0.008
UT: St. George	3	0.013	0.010	0.012
VA: Harrisonburg	3	0.012	0.008	0.010
VA: Lynchburg	9	0.012	0.006	0.009
VA: Richmond	5	0.009	0.006	0.007
VA: Virginia Beach	8	0.007	0.004	0.006
VT: Burlington	7	0.009	0.004	0.007
WA: Olympia	9	0.004	0.001	0.003
WA: Richland	2	0.006	0.006	0.006
WA: Seattle	3	0.002	0.001	0.002
WA: Spokane	8	0.006	0.001	0.004
WI: Madison	6	0.012	0.002	0.007
WI: Milwaukee	7	0.007	0.002	0.004
WI: Shawano	9	0.014	0.003	0.008
WV: Charleston	6	0.012	0.006	0.009

Table 3
Gross Beta in Airborne Particulates
May 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	6	0.007	0.002	0.003
AK: Fairbanks	9	0.008	0.003	0.005
AK: Juneau	6	0.004	0.001	0.002
AL: Birmingham	9	0.015	0.004	0.009
AL: Montgomery/408	8	0.013	0.004	0.008
AR: Little Rock	2	0.004	0.003	0.004
AZ: Phoenix/956	9	0.016	0.007	0.011
AZ: Tucson	9	0.017	0.007	0.011
AZ: Yuma	1	0.009	0.009	0.009
CA: Anaheim	9	0.009	0.003	0.006
CA: Bakersfield	4	0.007	0.004	0.005
CA: Eureka	4	0.004	0.002	0.003
CA: Fresno	5	0.012	0.004	0.008
CA: Richmond	5	0.009	0.003	0.006
CA: Riverside	8	0.015	0.006	0.010
CA: Sacramento	3	0.008	0.006	0.007
CA: San Bernardino Cty.	7	0.014	0.006	0.009
CA: San Diego	4	0.010	0.004	0.007
CA: San Francisco	8	0.005	0.001	0.003
CA: San Jose	9	0.010	0.002	0.005
CO: Colorado Springs	3	0.012	0.008	0.010
CO: Denver	6	0.016	0.005	0.011
CO: Grand Junction	2	0.011	0.010	0.010
CT: Hartford	9	0.008	0.002	0.006
DC: Washington	9	0.012	0.004	0.008
DE: Dover	5	0.008	0.004	0.006
FL: Jacksonville	9	0.007	0.003	0.005
FL: Miami	3	0.008	0.003	0.005
FL: Orlando	7	0.009	0.003	0.005
FL: Tallahassee	4	0.008	0.004	0.006
FL: Tampa	2	0.010	0.006	0.008
GA: Atlanta	4	0.011	0.005	0.007
GA: Augusta	7	0.012	0.004	0.008
HI: Honolulu	9	0.006	0.001	0.004
IA: Des Moines	8	0.010	0.005	0.008
IA: Mason City	6	0.008	0.004	0.006
ID: Boise	3	0.014	0.005	0.008
ID: Idaho Falls	7	0.014	0.004	0.010

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2013

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

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: Lockport	8	0.006	0.004	0.005
NY: New York City	4	0.006	0.004	0.005
NY: Rochester	9	0.007	0.004	0.005
NY: Syracuse	4	0.008	0.004	0.006
NY: Yaphank	8	0.008	0.002	0.005
OH: Cincinnati	10	0.028	0.004	0.009
OH: Cleveland	9	0.009	0.004	0.006
OH: Painesville	8	0.011	0.004	0.007
OH: Toledo	9	0.010	0.005	0.007
OK: Oklahoma City	9	0.015	0.006	0.010
OK: Tulsa	9	0.010	0.004	0.007
OR: Corvallis	9	0.009	0.001	0.003
OR: Portland	9	0.006	0.001	0.003
PA: Bloomsburg	9	0.008	0.003	0.005
PA: Philadelphia	5	0.010	0.005	0.008
PA: Pittsburgh	5	0.009	0.005	0.007
PR: San Juan	8	0.006	0.002	0.003
RI: Providence	4	0.004	0.004	0.004
SC: Columbia	4	0.008	0.005	0.006
SD: Pierre	2	0.007	0.006	0.007
SD: Rapid City	6	0.013	0.005	0.008
TN: Knoxville	5	0.015	0.005	0.010
TN: Memphis	6	0.012	0.003	0.007
TN: Nashville	8	0.010	0.003	0.006
TN: Oak Ridge/Bethel	8	0.012	0.004	0.008
TN: Oak Ridge/K25	8	0.012	0.004	0.008
TN: Oak Ridge/Melton	8	0.012	0.003	0.008
TN: Oak Ridge/Y12 E	8	0.012	0.003	0.008
TN: Oak Ridge/Y12 W	8	0.012	0.003	0.008
TX: Austin	3	0.014	0.008	0.011
TX: Dallas	4	0.010	0.005	0.009
TX: El Paso	4	0.018	0.014	0.016
TX: Ft. Worth	4	0.011	0.006	0.008
TX: Harlingen	4	0.015	0.007	0.010
TX: Houston	9	0.012	0.006	0.008
TX: Lubbock	6	0.003	0.001	0.002
TX: San Angelo	4	0.012	0.005	0.008
TX: San Antonio	7	0.012	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
May 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
UT: Salt Lake City	8	0.012	0.004	0.008
UT: St. George	2	0.010	0.008	0.009
VA: Harrisonburg	4	0.012	0.009	0.011
VA: Lynchburg	9	0.012	0.005	0.008
VA: Richmond	7	0.008	0.004	0.006
VA: Virginia Beach	9	0.007	0.003	0.005
VT: Burlington	9	0.013	0.004	0.007
WA: Olympia	7	0.007	0.001	0.004
WA: Richland	6	0.009	0.002	0.005
WA: Seattle	5	0.005	0.002	0.003
WA: Spokane	4	0.014	0.003	0.007
WI: Madison	7	0.009	0.006	0.007
WI: Milwaukee	4	0.006	0.003	0.004
WI: Shawano	9	0.010	0.004	0.006
WV: Charleston	6	0.012	0.004	0.008

Table 4
Gross Beta in Airborne Particulates
June 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	7	0.004	0.000	0.003
AK: Fairbanks	8	0.006	0.002	0.004
AK: Juneau	5	0.003	0.000	0.002
AL: Birmingham	7	0.012	0.005	0.009
AL: Montgomery/408	8	0.010	0.004	0.007
AR: Little Rock	4	0.013	0.009	0.011
AZ: Phoenix/956	8	0.014	0.008	0.010
AZ: Tucson	7	0.014	0.006	0.010
CA: Anaheim	7	0.006	0.003	0.005
CA: Bakersfield	5	0.008	0.004	0.006
CA: Eureka	4	0.001	0.001	0.001
CA: Fresno	4	0.008	0.003	0.005
CA: Richmond	4	0.003	0.002	0.002
CA: Riverside	8	0.011	0.004	0.009
CA: Sacramento	4	0.005	0.001	0.003
CA: San Bernardino Cty.	8	0.011	0.007	0.009
CA: San Diego	4	0.007	0.003	0.005
CA: San Francisco	7	0.002	0.000	0.001
CA: San Jose	8	0.005	0.001	0.003
CO: Colorado Springs	2	0.010	0.010	0.010
CO: Denver	6	0.014	0.008	0.012
CO: Grand Junction	3	0.014	0.011	0.012
CT: Hartford	8	0.011	0.002	0.006
DC: Washington	8	0.008	0.005	0.007
DE: Dover	3	0.007	0.004	0.006
FL: Jacksonville	7	0.007	0.003	0.004
FL: Miami	3	0.006	0.003	0.005
FL: Orlando	8	0.007	0.003	0.005
FL: Tallahassee	1	0.007	0.007	0.007
FL: Tampa	8	0.018	0.003	0.007
GA: Atlanta	3	0.009	0.005	0.007
GA: Augusta	4	0.011	0.006	0.008
HI: Honolulu	8	0.004	0.002	0.003
IA: Des Moines	6	0.008	0.004	0.006
IA: Mason City	5	0.006	0.004	0.005
ID: Boise	2	0.005	0.004	0.005
ID: Idaho Falls	8	0.012	0.004	0.007
IL: Aurora	8	0.009	0.004	0.007

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IL: Champaign	7	0.008	0.002	0.005
IL: Chicago	7	0.011	0.004	0.007
IN: Fort Wayne	4	0.012	0.008	0.011
IN: Indianapolis	8	0.013	0.004	0.008
KS: Kansas City	6	0.018	0.007	0.011
KS: Wichita	8	0.018	0.005	0.009
KY: Lexington	2	0.010	0.009	0.009
KY: Louisville	5	0.009	0.006	0.008
LA: Baton Rouge	7	0.011	0.003	0.007
LA: Shreveport	7	0.012	0.003	0.006
MA: Boston	8	0.010	0.001	0.005
MA: Worcester	8	0.012	0.002	0.007
MD: Baltimore	6	0.008	0.005	0.007
ME: Portland	7	0.015	0.004	0.010
MI: Bay City 48708	7	0.008	0.003	0.005
MI: Detroit	7	0.008	0.003	0.006
MI: Grand Rapids	4	0.008	0.006	0.007
MN: Duluth	6	0.006	0.003	0.004
MN: St. Paul	2	0.004	0.003	0.004
MO: Jefferson City	8	0.014	0.004	0.008
MO: Springfield	8	0.018	0.006	0.010
MO: St. Louis	2	0.012	0.005	0.008
MS: Jackson/Deq	5	0.012	0.004	0.007
MT: Billings	3	0.006	0.003	0.005
NC: Charlotte	7	0.008	0.005	0.006
NC: Greensboro	1	0.019	0.019	0.019
NC: Wilmington	4	0.006	0.004	0.005
ND: Bismarck	7	0.010	0.005	0.007
NE: Lincoln	8	0.013	0.002	0.007
NE: Omaha	4	0.010	0.005	0.007
NH: Concord	7	0.016	0.005	0.010
NJ: Edison	7	0.006	0.002	0.004
NM: Carlsbad	6	0.011	0.007	0.009
NM: Navajo Lake St Park	4	0.012	0.007	0.009
NV: Las Vegas/913	8	0.009	0.004	0.006
NV: Reno	8	0.011	0.006	0.008
NY: Albany	7	0.011	0.003	0.008
NY: Lockport	7	0.010	0.002	0.006

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NY: New York City	4	0.007	0.003	0.005
NY: Rochester	6	0.010	0.003	0.005
NY: Syracuse	3	0.010	0.005	0.007
NY: Yaphank	5	0.005	0.003	0.004
OH: Cincinnati	8	0.012	0.006	0.009
OH: Cleveland	5	0.008	0.004	0.005
OH: Painesville	5	0.010	0.005	0.008
OH: Toledo	8	0.008	0.004	0.006
OK: Oklahoma City	7	0.017	0.006	0.010
OK: Tulsa	8	0.020	0.004	0.010
OR: Corvallis	8	0.003	0.001	0.002
OR: Portland	8	0.002	0.001	0.002
PA: Bloomsburg	4	0.006	0.003	0.004
PA: Philadelphia	4	0.010	0.004	0.007
PA: Pittsburgh	4	0.010	0.007	0.008
PR: San Juan	8	0.011	0.003	0.006
RI: Providence	4	0.006	0.001	0.004
SC: Columbia	4	0.009	0.006	0.008
SD: Pierre	6	0.010	0.007	0.008
SD: Rapid City	6	0.012	0.004	0.008
TN: Knoxville	5	0.014	0.009	0.011
TN: Memphis	7	0.014	0.004	0.009
TN: Nashville	8	0.010	0.005	0.008
TN: Oak Ridge/Bethel	8	0.098	0.006	0.020
TN: Oak Ridge/K25	8	0.012	0.007	0.009
TN: Oak Ridge/Melton	8	0.011	0.006	0.008
TN: Oak Ridge/Y12 E	8	0.012	0.006	0.008
TN: Oak Ridge/Y12 W	8	0.012	0.006	0.008
TX: Amarillo	5	0.012	0.010	0.011
TX: Austin	4	0.014	0.005	0.008
TX: Dallas	1	0.007	0.007	0.007
TX: El Paso	3	0.016	0.016	0.016
TX: Ft. Worth	4	0.010	0.005	0.007
TX: Harlingen	5	0.013	0.003	0.008
TX: Houston	8	0.017	0.003	0.009
TX: Lubbock	7	0.004	0.001	0.002
TX: San Angelo	3	0.012	0.006	0.008
TX: San Antonio	8	0.016	0.005	0.010

Table 4 (continued)
Gross Beta in Airborne Particulates
June 2013

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
UT: Salt Lake City	8	0.011	0.004	0.007
UT: St. George	4	0.007	0.006	0.007
VA: Harrisonburg	7	0.011	0.007	0.008
VA: Lynchburg	8	0.010	0.007	0.008
VA: Richmond	5	0.009	0.005	0.007
VA: Virginia Beach	8	0.006	0.003	0.005
VT: Burlington	7	0.008	0.003	0.006
WA: Olympia	7	0.002	0.001	0.001
WA: Richland	8	0.004	0.001	0.003
WA: Seattle	4	0.002	0.001	0.001
WA: Spokane	6	0.007	0.003	0.004
WI: Madison	5	0.011	0.006	0.008
WI: Milwaukee	6	0.006	0.003	0.005
WI: Shawano	8	0.008	0.004	0.006
WV: Charleston	5	0.012	0.008	0.010

Table 5
Specific Gamma in Precipitation
April 2013

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	26.1	9.8
AR: Little Rock	Be-7	21	14
CA: Richmond		ND	
CO: Denver	Be-7	46	16
CT: Hartford	Be-7	41	17
FL: Jacksonville	Be-7	40	16
GA: Atlanta	Be-7	46	16
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	108	21
MI: Lansing	Be-7	17	13
MN: St. Paul	Be-7	16	13
MN: Welch/510	Be-7	14	13
NC: Charlotte	Be-7	30	16
NC: Wilmington	Be-7	31	14
NH: Concord	Be-7	19	13
NY: Albany	Be-7	18	12
NY: Yaphank	Be-7	22	13
OH: Painesville	Be-7	40	15
OR: Portland	Be-7	17	15
PA: Harrisburg	Be-7	16	12
TN: Knoxville		ND	
TN: Nashville	Be-7	23	12
TN: Oak Ridge/K25	Be-7	30	12
TN: Oak Ridge/Melton	Be-7	39	11
TN: Oak Ridge/Y12 E	Be-7	22	14
TX: Austin		ND	
UT: Salt Lake City	Be-7	13	13
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 6
Specific Gamma in Precipitation
May 2013

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408		ND	
AR: Little Rock	Be-7	21	15
CA: Richmond		ND	
CO: Denver	Be-7	42	17
CT: Hartford	Be-7	21	17
FL: Jacksonville	Be-7	20	18
GA: Atlanta	Be-7	24	17
HI: Honolulu	Be-7	86	24
ID: Idaho Falls		ND	
KS: Kansas City	Be-7	23	14
MA: Boston	Be-7	58	20
MI: Lansing	Be-7	25	19
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte	Be-7	27	12
NC: Wilmington	Be-7	15	11
NH: Concord		ND	
NY: Albany		ND	
NY: Yaphank		ND	
OH: Painesville	Be-7	21	18
OR: Portland	Be-7	12	11
PA: Harrisburg		ND	
TN: Knoxville	Ra-228	3.4	3.0
TN: Nashville		ND	
TN: Oak Ridge/K25	Be-7	94	26
TN: Oak Ridge/Melton	Be-7	105	26
TN: Oak Ridge/Y12 E	Be-7	79	25
TX: Austin		ND	
UT: Salt Lake City	Be-7	19	18
VA: Lynchburg		ND	
WA: Olympia	Be-7	23	18

Table 7
Specific Gamma in Precipitation
June 2013

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	21	11
AR: Little Rock	Be-7	25	15
CO: Denver	Be-7	55	29
CT: Hartford	Be-7	40	16
FL: Jacksonville	Be-7	45	19
GA: Atlanta	Be-7	63	16
ID: Idaho Falls	Ra-228	13	11
KS: Kansas City		ND	
MA: Boston	Be-7	104	21
MI: Lansing	Be-7	28	15
MN: St. Paul		ND	
MN: Welch/510	Be-7	19	10
NC: Charlotte	Be-7	17	14
NC: Wilmington		ND	
NY: Albany	Be-7	32	17
NY: Yaphank	Be-7	9.7	9.4
OH: Painesville	Be-7	33	15
OR: Portland		ND	
PA: Harrisburg	Be-7	36	16
TN: Knoxville		ND	
TN: Nashville	Be-7	19.2	9.2
TN: Oak Ridge/K25	Be-7	36	16
TN: Oak Ridge/Melton	Be-7	26.4	9.1
TN: Oak Ridge/Y12 E	Be-7	39	19
VA: Lynchburg	Be-7	17	14
	K-40	14	12
WA: Olympia	Be-7	45	17

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 volume of air represented by the annual composite typically ranges from 120,000 to 500,000 cubic meters.

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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 2013

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	05/31/13	36 80
AL: Dothan	04/04/13	-23 84
AL: Montgomery	04/18/13	0 76
AL: Muscle Shoals	04/04/13	-21 85
AL: Scottsboro	04/03/13	-31 85
AR: Little Rock	04/15/13	48 78
CA: Richmond	06/25/13	-9 78
CO: Denver	04/19/13	53 78
CT: Hartford	04/10/13	-31 85
DE: Dover	04/22/13	25 79
FL: Tampa	04/09/13	18 76
GA: Baxley	04/17/13	-14 86
GA: Savannah	06/24/13	-11 78
HI: Honolulu	05/20/13	-39 75
IA: Cedar Rapids	05/07/13	21 79
ID: Boise	04/02/13	6 86
ID: Idaho Falls	04/05/13	54 88
IL: Morris	04/05/13	-12 86
IL: W. Chicago	05/06/13	23 79
KS: Topeka	04/17/13	85 80
LA: New Orleans	04/25/13	49 80
MD: Baltimore	04/08/13	-30 77
MD: Conowingo	04/09/13	18 78
MI: Detroit	04/11/13	70 80
MN: St. Paul	04/03/13	-59 85
MN: Welch	04/03/13	-8 86
MO: Jefferson City	04/08/13	17 87
MS: Jackson	04/09/13	-12 76
MS: Port Gibson	04/09/13	87 80
MT: Helena	04/25/13	55 80
ND: Bismarck	04/12/13	11 77
NE: Lincoln	04/08/13	-40 84
NJ: Trenton	04/29/13	-32 76
NJ: Waretown	04/29/13	30 79
NY: New York City	04/16/13	-16 76
NY: Niagara Falls	04/23/13	118 84
NY: Syracuse	06/24/13	16 79
OH: Cincinnati	04/09/13	-25 75
OH: Columbus	04/16/13	50 88
OH: E. Liverpool	04/17/13	61 81

Table 8 (continued)
Tritium in Drinking Water
April–June 2013

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
OH: Painesville	06/13/13	–34 77
OH: Toledo	04/08/13	130 82
OR: Portland	06/28/13	–14 78
PA: Columbia	04/09/13	44 78
PA: Harrisburg	04/02/13	–54 83
PA: Pittsburgh	04/16/13	37 78
RI: Providence	04/09/13	29 78
SC: Barnwell	04/02/13	–28 77
SC: Columbia	04/30/13	46 80
SC: Jenkinsville	04/10/13	25 79
SC: Seneca	04/08/13	43 80
TN: Chattanooga	04/08/13	136 84
TN: Knoxville	04/09/13	–12 75
TN: Oak Ridge/#360	04/02/13	–101 82
TN: Oak Ridge/#371	04/02/13	–6 86
TN: Oak Ridge/#4442	04/02/13	31 88
TN: Oak Ridge/#768	04/02/13	–33 84
TN: Oak Ridge/#772	04/02/13	19 87
TX: Austin	04/03/13	8 87
VA: Ashland	04/30/13	3190 210
VA: Lynchburg	06/11/13	2 80
WA: Richland	05/14/13	25 80
WI: Madison	04/15/13	67 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 2013

Location	Date Collected	K		¹³⁷ Cs	¹⁴⁰ Ba	¹³¹ I
		g/L	± 2u	pCi/L ± 2u	pCi/L ± 2u	pCi/L ± 2u
AR: Fort Smith	05/08/13	1.67	0.20	ND	ND	ND
AZ: Phoenix	05/10/13	1.66	0.20	ND	ND	ND
CA: Los Angeles	06/04/13	1.64	0.19	ND	ND	ND
CA: San Francisco	04/09/13	1.95	0.23	ND	ND	ND
CT: Hartford	06/12/13	1.68	0.20	ND	ND	ND
DE: Wilmington	04/15/13	1.57	0.19	ND	ND	ND
FL: Plant City	04/23/13	1.66	0.20	ND	ND	ND
HI: Hilo	04/08/13	1.68	0.20	ND	ND	ND
IA: Des Moines	05/21/13	1.62	0.20	ND	ND	ND
KS: Wichita	04/09/13	1.65	0.20	ND	ND	ND
KY: Louisville	04/09/13	1.60	0.19	ND	ND	ND
MA: Boston	06/20/13	1.67	0.20	ND	ND	ND
MD: Baltimore	04/09/13	1.62	0.19	ND	ND	ND
MO: Kansas City	04/25/13	1.60	0.20	ND	ND	ND
NJ: Trenton	04/10/13	1.76	0.20	ND	ND	ND
NV: Las Vegas	06/10/13	1.58	0.19	ND	ND	ND
NV: Reno	06/11/13	1.71	0.21	ND	ND	ND
NY: Buffalo	06/06/13	1.65	0.20	ND	ND	ND
NY: Syracuse	04/18/13	1.58	0.19	ND	ND	ND
OH: Cincinnati	05/13/13	1.62	0.19	ND	ND	ND
OH: Cleveland	04/19/13	1.60	0.19	ND	ND	ND
OR: Portland	06/24/13	1.65	0.19	ND	ND	ND
PA: Pittsburgh	04/29/13	1.60	0.20	ND	ND	ND
TN: Chattanooga	04/01/13	1.61	0.18	ND	ND	ND
TN: Chattanooga	06/24/13	1.64	0.19	ND	ND	ND
TN: Knoxville	04/18/13	1.67	0.20	ND	ND	ND
TN: Memphis	05/20/13	1.65	0.20	ND	ND	ND
TX: Dallas	04/09/13	1.62	0.20	ND	ND	ND
TX: San Antonio	04/29/13	1.59	0.19	ND	ND	ND
VT: Montpelier	04/18/13	1.59	0.20	ND	ND	ND
WA: Spokane	04/25/13	1.68	0.20	ND	ND	ND
WA: Tacoma	06/27/13	1.71	0.20	ND	ND	ND
WV: Charleston	04/16/13	1.71	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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email: edwards.jonathan@epa.gov

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