

ENVIRONMENTAL

RADIATION

DATA

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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/tcfpgvtcfpgvfccvlgtfqvo_rfcpf 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
January 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	5	0.007	0.002	0.004
AK: Fairbanks	6	0.021	0.011	0.017
AK: Juneau	7	0.007	0.001	0.003
AL: Birmingham	9	0.013	0.006	0.010
AL: Montgomery/408	9	0.018	0.009	0.012
AR: Fort Smith	4	0.029	0.011	0.016
AR: Little Rock	6	0.019	0.005	0.009
AZ: Phoenix	8	0.025	0.007	0.016
AZ: Phoenix/956	8	0.021	0.009	0.014
AZ: Tucson	7	0.015	0.006	0.009
AZ: Yuma	3	0.017	0.006	0.012
CA: Anaheim	7	0.016	0.005	0.011
CA: Bakersfield	6	0.093	0.009	0.037
CA: Eureka	2	0.004	0.002	0.003
CA: Fresno	2	0.012	0.012	0.012
CA: Los Angeles	3	0.010	0.007	0.009
CA: Richmond	5	0.021	0.003	0.012
CA: Riverside	8	0.013	0.004	0.009
CA: Sacramento	9	0.021	0.004	0.011
CA: San Bernardino Cty.	7	0.014	0.004	0.010
CA: San Diego	4	0.010	0.004	0.007
CA: San Francisco	9	0.014	0.001	0.006
CA: San Jose	7	0.021	0.002	0.008
CO: Denver	8	0.012	0.005	0.009
CO: Grand Junction	6	0.021	0.009	0.016
CT: Hartford	9	0.010	0.004	0.008
DC: Washington	9	0.020	0.005	0.009
DE: Dover	6	0.015	0.005	0.007
FL: Jacksonville	9	0.009	0.004	0.006
FL: Miami	3	0.005	0.004	0.005
FL: Orlando	9	0.010	0.004	0.007
FL: Tallahassee	3	0.011	0.008	0.009
FL: Tampa	6	0.009	0.005	0.007
GA: Atlanta	2	0.008	0.007	0.008
GA: Augusta	6	0.005	0.004	0.004
HI: Hilo	9	0.004	0.002	0.003
HI: Honolulu	9	0.003	0.002	0.002
IA: Des Moines	6	0.024	0.005	0.013

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IA: Mason City	6	0.018	0.006	0.012
ID: Idaho Falls	7	0.015	0.004	0.009
IL: Aurora	9	0.031	0.006	0.014
IL: Chicago	9	0.030	0.006	0.011
IN: Fort Wayne	1	0.011	0.011	0.011
IN: Indianapolis	8	0.025	0.007	0.012
KS: Kansas City	9	0.017	0.005	0.009
KS: Topeka	8	0.028	0.005	0.011
KS: Wichita	7	0.022	0.005	0.010
KY: Lexington	6	0.021	0.010	0.014
KY: Louisville	8	0.023	0.005	0.009
LA: Baton Rouge	9	0.008	0.003	0.005
LA: Shreveport	7	0.010	0.004	0.007
MA: Boston	9	0.006	0.003	0.005
MA: Worcester	7	0.014	0.006	0.009
MD: Baltimore	9	0.024	0.004	0.010
ME: Orono	3	0.010	0.007	0.009
ME: Portland	3	0.006	0.004	0.006
MI: Detroit	8	0.016	0.006	0.009
MI: Grand Rapids	6	0.017	0.007	0.012
MI: Lansing	9	0.041	0.016	0.027
MN: Duluth	4	0.018	0.006	0.009
MN: St. Paul	5	0.012	0.006	0.009
MO: Jefferson City	8	0.019	0.003	0.008
MO: Springfield	7	0.019	0.005	0.011
MO: St. Louis	2	0.013	0.011	0.012
MS: Jackson/Deq	9	0.013	0.004	0.008
MT: Billings	2	0.008	0.005	0.007
NC: Charlotte	8	0.009	0.006	0.007
NC: Raleigh	5	0.009	0.003	0.006
NC: Wilmington	4	0.007	0.005	0.006
ND: Bismarck	8	0.020	0.003	0.009
NE: Kearney	7	0.019	0.003	0.008
NE: Lincoln	7	0.022	0.004	0.012
NE: Omaha	3	0.012	0.007	0.009
NH: Concord	4	0.007	0.006	0.006
NJ: Edison	4	0.005	0.004	0.005
NJ: Trenton	9	0.018	0.007	0.010

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Albuquerque	4	0.013	0.005	0.009
NM: Carlsbad	6	0.014	0.008	0.010
NM: Navajo Lake St Park	5	0.020	0.009	0.013
NV: Las Vegas/913	3	0.012	0.006	0.010
NV: Reno	7	0.024	0.003	0.011
NY: Albany	9	0.015	0.005	0.010
NY: Lockport	9	0.013	0.005	0.007
NY: New York City	4	0.010	0.007	0.008
NY: Rochester	3	0.005	0.003	0.004
NY: Syracuse	1	0.007	0.007	0.007
NY: Yaphank	7	0.006	0.004	0.005
OH: Cincinnati	9	0.022	0.004	0.010
OH: Cleveland	8	0.021	0.004	0.009
OH: Painesville	7	0.013	0.006	0.009
OH: Toledo	8	0.025	0.009	0.013
OK: Oklahoma City	9	0.016	0.004	0.008
OK: Tulsa	8	0.020	0.004	0.009
OR: Corvallis	7	0.004	0.001	0.003
OR: Portland	9	0.004	0.001	0.002
PA: Harrisburg	7	0.009	0.004	0.006
PA: Philadelphia	4	0.011	0.005	0.007
PA: Pittsburgh	6	0.014	0.006	0.009
PR: San Juan	9	0.003	0.001	0.002
RI: Providence	4	0.008	0.003	0.005
SC: Barnwell	1	0.009	0.009	0.009
SC: Columbia	3	0.013	0.011	0.012
SD: Pierre	9	0.020	0.003	0.009
SD: Rapid City	7	0.016	0.004	0.008
TN: Knoxville	7	0.012	0.005	0.007
TN: Memphis	4	0.021	0.007	0.011
TN: Nashville	4	0.009	0.007	0.008
TN: Oak Ridge/Bethel	7	0.018	0.007	0.011
TN: Oak Ridge/K25	7	0.018	0.008	0.012
TN: Oak Ridge/Melton	7	0.021	0.009	0.014
TN: Oak Ridge/Y12 E	7	0.019	0.008	0.012
TN: Oak Ridge/Y12 W	7	0.019	0.008	0.012
TX: Austin	3	0.011	0.009	0.010
TX: Dallas	8	0.014	0.005	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: El Paso	7	0.022	0.009	0.015
TX: Ft. Worth	4	0.010	0.008	0.009
TX: Harlingen	7	0.010	0.006	0.008
TX: Houston	9	0.012	0.004	0.006
TX: Laredo	3	0.022	0.007	0.013
TX: Lubbock	5	0.009	0.001	0.006
TX: San Angelo	6	0.015	0.006	0.008
TX: San Antonio	9	0.017	0.005	0.010
UT: Salt Lake City	8	0.022	0.004	0.011
VA: Harrisonburg	8	0.011	0.006	0.008
VA: Lynchburg	9	0.010	0.007	0.008
VA: Richmond	3	0.015	0.006	0.010
VA: Virginia Beach	8	0.007	0.003	0.005
VT: Burlington	9	0.009	0.005	0.008
WA: Olympia	5	0.004	0.002	0.003
WA: Richland	7	0.010	0.003	0.006
WA: Seattle	4	0.003	0.001	0.002
WA: Spokane	7	0.009	0.003	0.006
WI: Madison	9	0.027	0.006	0.012
WI: Milwaukee	7	0.020	0.005	0.010
WV: Charleston	6	0.027	0.007	0.013

Table 3
Gross Beta in Airborne Particulates
February 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	6	0.008	0.001	0.003
AK: Fairbanks	6	0.009	0.002	0.005
AK: Juneau	7	0.004	0.001	0.002
AL: Birmingham	8	0.012	0.006	0.010
AL: Montgomery/408	8	0.018	0.008	0.012
AR: Fort Smith	4	0.015	0.009	0.012
AR: Little Rock	7	0.011	0.004	0.008
AZ: Phoenix	7	0.022	0.006	0.016
AZ: Phoenix/956	8	0.017	0.005	0.012
AZ: Tucson	8	0.013	0.005	0.010
AZ: Yuma	1	0.004	0.004	0.004
CA: Bakersfield	7	0.033	0.004	0.015
CA: Fresno	5	0.017	0.004	0.010
CA: Los Angeles	4	0.018	0.007	0.013
CA: Richmond	4	0.010	0.003	0.006
CA: Riverside	7	0.012	0.004	0.009
CA: Sacramento	8	0.015	0.002	0.006
CA: San Bernardino Cty.	9	0.016	0.004	0.010
CA: San Diego	9	0.018	0.003	0.009
CA: San Francisco	8	0.010	0.002	0.004
CA: San Jose	8	0.022	0.002	0.007
CO: Denver	8	0.028	0.004	0.016
CO: Grand Junction	5	0.018	0.005	0.012
CT: Hartford	7	0.010	0.005	0.007
DC: Washington	8	0.013	0.008	0.009
DE: Dover	7	0.009	0.006	0.007
FL: Jacksonville	8	0.009	0.004	0.007
FL: Miami	2	0.004	0.003	0.004
FL: Orlando	8	0.009	0.006	0.007
FL: Tallahassee	4	0.012	0.006	0.009
FL: Tampa	7	0.008	0.004	0.007
GA: Atlanta	2	0.007	0.006	0.006
GA: Augusta	6	0.011	0.005	0.008
HI: Hilo	8	0.004	0.002	0.003
HI: Honolulu	8	0.003	0.002	0.002
IA: Des Moines	7	0.014	0.006	0.010
IA: Mason City	7	0.012	0.007	0.010
ID: Idaho Falls	8	0.022	0.003	0.010

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IL: Aurora	8	0.015	0.009	0.012
IL: Chicago	8	0.012	0.007	0.010
IN: Indianapolis	8	0.012	0.008	0.010
KS: Kansas City	7	0.018	0.002	0.008
KS: Topeka	8	0.019	0.006	0.011
KS: Wichita	7	0.019	0.004	0.011
KY: Lexington	8	0.017	0.011	0.014
KY: Louisville	7	0.010	0.005	0.007
LA: Baton Rouge	8	0.007	0.003	0.005
LA: Shreveport	8	0.011	0.003	0.006
MA: Boston	8	0.008	0.005	0.006
MA: Worcester	7	0.014	0.009	0.010
MD: Baltimore	1	0.010	0.010	0.010
ME: Orono	4	0.010	0.008	0.009
ME: Portland	7	0.015	0.005	0.008
MI: Bay City 48708	4	0.011	0.008	0.009
MI: Detroit	8	0.011	0.007	0.009
MI: Grand Rapids	7	0.013	0.007	0.010
MI: Lansing	8	0.037	0.020	0.027
MN: Duluth	4	0.012	0.007	0.009
MN: St. Paul	4	0.012	0.007	0.010
MO: Jefferson City	8	0.013	0.003	0.007
MO: Springfield	6	0.019	0.005	0.010
MO: St. Louis	5	0.011	0.007	0.008
MS: Jackson/Deq	8	0.013	0.005	0.009
MT: Billings	3	0.020	0.006	0.013
NC: Charlotte	8	0.010	0.006	0.008
NC: Raleigh	4	0.008	0.005	0.007
NC: Wilmington	5	0.008	0.006	0.006
ND: Bismarck	5	0.014	0.009	0.011
NE: Kearney	8	0.012	0.003	0.008
NE: Lincoln	8	0.015	0.004	0.009
NE: Omaha	2	0.008	0.007	0.007
NH: Concord	7	0.010	0.006	0.008
NJ: Edison	7	0.008	0.004	0.006
NJ: Trenton	6	0.012	0.010	0.011
NM: Albuquerque	4	0.012	0.007	0.010
NM: Carlsbad	4	0.022	0.009	0.013

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Navajo Lake St Park	4	0.019	0.006	0.013
NV: Las Vegas/913	8	0.020	0.004	0.011
NV: Reno	8	0.024	0.005	0.011
NY: Albany	7	0.014	0.010	0.011
NY: Lockport	6	0.009	0.006	0.008
NY: New York City	5	0.009	0.007	0.008
NY: Yaphank	8	0.008	0.004	0.005
OH: Cincinnati	7	0.014	0.006	0.009
OH: Cleveland	8	0.011	0.006	0.008
OH: Painesville	8	0.013	0.008	0.011
OH: Toledo	7	0.015	0.010	0.012
OK: Oklahoma City	8	0.016	0.004	0.009
OK: Tulsa	7	0.025	0.005	0.011
OR: Corvallis	8	0.011	0.001	0.004
OR: Portland	8	0.009	0.001	0.004
PA: Philadelphia	4	0.008	0.006	0.006
PA: Pittsburgh	5	0.011	0.009	0.010
PR: San Juan	7	0.003	0.002	0.002
RI: Providence	4	0.009	0.006	0.007
SC: Barnwell	2	0.010	0.008	0.009
SC: Columbia	3	0.011	0.005	0.009
SD: Pierre	8	0.012	0.003	0.008
SD: Rapid City	6	0.016	0.006	0.011
TN: Knoxville	5	0.008	0.007	0.008
TN: Memphis	4	0.014	0.007	0.010
TN: Nashville	7	0.012	0.007	0.008
TN: Oak Ridge/Bethel	7	0.013	0.008	0.011
TN: Oak Ridge/K25	7	0.014	0.008	0.011
TN: Oak Ridge/Melton	7	0.015	0.007	0.011
TN: Oak Ridge/Y12 E	7	0.016	0.009	0.012
TN: Oak Ridge/Y12 W	7	0.015	0.007	0.012
TX: Austin	3	0.011	0.008	0.010
TX: Dallas	7	0.015	0.003	0.010
TX: El Paso	2	0.025	0.015	0.020
TX: Ft. Worth	5	0.018	0.007	0.011
TX: Harlingen	7	0.012	0.005	0.009
TX: Houston	5	0.008	0.004	0.006
TX: Laredo	7	0.013	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Lubbock	3	0.023	0.003	0.014
TX: San Angelo	8	0.012	0.003	0.008
TX: San Antonio	8	0.011	0.005	0.009
UT: Salt Lake City	8	0.034	0.005	0.015
VA: Harrisonburg	8	0.011	0.007	0.009
VA: Lynchburg	8	0.012	0.008	0.010
VA: Richmond	8	0.009	0.006	0.008
VA: Virginia Beach	7	0.008	0.005	0.006
VT: Burlington	8	0.009	0.006	0.008
WA: Olympia	7	0.008	0.001	0.003
WA: Richland	8	0.032	0.002	0.009
WA: Seattle	4	0.005	0.001	0.002
WA: Spokane	8	0.012	0.002	0.006
WI: Madison	8	0.014	0.007	0.012
WI: Milwaukee	7	0.011	0.006	0.009
WV: Charleston	6	0.012	0.007	0.009

Table 4
Gross Beta in Airborne Particulates
March 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	8	0.010	0.003	0.006
AK: Fairbanks	4	0.011	0.007	0.010
AK: Juneau	7	0.004	0.001	0.002
AL: Birmingham	8	0.011	0.005	0.008
AL: Montgomery/408	9	0.013	0.006	0.009
AR: Fort Smith	4	0.007	0.005	0.006
AR: Little Rock	7	0.008	0.005	0.007
AZ: Phoenix	9	0.019	0.009	0.013
AZ: Phoenix/956	8	0.023	0.006	0.013
AZ: Tucson	9	0.013	0.005	0.009
AZ: Yuma	2	0.009	0.006	0.008
CA: Anaheim	8	0.012	0.003	0.007
CA: Bakersfield	6	0.013	0.003	0.007
CA: Eureka	2	0.003	0.002	0.003
CA: Fresno	2	0.006	0.004	0.005
CA: Los Angeles	4	0.011	0.005	0.007
CA: Richmond	4	0.006	0.002	0.004
CA: Riverside	8	0.011	0.004	0.006
CA: Sacramento	9	0.007	0.002	0.004
CA: San Bernardino Cty.	8	0.014	0.004	0.008
CA: San Diego	6	0.007	0.003	0.005
CA: San Francisco	9	0.003	0.001	0.002
CA: San Jose	8	0.006	0.002	0.003
CO: Denver	7	0.015	0.008	0.011
CO: Grand Junction	6	0.014	0.004	0.009
CT: Hartford	9	0.007	0.004	0.006
DC: Washington	9	0.010	0.006	0.008
DE: Dover	6	0.008	0.005	0.007
FL: Jacksonville	9	0.007	0.003	0.005
FL: Miami	4	0.003	0.002	0.003
FL: Orlando	9	0.008	0.003	0.006
FL: Tallahassee	4	0.008	0.005	0.007
FL: Tampa	5	0.007	0.005	0.005
GA: Atlanta	4	0.009	0.007	0.008
GA: Augusta	7	0.012	0.005	0.008
HI: Hilo	9	0.005	0.002	0.003
HI: Honolulu	9	0.006	0.001	0.003
IA: Des Moines	7	0.014	0.005	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IA: Mason City	5	0.012	0.004	0.008
ID: Idaho Falls	9	0.014	0.004	0.007
IL: Aurora	9	0.012	0.006	0.010
IL: Chicago	8	0.010	0.006	0.008
IN: Fort Wayne	1	0.009	0.009	0.009
IN: Indianapolis	9	0.011	0.007	0.009
KS: Kansas City	7	0.009	0.004	0.006
KS: Topeka	9	0.011	0.006	0.009
KS: Wichita	7	0.016	0.006	0.009
KY: Lexington	8	0.017	0.010	0.012
KY: Louisville	8	0.008	0.006	0.007
LA: Baton Rouge	9	0.005	0.003	0.004
LA: Shreveport	7	0.005	0.003	0.004
MA: Boston	9	0.007	0.005	0.006
MA: Worcester	7	0.013	0.006	0.010
ME: Orono	5	0.010	0.005	0.008
ME: Portland	8	0.009	0.006	0.007
MI: Bay City 48708	8	0.011	0.006	0.008
MI: Detroit	9	0.011	0.006	0.009
MI: Grand Rapids	7	0.010	0.008	0.009
MI: Lansing	9	0.030	0.013	0.021
MN: Duluth	5	0.011	0.005	0.007
MN: St. Paul	4	0.009	0.006	0.008
MO: Jefferson City	9	0.010	0.004	0.006
MO: Springfield	7	0.011	0.004	0.007
MO: St. Louis	2	0.009	0.007	0.008
MS: Jackson/Deq	9	0.010	0.005	0.007
MT: Billings	4	0.010	0.007	0.008
NC: Charlotte	9	0.009	0.005	0.007
NC: Raleigh	3	0.007	0.005	0.006
NC: Wilmington	4	0.006	0.005	0.006
ND: Bismarck	7	0.015	0.005	0.009
NE: Kearney	7	0.010	0.006	0.008
NE: Lincoln	9	0.012	0.006	0.009
NE: Omaha	4	0.011	0.008	0.010
NH: Concord	6	0.008	0.006	0.007
NJ: Edison	9	0.006	0.002	0.005
NJ: Trenton	7	0.011	0.007	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NM: Carlsbad	5	0.014	0.006	0.010
NM: Navajo Lake St Park	4	0.015	0.007	0.010
NV: Las Vegas/913	2	0.005	0.004	0.005
NV: Reno	9	0.013	0.001	0.007
NY: Albany	7	0.014	0.010	0.012
NY: Lockport	8	0.009	0.006	0.007
NY: New York City	4	0.008	0.006	0.007
NY: Rochester	6	0.011	0.006	0.009
NY: Yaphank	9	0.006	0.004	0.005
OH: Cincinnati	9	0.009	0.006	0.008
OH: Cleveland	6	0.009	0.006	0.007
OH: Painesville	7	0.010	0.006	0.008
OH: Toledo	8	0.013	0.008	0.011
OK: Oklahoma City	9	0.008	0.004	0.006
OK: Tulsa	4	0.007	0.004	0.006
OR: Corvallis	9	0.003	0.001	0.002
OR: Portland	9	0.004	0.002	0.002
PA: Philadelphia	5	0.008	0.006	0.007
PA: Pittsburgh	4	0.010	0.008	0.009
PR: San Juan	9	0.009	0.002	0.004
RI: Providence	1	0.007	0.007	0.007
SC: Barnwell	2	0.011	0.007	0.009
SC: Columbia	4	0.011	0.007	0.009
SD: Pierre	8	0.011	0.006	0.009
SD: Rapid City	6	0.012	0.008	0.009
TN: Knoxville	8	0.019	0.006	0.010
TN: Memphis	4	0.008	0.006	0.007
TN: Nashville	7	0.010	0.006	0.007
TN: Oak Ridge/Bethel	9	0.010	0.006	0.008
TN: Oak Ridge/K25	9	0.011	0.006	0.009
TN: Oak Ridge/Melton	9	0.011	0.007	0.009
TN: Oak Ridge/Y12 E	9	0.012	0.007	0.009
TN: Oak Ridge/Y12 W	9	0.012	0.006	0.009
TX: Austin	3	0.013	0.006	0.008
TX: Dallas	9	0.011	0.004	0.007
TX: El Paso	6	0.017	0.010	0.014
TX: Ft. Worth	8	0.008	0.004	0.006
TX: Harlingen	4	0.007	0.004	0.006

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2012

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Houston	8	0.013	0.005	0.008
TX: Laredo	8	0.011	0.005	0.008
TX: San Angelo	6	0.009	0.004	0.006
TX: San Antonio	9	0.012	0.004	0.007
UT: Salt Lake City	9	0.020	0.005	0.009
VA: Harrisonburg	9	0.013	0.005	0.009
VA: Lynchburg	9	0.013	0.007	0.009
VA: Richmond	8	0.008	0.005	0.007
VA: Virginia Beach	7	0.007	0.005	0.006
VT: Burlington	9	0.013	0.006	0.009
WA: Olympia	8	0.004	0.001	0.002
WA: Richland	9	0.006	0.002	0.004
WA: Seattle	5	0.003	0.002	0.002
WA: Spokane	8	0.007	0.002	0.004
WI: Madison	9	0.012	0.007	0.009
WI: Milwaukee	7	0.010	0.004	0.008
WV: Charleston	6	0.009	0.007	0.008

Table 5
Specific Gamma in Precipitation
January 2012

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408		ND	
AR: Little Rock		ND	
CA: Richmond	Be-7	300	260
	Cs-134	33.2	7.1
	Cs-137	56	10
	Tl-208	10.1	8.1
	K-40	320	280
	Pb-212	62	43
	Pb-211	25	22
CO: Denver	Pb-212	2.8	2.5
		ND	
CT: Hartford		ND	
FL: Jacksonville		ND	
GA: Atlanta		ND	
HI: Honolulu		ND	
ID: Idaho Falls		ND	
MA: Boston	K-40	17	13
MN: St. Paul		ND	
NC: Charlotte	Be-7	102	42
NC: Wilmington		ND	
NY: Albany		ND	
NY: Yaphank	Be-7	44	39
OH: Painesville		ND	
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Knoxville	Pb-212	2.1	2.0
TN: Nashville	K-40	12	12
TN: Oak Ridge/K25	K-40	17	12
TN: Oak Ridge/Melton	Be-7	35	24
	Tl-208	0.67	0.65
TN: Oak Ridge/Y12 E		ND	
TX: Austin	Ra-224	29	22
TX: El Paso	K-40	13	12
UT: Salt Lake City	Pb-212	3.6	2.5
VA: Lynchburg		ND	
WA: Olympia	Pb-212	2.1	2.0

Table 6
Specific Gamma in Precipitation
February 2012

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	40	31
AR: Little Rock		ND	
CA: Richmond	Cs-134	2.7	1.3
	Cs-137	5.6	1.4
CO: Denver	Tl-208	1.4	1.3
CT: Hartford	Be-7	80	26
	Pb-212	1.8	1.3
	Tl-208	1.59	0.69
FL: Jacksonville	K-40	21	13
GA: Atlanta		ND	
HI: Honolulu		ND	
ID: Idaho Falls	K-40	14.4	8.7
	Tl-208	0.79	0.63
MA: Boston	Be-7	101	33
	K-40	13	12
	Pb-212	2.3	2.3
NC: Charlotte	K-40	18	12
	Pb-212	2.5	2.1
NC: Wilmington	Be-7	29	28
	K-40	21	13
NY: Albany	Be-7	63	49
NY: Yaphank	Be-7	49	28
	K-40	14	13
OR: Portland	Tl-208	1.32	0.94
TN: Knoxville		ND	
TN: Nashville	Be-7	105	41
	K-40	21	12
TN: Oak Ridge/K25	Be-7	95	41
	Pb-212	2.9	2.4
TN: Oak Ridge/Melton	Be-7	112	39
	K-40	23	12
	Pb-212	2.6	2.5
TN: Oak Ridge/Y12 E	Be-7	47	33
TX: Austin	K-40	15	13
UT: Salt Lake City		ND	
VA: Lynchburg	K-40	14	14
	Pb-212	2.4	2.0
	Ra-228	4.4	4.3
WA: Olympia	Tl-208	1.6	1.1

Table 7
Specific Gamma in Precipitation
March 2012

Location	Nuclide	pCi/L \pm 2u	
AL: Montgomery/408	Be-7	36	30
	Tl-208	1.5	1.3
AR: Little Rock		ND	
CA: Richmond	Be-7	30	21
	Cs-137	1.17	0.92
CT: Hartford	Be-7	40	25
FL: Jacksonville	Ra-228	2.4	2.2
GA: Atlanta	Be-7	78	32
HI: Honolulu		ND	
ID: Idaho Falls	Be-7	41	32
KS: Kansas City	Be-7	41	30
MA: Boston	Be-7	34	29
	Tl-208	1.5	1.2
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte	Be-7	32	29
NC: Wilmington	K-40	11	11
NH: Concord		ND	
NY: Albany	Be-7	64	29
NY: Yaphank	Be-7	23	18
OH: Painesville	Be-7	55	27
	Pb-212	2.7	2.3
	Tl-208	0.95	0.94
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Knoxville	Tl-208	2.1	1.2
TN: Nashville		ND	
TN: Oak Ridge/K25	Pb-212	3.3	2.1
TN: Oak Ridge/Melton	Be-7	37	30
	K-40	15	12
	Be-7	33	29
TN: Oak Ridge/Y12 E	Pb-212	3.8	2.6
	Tl-208	1.6	1.3
		ND	
TX: Austin		ND	
UT: Salt Lake City		ND	
VA: Lynchburg	K-40	11	10
	Tl-208	1.2	1.0
WA: Olympia	Tl-208	1.9	1.3

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
January–March 2012

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	01/03/12	-27 77
AL: Dothan	01/05/12	-2 77
AL: Montgomery	01/30/12	-58 77
AL: Muscle Shoals	01/12/12	-18 90
AL: Scottsboro	01/11/12	-47 87
AR: Little Rock	01/06/12	-16 77
CA: Richmond	01/06/12	9 78
CO: Denver	01/06/12	-7 77
CT: Hartford	01/04/12	-23 77
DE: Dover	01/09/12	-41 88
FL: Tampa	01/03/12	2 78
GA: Baxley	03/13/12	-23 78
GA: Savannah	01/03/12	-52 75
HI: Honolulu	03/09/12	66 75
IA: Cedar Rapids	01/04/12	-36 91
ID: Boise	01/03/12	-11 77
ID: Idaho Falls	01/06/12	134 96
IL: Morris	03/20/12	7 79
KS: Topeka	01/26/12	2 79
LA: New Orleans	03/29/12	80 76
MD: Baltimore	01/09/12	-12 89
MD: Conowingo	01/03/12	-45 78
MI: Detroit	02/27/12	57 81
MN: St. Paul	01/10/12	-20 89
MN: Welch	01/10/12	-35 88
MO: Jefferson City	01/06/12	-18 76
MS: Jackson	01/11/12	-22 90
MS: Port Gibson	01/11/12	19 96
ND: Bismarck	02/15/12	-40 77
NE: Lincoln	01/12/12	-61 87
NH: Concord	02/14/12	-7 78
NJ: Trenton	01/30/12	20 80
NJ: Waretown	01/30/12	18 80
NY: Albany	01/26/12	-14 89
NY: New York City	01/09/12	45 92
NY: Niagara Falls	01/03/12	16 79
NY: Syracuse	01/31/12	18 81
OH: Cincinnati	01/03/12	56 80
OH: Columbus	02/03/12	-25 78
OH: E. Liverpool	02/01/12	-34 77

Table 8 (continued)
Tritium in Drinking Water
January–March 2012

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
OH: Painesville	02/15/12	72 82
OH: Toledo	02/08/12	-7 79
OR: Portland	03/29/12	94 76
PA: Columbia	01/03/12	13 79
PA: Harrisburg	01/03/12	-10 90
PA: Pittsburgh	01/31/12	-29 78
RI: Providence	01/03/12	-38 76
SC: Barnwell	01/25/12	-16 89
SC: Columbia	01/17/12	10 90
SC: Jenkinsville	01/11/12	22 91
SC: Seneca	01/16/12	0 90
TN: Knoxville	01/04/12	-45 77
TN: Oak Ridge/#360	01/05/12	25 79
TN: Oak Ridge/#371	01/05/12	-34 76
TN: Oak Ridge/#4442	01/05/12	23 79
TN: Oak Ridge/#768	01/05/12	-59 75
TN: Oak Ridge/#772	01/05/12	-12 89
TX: Austin	01/26/12	27 80
VA: Ashland	02/17/12	3220 220
VA: Lynchburg	01/05/12	13 79
WA: Richland	01/10/12	-2 90
WI: Madison	01/05/12	38 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
January–March 2012

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	01/31/12	1.66 0.19	ND	ND	NR
AZ: Phoenix	03/30/12	1.68 0.19	ND	ND	ND
CA: Los Angeles	03/08/12	1.66 0.19	ND	ND	ND
CA: San Francisco	01/11/12	1.92 0.23	2.9 2.5	ND	ND
CT: Hartford	02/15/12	1.66 0.20	ND	ND	NR
DE: Wilmington	01/23/12	1.65 0.20	ND	ND	ND
FL: Plant City	01/24/12	1.73 0.20	2.7 2.2	ND	ND
HI: Hilo	01/24/12	1.74 0.20	ND	NR	NR
IA: Des Moines	01/30/12	1.65 0.19	ND	NR	NR
KS: Wichita	02/14/12	1.73 0.20	ND	ND	NR
KY: Louisville	01/11/12	1.66 0.19	ND	ND	ND
MA: Boston	03/29/12	1.67 0.20	ND	ND	ND
MD: Baltimore	01/09/12	1.58 0.19	ND	ND	ND
MI: Detroit	01/31/12	1.62 0.19	ND	NR	NR
MO: Jefferson City	03/07/12	1.69 0.19	ND	ND	ND
NJ: Trenton	01/06/12	1.63 0.20	ND	ND	ND
NM: Albuquerque	03/07/12	1.51 0.18	ND	ND	ND
NV: Las Vegas	01/09/12	1.77 0.20	ND	NR	NR
NV: Reno	01/12/12	1.67 0.19	ND	ND	ND
NY: Buffalo	02/22/12	1.65 0.19	ND	ND	NR
NY: Syracuse	01/09/12	1.61 0.19	ND	ND	ND
OH: Cincinnati	01/09/12	1.69 0.19	ND	ND	ND
OH: Cleveland	02/14/12	1.70 0.19	ND	ND	NR
PA: Pittsburgh	01/10/12	1.71 0.19	ND	ND	ND
TN: Chattanooga	01/05/12	1.72 0.20	ND	ND	ND
TN: Knoxville	01/18/12	1.57 0.19	ND	ND	ND
TN: Memphis	01/23/12	1.58 0.19	ND	ND	ND
TX: San Antonio	01/31/12	1.58 0.19	ND	NR	NR
WA: Spokane	01/24/12	1.63 0.19	ND	NR	NR
WA: Tacoma	03/31/12	1.73 0.20	ND	ND	ND
WV: Charleston	01/09/12	1.73 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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