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ENVIRONMENTAL RADIATION DATA

REPORT 131

July - September 2007

United States Environmental Protection Agency

Office of Radiation and Indoor Air

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Preface

Environmental Radiation Data(ERD) is compiled and published quarterly by the Office of Radiation and Indoor Air's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama, and contains data from the RadNet monitoring system (formerly ERAMS). ERD is published in both hard-copy and electronic formats. Electronic reports are available online at www.epa.gov/narel.

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 these samples include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides ancillary information on natural background levels and on routine and accidental releases into the environment from stationary sources.

The radiochemical procedures used by NAREL to analyze the RadNet samples are contained in the *NAREL Radiochemistry Procedures Manual*. Station operation and sample collection are in accordance with procedures contained in the *ERAMS Manual*(EPA 520/5-84-007, 008, 009).

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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 Air and 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/m³	0.0015
	Water	pCi/L	2
	Precipitation	pCi/L	2
Tritium	Water	pCi/L	150
	Milk	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m³	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 ^{239}Pu and ^{240}Pu, 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 m^3.

‡ 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. Airborne particulates are collected continuously at field stations representing wide geographic coverage throughout the United States.

Filters (10-cm diameter synthetic fiber) from air samplers are changed twice weekly and field measurements are made with a G-M survey meter 5 hours after collection to allow natural radon isotopes and their progeny to decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found.

The filters are sent to NAREL for more sensitive analysis in a low background beta counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m^3. The laboratory obtained values are usually lower than the field estimates because of the decay of naturally occurring radionuclides during the time between the two measurements.

Precipitation samples are collected at most field stations that collect air filters. These samples are also sent to NAREL where they are composited monthly for gamma scans, tritium, and gross beta activity measurements.

A compilation of individual measurements is available from the National Air and Radiation Environmental Laboratory, 540 South Morris Avenue, Montgomery, AL 36115-2601.

Table 2
Gross Beta in Airborne Particulates
July 2007

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AL: Birmingham	9	0.1	-0.0	0.0	0.011	0.005	0.008
AL: Montgomery/408	9	0.2	0.0	0.1	0.010	0.005	0.007
AR: Little Rock	5	0.1	0.0	0.0	0.017	0.008	0.012
AZ: Phoenix	5	0.3	0.1	0.2	0.014	0.008	0.012
CA: Anaheim	7	0.0	0.0	0.0	0.009	0.004	0.006
CA: Los Angeles	9	0.1	0.0	0.1	0.008	0.004	0.006
CA: Richmond	4	0.0	0.0	0.0	0.002	0.001	0.002
CA: Riverside	8	0.0	0.0	0.0	0.010	0.005	0.008
CA: San Bernardino Cty.	7	0.1	0.0	0.0	0.031	0.006	0.012
CA: San Diego	4	0.0	0.0	0.0	0.005	0.004	0.004
CA: San Francisco	5	0.0	-0.0	0.0	0.002	0.001	0.001
CA: San Jose	4	-0.0	-0.0	-0.0	0.003	0.001	0.003
CO: Denver	9	0.5	0.2	0.3	0.010	0.006	0.007
CT: Hartford	9	0.2	0.1	0.1	0.017	0.007	0.012
DC: Washington	9	0.2	0.0	0.1	0.012	0.003	0.007
DE: Wilmington	9	0.4	0.1	0.2	0.014	0.005	0.010
FL: Jacksonville	9	0.1	0.0	0.1	0.006	0.003	0.005
FL: Miami	7	0.0	0.0	0.0	0.010	0.003	0.006
FL: Orlando	9	0.1	0.0	0.0	0.006	0.003	0.004
GA: Atlanta	6	0.1	0.0	0.1	0.010	0.006	0.008
IA: Iowa City	9	2.8	0.1	1.3	0.015	0.006	0.010
ID: Idaho Falls	9				0.010	0.006	0.008
IL: Chicago	8	0.3	0.0	0.1	0.013	0.003	0.008
IN: Indianapolis	9	0.3	0.1	0.2	0.013	0.004	0.008
KS: Kansas City	9	0.7	0.2	0.5	0.025	0.012	0.018
KS: Topeka	9	1.0	0.1	0.5	0.013	0.007	0.010
MA: Boston	9	0.1	0.0	0.1	0.010	0.003	0.007
MD: Baltimore	4	0.2	0.0	0.1	0.014	0.007	0.011
MI: Detroit	7	0.3	0.0	0.1	0.012	0.003	0.007
MI: Lansing	9	0.4	0.2	0.3	0.016	0.004	0.009
MN: St. Paul	5	0.3	0.1	0.2	0.015	0.007	0.010
MS: Jackson	7	0.1	0.0	0.0	0.011	0.006	0.008
NC: Charlotte	9	0.2	0.1	0.1	0.013	0.006	0.009
NC: Wilmington	4				0.012	0.007	0.009
ND: Bismarck	5	1.6	0.3	1.0	0.013	0.008	0.010
NH: Concord	9	0.1	0.0	0.1	0.008	0.003	0.007
NJ: Edison	9	0.1	0.0	0.0	0.009	0.002	0.006
NJ: Trenton	9	0.5	0.1	0.2	0.012	0.006	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
July 2007

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
NV: Las Vegas/913	5	0.3	0.0	0.1	0.010	0.005	0.008
NY: Albany	4	0.1	0.0	0.0	0.011	0.005	0.007
NY: New York City	7	0.1	0.0	0.0	0.015	0.007	0.011
NY: Yaphank	9	0.1	0.0	0.0	0.006	0.002	0.004
OH: Cincinnati	3	0.3	0.0	0.1	0.013	0.005	0.010
OH: Cleveland	9	0.2	0.0	0.1	0.022	0.006	0.014
OH: Columbus	3	0.0	0.0	0.0	0.021	0.005	0.013
OH: Painesville	8	0.2	0.1	0.1	0.012	0.003	0.008
OH: Ross	9				0.033	0.005	0.017
OK: Oklahoma City	5	0.3	0.0	0.1	0.013	0.004	0.007
OR: Portland	9	0.1	0.0	0.0	0.006	0.002	0.004
PA: Harrisburg	9	0.4	0.1	0.2	0.013	0.006	0.008
PA: Pittsburgh	6	0.4	0.0	0.1	0.024	0.005	0.010
RI: Providence	9	0.3	0.0	0.1	0.012	0.004	0.008
SC: Barnwell	2	0.0	0.0	0.0	0.011	0.010	0.011
SC: Columbia	5	0.2	0.0	0.1	0.011	0.007	0.009
SD: Pierre	9	4.7	1.4	2.8	0.016	0.008	0.012
TN: Knoxville	9	0.9	0.2	0.5	0.022	0.011	0.016
TN: Memphis	7	0.3	-0.0	0.1	0.018	0.007	0.010
TN: Nashville	8	0.4	0.1	0.2	0.014	0.008	0.011
TN: Oak Ridge/Bethel	9	1.1	0.3	0.6	0.015	0.008	0.011
TN: Oak Ridge/K25	9	1.5	0.2	0.9	0.016	0.009	0.012
TN: Oak Ridge/Melton	9	1.1	0.3	0.6	0.013	0.008	0.011
TN: Oak Ridge/Y12 E	9	1.0	0.3	0.5	0.016	0.010	0.013
TN: Oak Ridge/Y12 W	9	0.4	0.2	0.3	0.014	0.009	0.012
TX: Austin	9	0.1	0.0	0.1	0.013	0.005	0.008
TX: Austin/Concordia	5	0.2	0.1	0.1	0.013	0.004	0.008
TX: Dallas	8	0.2	0.0	0.1	0.008	0.002	0.006
TX: El Paso	9	0.6	0.3	0.4	0.013	0.005	0.009
TX: Houston	9	0.1	0.0	0.0	0.010	0.005	0.007
UT: Salt Lake City	9	0.5	0.0	0.2	0.056	0.011	0.023
VA: Lynchburg	7	1.2	0.1	0.7	0.023	0.009	0.013
VA: Richmond	9	0.1	0.0	0.0	0.009	0.003	0.007
VA: Virginia Beach	7	0.1	0.0	0.0	0.009	0.003	0.006
WA: Olympia	9	0.1	0.0	0.0	0.004	0.001	0.002
WA: Spokane	8	0.6	0.2	0.4	0.014	0.004	0.010
WI: Milwaukee	6	0.5	0.0	0.2	0.022	0.008	0.017

Table 3
Gross Beta in Airborne Particulates
August 2007

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AL: Birmingham	9	0.2	0.0	0.1	0.028	0.006	0.014
AL: Montgomery/408	9	0.1	0.0	0.1	0.018	0.004	0.010
AR: Little Rock	8	0.1	0.0	0.0	0.028	0.012	0.020
AZ: Phoenix	4	0.5	0.1	0.3	0.026	0.010	0.015
AZ: Phoenix/956	9	0.8	0.2	0.5	0.020	0.010	0.015
CA: Anaheim	9	0.0	0.0	0.0	0.010	0.007	0.009
CA: Fresno	5	0.5	0.1	0.3	0.010	0.005	0.007
CA: Los Angeles	7	1.1	0.1	0.2	0.047	0.007	0.015
CA: Richmond	5	0.0	0.0	0.0	0.004	0.002	0.003
CA: Riverside	9	0.0	0.0	0.0	0.014	0.008	0.010
CA: San Bernardino Cty.	8	0.0	0.0	0.0	0.016	0.009	0.012
CA: San Diego	5	0.0	0.0	0.0	0.007	0.005	0.006
CA: San Francisco	4	0.0	0.0	0.0	0.024	0.002	0.008
CA: San Jose	8	0.1	-0.0	0.0	0.011	0.003	0.005
CO: Denver	9	0.4	0.1	0.2	0.009	0.005	0.007
CT: Hartford	9	0.3	0.1	0.2	0.024	0.006	0.015
DC: Washington	9	0.1	0.0	0.0	0.011	0.003	0.005
DE: Wilmington	8	0.2	0.0	0.1	0.017	0.003	0.009
FL: Jacksonville	9	0.1	0.0	0.0	0.014	0.004	0.008
FL: Miami	7	0.0	0.0	0.0	0.009	0.004	0.007
FL: Orlando	9	0.2	0.0	0.1	0.015	0.004	0.008
GA: Atlanta	5	0.2	0.0	0.1	0.020	0.007	0.014
IA: Iowa City	9	2.9	0.3	1.2	0.018	0.010	0.013
ID: Idaho Falls	9				0.011	0.007	0.009
IL: Chicago	9	0.1	0.0	0.1	0.013	0.006	0.009
IN: Indianapolis	9	0.7	0.1	0.3	0.017	0.006	0.010
KS: Kansas City	8	0.9	0.2	0.4	0.030	0.009	0.020
KS: Topeka	9	1.7	0.3	0.6	0.019	0.009	0.013
MA: Boston	8	0.1	0.0	0.1	0.013	0.004	0.008
MD: Baltimore	5	0.3	0.0	0.1	0.037	0.010	0.019
MI: Detroit	9	0.3	0.0	0.1	0.011	0.005	0.008
MI: Lansing	6	0.5	0.0	0.2	0.019	0.009	0.013
MN: St. Paul	4	0.1	0.0	0.1	0.013	0.006	0.010
MS: Jackson	9	0.6	0.0	0.2	0.028	0.007	0.014
NC: Charlotte	10	0.2	0.0	0.1	0.030	0.007	0.016
NC: Wilmington	4				0.014	0.006	0.011
ND: Bismarck	5	1.3	0.5	0.8	0.013	0.005	0.010
NH: Concord	9	0.1	0.0	0.1	0.014	0.004	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
August 2007

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
NJ: Edison	8	0.1	0.0	0.0	0.012	0.003	0.008
NJ: Trenton	9	0.7	0.1	0.3	0.021	0.004	0.010
NV: Las Vegas/913	3	0.0	0.0	0.0	0.010	0.009	0.009
NY: Albany	5	0.1	0.0	0.0	0.010	0.005	0.008
NY: New York City	5	0.0	0.0	0.0	0.015	0.008	0.013
NY: Yaphank	9	0.2	0.0	0.1	0.011	0.002	0.005
OH: Cincinnati	9	0.4	0.1	0.2	0.018	0.006	0.011
OH: Cleveland	9	0.2	0.0	0.1	0.024	0.010	0.016
OH: Columbus	9	0.0	0.0	0.0	0.026	0.010	0.016
OH: Painesville	7	0.3	0.1	0.1	0.016	0.004	0.010
OH: Ross	9				0.032	0.014	0.021
OK: Oklahoma City	9	0.3	0.1	0.2	0.017	0.003	0.010
OR: Portland	8	0.1	0.0	0.1	0.008	0.004	0.006
PA: Harrisburg	9	0.4	0.1	0.2	0.020	0.005	0.011
PA: Pittsburgh	8	0.2	0.0	0.1	0.016	0.004	0.010
RI: Providence	7	0.4	0.0	0.2	0.016	0.006	0.012
SC: Columbia	5	0.3	0.1	0.1	0.022	0.009	0.015
SD: Pierre	8	4.4	0.4	1.6	0.017	0.009	0.013
TN: Knoxville	8	0.8	0.5	0.6	0.031	0.013	0.022
TN: Memphis	7	0.6	0.1	0.3	0.021	0.009	0.014
TN: Oak Ridge/Bethel	9	1.3	0.2	0.9	0.029	0.009	0.016
TN: Oak Ridge/K25	9	2.1	0.5	1.3	0.027	0.011	0.017
TN: Oak Ridge/Melton	9	1.7	0.8	1.2	0.027	0.010	0.016
TN: Oak Ridge/Y12 E	9	1.5	0.7	1.0	0.030	0.012	0.018
TN: Oak Ridge/Y12 W	9	0.6	0.3	0.5	0.027	0.009	0.016
TX: Austin	9	0.2	0.0	0.1	0.024	0.004	0.012
TX: Austin/Concordia	9	0.4	0.1	0.2	0.020	0.004	0.011
TX: Dallas	8	0.4	0.1	0.3	0.015	0.005	0.009
TX: El Paso	9	1.1	0.3	0.7	0.027	0.007	0.013
TX: Ft. Worth	8	0.4	0.0	0.2	0.012	0.003	0.007
TX: Houston	9	0.2	0.0	0.1	0.017	0.003	0.008
UT: Salt Lake City	9	0.6	0.0	0.3	0.023	0.012	0.017
VA: Lynchburg	9	1.6	0.3	0.9	0.024	0.010	0.016
VA: Richmond	9	0.2	0.0	0.0	0.018	0.004	0.010
VA: Virginia Beach	9	0.1	0.0	0.0	0.018	0.004	0.009
WA: Olympia	9	0.1	0.0	0.0	0.004	0.001	0.003
WA: Spokane	8	0.7	0.2	0.4	0.017	0.007	0.010
WI: Milwaukee	4	0.5	0.0	0.2	0.037	0.007	0.021

Table 4
Gross Beta in Airborne Particulates
September 2007

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AL: Birmingham	8	0.6	0.0	0.2	0.036	0.006	0.017
AL: Montgomery/408	8	0.2	0.0	0.1	0.020	0.004	0.009
AR: Little Rock	5	0.6	0.0	0.2	0.024	0.008	0.015
AZ: Phoenix	4	0.7	0.2	0.4	0.013	0.010	0.012
AZ: Phoenix/956	8	4.5	0.3	1.0	0.138	0.012	0.031
CA: Anaheim	8	0.0	0.0	0.0	0.013	0.005	0.009
CA: Fresno	7	0.5	0.1	0.3	0.014	0.005	0.009
CA: Los Angeles	8	0.4	0.1	0.2	0.021	0.005	0.012
CA: Richmond	4	0.1	0.0	0.1	0.007	0.002	0.005
CA: Riverside	8	0.0	0.0	0.0	0.019	0.005	0.009
CA: San Bernardino Cty.	7	0.0	0.0	0.0	0.014	0.007	0.011
CA: San Diego	3	0.1	0.0	0.0	0.040	0.006	0.018
CA: San Francisco	3				0.007	0.005	0.006
CA: San Jose	5	0.2	0.0	0.1	0.009	0.005	0.006
CO: Denver	8	0.5	0.1	0.3	0.009	0.005	0.007
CT: Hartford	7	0.3	0.0	0.1	0.035	0.006	0.014
DC: Washington	7	0.4	0.0	0.1	0.006	0.003	0.005
DE: Wilmington	7	0.3	0.1	0.2	0.011	0.007	0.009
FL: Jacksonville	8	0.0	0.0	0.0	0.007	0.003	0.004
FL: Miami	6	0.0	0.0	0.0	0.011	0.002	0.005
FL: Orlando	7	0.1	0.0	0.0	0.008	0.004	0.005
GA: Atlanta	5	0.0	0.0	0.0	0.014	0.005	0.010
IA: Iowa City	8	3.3	0.4	1.3	0.023	0.007	0.013
ID: Idaho Falls	8	0.4	0.4	0.4	0.013	0.000	0.007
IL: Chicago	7	7.1	0.0	1.1	0.019	0.006	0.012
IN: Indianapolis	8	0.5	0.1	0.3	0.016	0.005	0.009
KS: Kansas City	8	0.3	0.1	0.2	0.017	0.005	0.010
KS: Topeka	8	0.6	0.0	0.4	0.016	0.005	0.011
MA: Boston	7	0.1	0.0	0.0	0.010	0.002	0.005
MD: Baltimore	4	0.3	0.1	0.1	0.015	0.007	0.012
MI: Detroit	6	0.3	0.1	0.2	0.012	0.003	0.009
MN: St. Paul	3	0.1	0.0	0.1	0.013	0.002	0.008
MS: Jackson	2	0.4	0.0	0.2	0.018	0.015	0.016
NC: Charlotte	7	0.2	0.1	0.1	0.033	0.005	0.013
NC: Wilmington	4				0.011	0.005	0.008
ND: Bismarck	3	0.4	0.2	0.3	0.014	0.005	0.008
NH: Concord	8	0.2	0.1	0.1	0.013	0.005	0.009
NJ: Edison	8	0.1	-0.0	0.0	0.009	0.002	0.005

Table 4 (continued)
Gross Beta in Airborne Particulates
September 2007

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
NJ: Trenton	8	0.6	0.2	0.4	0.015	0.004	0.009
NY: Albany	3	0.1	0.0	0.0	0.012	0.006	0.008
NY: Lockport	7	0.0	0.0	0.0	0.020	0.003	0.009
NY: New York City	6	0.0	0.0	0.0	0.015	0.006	0.011
NY: Yaphank	8	0.2	0.0	0.1	0.006	0.002	0.004
OH: Cincinnati	8	0.3	0.0	0.1	0.016	0.004	0.009
OH: Cleveland	8	1.1	0.1	0.2	0.036	0.005	0.019
OH: Columbus	7	0.0	0.0	0.0	0.027	0.009	0.015
OH: Painesville	7	0.3	0.0	0.2	0.022	0.005	0.012
OH: Ross	8				0.054	0.009	0.030
OK: Oklahoma City	5	0.1	0.1	0.1	0.010	0.004	0.007
OR: Portland	7	0.2	0.0	0.1	0.013	0.005	0.008
PA: Harrisburg	8	0.6	0.2	0.4	0.019	0.007	0.012
PA: Pittsburgh	6	0.7	0.0	0.2	0.018	0.004	0.011
RI: Providence	7	0.3	0.1	0.1	0.014	0.005	0.009
SC: Barnwell	1	0.0	0.0	0.0	0.011	0.011	0.011
SC: Columbia	3	0.1	0.0	0.0	0.021	0.008	0.016
SD: Pierre	6	1.9	1.0	1.3	0.019	0.007	0.014
TN: Knoxville	8	0.7	0.4	0.6	0.038	0.012	0.025
TN: Memphis	5	0.2	0.1	0.1	0.020	0.005	0.011
TN: Oak Ridge/Bethel	6	1.6	0.6	0.9	0.021	0.010	0.017
TN: Oak Ridge/K25	6	2.0	0.5	1.1	0.022	0.010	0.015
TN: Oak Ridge/Melton	7	2.6	0.8	1.3	0.021	0.011	0.017
TN: Oak Ridge/Y12 E	7	2.7	0.6	1.1	0.027	0.007	0.017
TN: Oak Ridge/Y12 W	7	0.6	0.2	0.4	0.020	0.008	0.015
TX: Austin	8	0.2	0.0	0.1	0.018	0.005	0.011
TX: Austin/Concordia	7	0.4	0.1	0.3	0.020	0.005	0.013
TX: Dallas	6	0.4	0.3	0.3	0.016	0.004	0.011
TX: El Paso	8	1.1	0.4	0.7	0.019	0.008	0.012
TX: Ft. Worth	7	0.2	0.0	0.1	0.009	0.002	0.005
TX: Houston	7	0.2	0.0	0.1	0.014	0.004	0.008
UT: Salt Lake City	8	0.6	0.0	0.2	0.025	0.011	0.017
VA: Lynchburg	6	1.8	0.3	1.0	0.020	0.008	0.014
VA: Richmond	8	0.1	0.0	0.1	0.011	0.003	0.008
VA: Virginia Beach	7	0.1	0.0	0.0	0.010	0.004	0.007
WA: Olympia	8	0.1	0.0	0.1	0.006	0.002	0.004
WA: Spokane	4	0.8	0.3	0.5	0.015	0.006	0.010
WI: Milwaukee	4	0.6	0.1	0.3	0.026	0.009	0.017

Table 5
Gross Beta and Specific Gamma in Precipitation
July 2007

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.58	0.32	Be7	15.3	9.7
AR: Little Rock	0.57	0.31		ND	
CO: Denver	3.74	0.64	Be7	74	29
CT: Hartford	1.29	0.40	Be7	53	40
DE: Wilmington	2.11	0.47	Be7	45	45
			Pb212	5.3	7.7
FL: Jacksonville	1.26	0.38	Pb212	2.4	4.7
GA: Atlanta	3.72	0.62	Be7	77	22
IA: Iowa City	1.11	0.37		ND	
ID: Idaho Falls	1.09	0.38		ND	
KS: Kansas City	1.45	0.40	Tl208	1.9	3.1
MA: Boston	3.56	0.61	Be7	59	50
MI: Lansing	4.78	0.77	Be7	39	32
MN: St. Paul	0.82	0.34	Be7	31	20
NC: Charlotte	2.00	0.46	Be7	58	22
NC: Wilmington	0.72	0.35		ND	
ND: Bismarck	1.10	0.38		ND	
NH: Concord	3.03	0.55	Be7	44	38
NM: Santa Fe	1.75	0.44	Be7	32	20
			Pb212	2.6	2.7
NY: Albany	2.36	0.49	Be7	69	35
			Pb212	4.3	4.9
NY: Yaphank	7.4	1.0	K40	15	13
OH: Painesville	3.02	0.55	Be7	64	55
OR: Portland	1.81	0.44	Be7	78	39
PA: Harrisburg	3.45	0.61	Be7	69	39
TN: Knoxville	1.73	0.45	Pb212	2.2	2.4
TN: Nashville	2.57	0.53	Be7	27	10
TN: Oak Ridge/K25	1.58	0.42	Be7	68	22
			K40	8	12
TN: Oak Ridge/Melton	2.81	0.54	Be7	82	24
TX: Austin/Concordia	0.19	0.28	Pb212	3.3	2.6
TX: Dallas	-0.03	0.26		ND	
TX: El Paso	0.80	0.34		ND	
UT: Salt Lake City	2.74	0.56	Be7	60	35
VA: Lynchburg	4.82	0.75		ND	
WA: Olympia	0.42	0.30		ND	

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
August 2007

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	1.12	0.37	Be7	71	21
CO: Denver	1.88	0.47	Be7	40	18
CT: Hartford	3.67	0.68	Be7	60	18
DE: Wilmington	3.59	0.61	Be7	63	38
FL: Jacksonville	0.59	0.32	Be7	29	19
GA: Atlanta	2.75	0.54	Be7	123	34
IA: Iowa City	0.57	0.33		ND	
ID: Idaho Falls	1.24	0.40	Pb212	4.2	6.2
KS: Kansas City	0.71	0.35		ND	
MA: Boston	6.49	0.90	Be7	90	15
MI: Lansing	0.87	0.36		ND	
MN: St. Paul	1.15	0.38	Be7	36	21
NC: Charlotte	2.53	0.94	Be7	95	32
NC: Wilmington	0.46	0.32	Be7	20	17
ND: Bismarck	1.26	0.41		ND	
NH: Concord	5.79	0.83	Be7	77	19
NY: Albany	3.59	0.64	Be7	84	20
			K40	8	12
NY: Yaphank	7.7	1.0	K40	12	13
OH: Painesville	0.31	0.35	Be7	21	20
OR: Portland	0.47	0.31		ND	
PA: Harrisburg	2.20	0.47	Be7	35	31
TN: Knoxville	1.12	0.39	Be7	41	20
TN: Oak Ridge/K25	2.05	0.47	Be7	84	23
TN: Oak Ridge/Melton	6.33	0.90	Be7	143	43
TX: Austin	0.81	0.36		ND	
TX: El Paso	0.48	0.33	Be7	17	12
VA: Lynchburg	16.1	1.9		ND	
WA: Olympia	0.66	0.37		ND	

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
September 2007

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.36	0.30		ND	
AR: Little Rock	0.50	0.33	Tl208	1.5	1.5
CA: Richmond	-0.5	2.6		ND	
CO: Denver	2.17	0.49	Be7	54	20
			K40	12	12
CT: Hartford	1.31	0.39	Be7	32	15
			Bi212	7.4	9.4
DE: Wilmington	1.44	0.43		ND	
FL: Jacksonville	1.22	0.39	Be7	39	16
GA: Atlanta	1.77	0.45	Be7	37	18
IA: Iowa City	0.75	0.35	Be7	12.6	8.8
KS: Kansas City	1.02	0.37	Be7	17	14
MA: Boston	0.50	0.31	Be7	27	16
MI: Lansing	2.33	0.49	Be7	13	12
MN: St. Paul	0.63	0.33		ND	
NC: Wilmington	0.89	0.35		ND	
ND: Bismarck	0.61	0.32		ND	
NH: Concord	2.10	0.46	Be7	63	17
NY: Albany	2.20	0.48	Be7	63	18
NY: Yaphank	13.1	1.6	K40	15	13
OH: Painesville	1.09	0.38	Be7	43.0	9.8
OR: Portland	0.89	0.35	Be7	40	28
PA: Harrisburg	3.38	0.61	Be7	109	39
TN: Knoxville	0.92	0.35		ND	
TN: Oak Ridge/K25	1.29	0.39	Be7	36	16
TN: Oak Ridge/Melton	3.19	0.59	Be7	31	15
TX: Austin	0.22	0.29	Be7	29	16
TX: El Paso	0.27	0.29		ND	
UT: Salt Lake City	3.33	0.63	Be7	14.5	8.2
VA: Lynchburg	4.71	0.73		ND	
WA: Olympia	0.58	0.32	Be7	29	14
			Pb212	1.9	2.3

Note: ND = Not Detected

Table 8
Tritium in Precipitation
July - September 2007

Location	July 2007 pCi/L	± 2*u*	August 2007 pCi/L	± 2*u*	September 2007 pCi/L	± 2*u*
AL: Montgomery/408	-14	81	9	84	-10	73
AR: Little Rock	42	86	NS		47	77
CA: Richmond	NS		NS		86	79
CO: Denver	81	87	140	83	37	76
CT: Hartford	-29	81	39	86	52	77
DE: Wilmington	-27	81	4	84	65	77
FL: Jacksonville	-51	80	-63	82	6	74
GA: Atlanta	11	82	-28	83	44	76
IA: Iowa City	51	86	22	78	-4	74
ID: Idaho Falls	-7	83	0	83	NS	
KS: Kansas City	-2	84	4	77	57	78
MA: Boston	51	85	22	85	31	75
MI: Lansing	72	84	7	85	8	75
MN: St. Paul	-4	83	60	82	15	75
NC: Charlotte	-2	83	-11	84	NS	
NC: Wilmington	-61	79	5	84	8	74
ND: Bismarck	-29	82	51	79	13	74
NH: Concord	31	84	-15	84	27	75
NM: Santa Fe	-73	81	NS		NS	
NY: Albany	16	83	29	85	4	74
NY: Yaphank	-13	82	-13	84	-27	72
OH: Painesville	39	83	-2	84	4	74
OR: Portland	-5	84	7	77	68	78
PA: Harrisburg	-14	81	-7	84	27	75
TN: Knoxville	5	82	-31	82	44	76
TN: Nashville	4	82	NS		NS	
TN: Oak Ridge/K25	82	86	-20	83	30	75
TN: Oak Ridge/Melton	80	86	-4	84	108	80
TX: Austin	NS		38	79	47	77
TX: Austin/Concordia	-4	84	NS		NS	
TX: Dallas	-40	82	NS		NS	
TX: El Paso	-40	82	42	79	70	78
UT: Salt Lake City	7	84	NS		16	76
VA: Lynchburg	5	82	33	86	31	75
WA: Olympia	-36	82	-13	82	0	75

Note: NS = No Sample

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 continuously operating airborne particulate samplers.

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.

Plutonium and uranium results are published when they become available.

Beta Activity in Precipitation

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 gross beta, tritium, and gamma-emitting radionuclides.

2. Drinking Water Program

The RadNet drinking water program provides data on radionuclide concentrations in the nation's drinking water supplies. Samples are taken at 78 sites which are either major population centers or selected nuclear facility environs.

Drinking water data are used to assess trends and anomalies in concentrations, and to compare with standards set forth in the EPA "National Interim Primary Drinking Water Regulations." These regulations provide for approval of supplies when the combined radium-226 and radium-228 levels do not exceed 5 pCi/L, when the gross alpha (excluding radon and uranium) levels do not exceed 15 pCi/L, when tritium levels do not exceed 20,000 pCi/L, when the strontium-90 levels do not exceed 8 pCi/L, and when the gross beta levels do not exceed 50 pCi/L.

The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, strontium-90, 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; (d) iodine-131 on one quarterly sample per year for each station; and (e) an annual composite for 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.

Table 9
Tritium in Drinking Water
July - September 2007

Location	Date Collected	^{3}H pCi/L	± 2*u*
AK: Fairbanks	08/23/07	-13	82
AL: Dothan	07/05/07	-7	81
AL: Montgomery/408	07/02/07	-37	80
AL: Muscle Shoals	07/11/07	84	86
AL: Scottsboro	07/11/07	34	84
AR: Little Rock	07/10/07	61	86
CA: Los Angeles	07/05/07	-4	82
CA: Richmond	07/03/07	2	82
CO: Denver	07/05/07	70	87
CT: Hartford	07/03/07	-7	84
DE: Dover	07/03/07	-25	83
FL: Tampa	07/16/07	-25	80
GA: Baxley	07/24/07	-39	80
GA: Savannah	09/28/07	27	77
HI: Honolulu	08/06/07	6	75
IA: Cedar Rapids	09/07/07	6	75
ID: Boise	09/10/07	-50	71
ID: Idaho Falls	07/06/07	-29	84
IL: Morris	07/05/07	-25	84
IL: W. Chicago	07/18/07	32	84
KS: Topeka	07/16/07	-83	78
LA: New Orleans	08/30/07	-19	73
MD: Baltimore	07/02/07	2	84
MD: Conowingo	07/15/07	34	85
MI: Detroit	07/09/07	100	87
MI: Grand Rapids	07/30/07	22	76
MN: Red Wing	07/03/07	-11	84
MN: St. Paul	07/31/07	33	76
MO: Jefferson City	07/05/07	18	85
MS: Jackson	07/03/07	2	85
MS: Port Gibson	07/03/07	42	87
MT: Helena	07/13/07	-21	80
NC: Charlotte	07/05/07	1060	120
NC: Raleigh	07/26/07	21	75
ND: Bismarck	07/02/07	36	86
NE: Lincoln	07/03/07	-47	83
NH: Concord	07/16/07	4	82
NJ: Trenton	07/11/07	52	84
NJ: Waretown	07/16/07	-60	79
NM: Santa Fe	07/06/07	16	85

Table 9 (continued)
Tritium in Drinking Water
July - September 2007

Location	Date Collected	^{3}H pCi/L	± 2*u*
NV: Las Vegas/906	09/28/07	25	77
NY: Albany	07/05/07	29	86
NY: New York City	07/25/07	0	74
NY: Syracuse	08/22/07	-7	83
OH: Cincinnati	08/29/07	242	85
OH: Columbus	08/09/07	-54	81
OH: E. Liverpool	07/25/07	600	100
OH: Painesville	07/26/07	82	79
OH: Toledo	07/03/07	85	88
PA: Columbia	07/15/07	37	86
PA: Harrisburg	07/15/07	15	85
PA: Philadelphia/Baxter	08/01/07	61	77
PA: Philadelphia/Belmont	08/01/07	174	83
PA: Philadelphia/Queen	08/01/07	149	82
PA: Pittsburgh	07/25/07	7	84
SC: Barnwell	07/05/07	-16	82
SC: Columbia	07/05/07	-9	82
SC: Jenkinsville	07/03/07	20	83
SC: Seneca	07/10/07	-23	81
TN: Chattanooga	07/02/07	81	89
TN: Knoxville	07/18/07	-12	81
TN: Oak Ridge/#360	07/10/07	20	83
TN: Oak Ridge/#371	07/10/07	18	83
TN: Oak Ridge/#4442	07/10/07	31	84
TN: Oak Ridge/#768	07/10/07	2	82
TN: Oak Ridge/#772	07/10/07	14	83
TX: Austin	07/11/07	22	84
VA: Ashland	07/27/07	112	81
VA: Lynchburg	07/03/07	-4	85
WA: Richland	07/05/07	-25	83
WA: Seattle	07/09/07	0	83

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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.

Quarterly samples are collected at approximately 55 sampling sites. The samples are composited, according to production, from the major milk suppliers representing more than 80 percent of the milk consumed in a given population center.

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 10

Radionuclides in Pasteurized Milk

July - September 2007

Location	Date Collected	K g/L ± 2*u*	^{137}Cs pCi/L ± 2*u*	^{140}Ba pCi/L ± 2*u*	^{131}I pCi/L ± 2*u*
AR: Little Rock	09/10/07	1.55 0.20	ND	ND	ND
AZ: Phoenix	09/28/07	1.57 0.20	ND	ND	ND
CA: Los Angeles	08/03/07	1.64 0.20	ND	ND	ND
CA: Sacramento	07/10/07	1.80 0.23	ND	ND	ND
CA: San Francisco	07/10/07	1.55 0.20	ND	ND	ND
CT: Hartford	07/27/07	1.69 0.21	ND	ND	ND
DE: Wilmington	08/03/07	1.63 0.20	ND	ND	ND
FL: Tampa	07/23/07	1.61 0.20	ND	ND	ND
HI: Honolulu	08/14/07	1.54 0.19	ND	ND	ND
IA: Des Moines	09/10/07	1.63 0.20	ND	ND	ND
KS: Wichita	07/10/07	1.62 0.20	ND	ND	ND
KY: Louisville	07/03/07	1.64 0.20	ND	ND	ND
MA: Boston	09/19/07	1.55 0.19	ND	ND	ND
MO: Jefferson City	07/17/07	1.63 0.21	ND	ND	ND
NJ: Trenton	07/17/07	1.58 0.20	ND	ND	ND
NV: Las Vegas	09/21/07	1.64 0.22	ND	ND	ND
NY: Buffalo	07/06/07	1.63 0.20	ND	ND	ND
NY: Syracuse	07/20/07	1.58 0.21	ND	ND	ND
OH: Cincinnati	08/21/07	1.45 0.19	ND	ND	ND
OH: Cleveland	09/19/07	1.58 0.20	ND	ND	ND
OR: Portland	07/16/07	1.69 0.22	ND	ND	ND
PA: Pittsburgh	08/08/07	1.63 0.21	ND	ND	ND
RI: Providence	07/06/07	1.57 0.20	ND	ND	ND
TN: Chattanooga	09/05/07	1.48 0.19	ND	ND	ND
TN: Knoxville	08/14/07	1.53 0.19	ND	ND	ND
TN: Memphis	07/23/07	1.58 0.20	ND	ND	ND
TX: Austin	07/23/07	1.47 0.18	ND	ND	ND
TX: Ft. Worth	08/20/07	1.67 0.20	ND	ND	ND
VA: Norfolk	08/14/07	1.58 0.21	ND	ND	ND
VT: Montpelier	09/21/07	1.78 0.21	ND	ND	ND
WA: Spokane	07/16/07	1.54 0.23	ND	ND	ND
WA: Tacoma	09/28/07	1.61 0.21	ND	ND	ND
WV: Charleston	07/09/07	1.58 0.19	ND	ND	ND

Note: ND = Not Detected

Table 11
Strontium-90 in Pasteurized Milk
July - September 2007

Location	Date Collected	^{90}Sr pCi/L	± 2*u*
CA: Sacramento	07/10/07	0.09	0.54
CT: Hartford	07/27/07	0.47	0.50
KY: Louisville	07/03/07	0.48	0.49
MO: Jefferson City	07/17/07	0.11	0.47
NJ: Trenton	07/17/07	0.35	0.48
RI: Providence	07/06/07	1.01	0.68
TX: Austin	07/23/07	-0.01	0.51
WA: Spokane	07/16/07	-0.13	0.55

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For More Information

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

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